# THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES FOR ACCESSING HIV AND AIDS INFORMATION BY HEALTHCARE PROFESSIONALS IN ZIMBABWE

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in the Department of Library and Information Science, University of the Western Cape, Cape Town, South Africa.

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**DECLARATION**

I declare that *The use of Information and Communication Technologies for accessing HIV and AIDS information by healthcare professionals in Zimbabwe* is my own work, and that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used have been indicated and acknowledged as complete references.

**Tapiwa Gandiwa** **May, 2021**

**DEDICATION**

I dedicate this thesis to my wife and my children.

**ACKNOWLEDGEMENTS**

I would like to express my sincere gratitude to my thesis supervisor Dr Lizette King for the guidance and unwavering support throughout my studies, you never lost hope on me during tough times and you had faith in me at all times. Your timely intervention gave me hope and energy to progress.

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I would like to offer my gratitude to the National AIDS Council of Zimbabwe who assisted me in getting permission to collect data from the select HIV and AIDS organisations.

Lastly, I would like to thank all the participants and their input.

Kindly note that while I acknowledge all the support, I remain responsible for the interpretation of the data and any shortcomings that may be contained in the study.

**ABSTRACT**

This study sought to investigate the information needs of selected HIV and AIDS health organisations in Zimbabwe with a view to proposing a framework for developing an information access platform. ICTs can play a pivotal role in improving access to HIV and AIDS information and in coordinating HIV and AIDS activities in Zimbabwe. However, the development of ICTs in Zimbabwe's health sector has been haphazard and idiosyncratic to a plethora of HIV and AIDS organisations operating in Zimbabwe. This study proposes a framework for the development of ICTs for accessing HIV and AIDS information in Zimbabwe. The needs-based framework was proposed after evaluating the information needs of healthcare workers and current health information technologies. An integrated theoretical framework incorporating the General System Theory, the Social Construction of Technology theory and the HOT-fit model was used to frame the study. The pragmatic philosophy used enabled the researcher to use an embedded mixed methodology and a multiple case strategy. A questionnaire, interviews and a customized website evaluation rubric were used to collect data from one hundred and seventy-four (174) healthcare professionals and seven (5) IT administrators drawn from select HIV and AIDS organisations.



The study found out that healthcare need information on a variety of topics and the most common topics were: Treatment options; policy issues and HIV and AIDS services were the most common topics needed by the healthcare workers. Healthcare workers use information from a variety of sources with medical databases, the Internet electronic journals being the most predominant source of health information. Social media and textbooks were also widely consulted. The most preferred ICT tools were iPads or tablets, laptops, desktops and smartphones respectively. The ICTs used in the HIV and AIDS organisations were not adequately meeting the needs of the healthcare workers. The respondents recommended the

adoption and use of mobile technologies and electronic resources for their information needs. A web-based content management system was suggested. Open-source software was recommended for developing the platform, using a set of information system design principles. Apart from the technological issues, the HIV organisations should also address the human and organisational issues that relate to policy and training. Some of the benefits of the platform will be less duplication of effort; improved information access, storage, analysis, and dissemination; enhanced performance analysis and reporting; reduced medical errors and improved patient care. The study recommends the development and implementation of the information access platform in line with the preferred information sources, media, and access channels.

**KEYWORDS**

Health information systems

Healthcare workers

HIV and AIDS

Information access

Information and Communication Technology

Information systems

Information Technology

Zimbabwe

**LIST OF ACRONYMS**

| | |
|---|---|
| AIDS | Acquired immunodeficiency syndrome |
| CDM | Chronic disease management |
| COVID-19 | Coronavirus disease 19 |
| DANIDA | Danish International Development Agency |
| ECDC | European Centre for Disease Prevention and Control |
| EHRs | Electronic health records |
| EMRs | Electronic medical records |
| GPs | General practitioners |
| GST | General System Theory |
| HIS | Health Information System |
| HIT | Health Information Technology |
| HIV | Human Immunodeficiency Virus |
| ICT | Information & Communication Technologies |
| IT | Information Technology |
| NAC | National AIDS Council of Zimbabwe |
| OECD | The Organisation for Economic Co-Operation and Development |
| RSS | Relatively Simple Syndication |
| SARS | Severe cute respiratory syndrome |
| SCOT | Social Construction of Technology |
| SPSS | Statistical Package for Social Science Research |
| STD | Sexually Transmitted Disease |
| STI | Sexually Transmitted Infection |

| | |
|---|---|
| TBAs | Traditional Birth Attendants |
| UNAIDS | Joint United Nations Programme on HIV and AIDS |
| UNDP | United Nations Development Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| WHO | World Health Organisation |

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

This study sought to develop a needs-based information access platform for healthcare professionals in HIV and AIDS organisations in Zimbabwe. There is a lack of a common platform for sharing HIV and AIDS information among healthcare professionals and this has resulted in duplication of effort and lack of coordination among key stakeholders in the health sector. With the increase in the importance of Information communication technologies (ICTs) in information sharing in this digital era, the study proposes an ICT based platform, informed by the needs of the healthcare professionals. The study used a participant-oriented model (HOT-fit) to evaluate current ICTs and assessed the information needs of healthcare professionals in developing the platform. The General System Theory (GST) and the Social Construction of Technology (SCOT) Theory informed the development of the information access platform. The researcher used the mixed methods approach, enshrined in the pragmatic philosophy to collect data from healthcare professionals and IT professionals working in Zimbabwean HIV and AIDS organisations.

## 1.2 Background and motivation

While, recent reports (UNAIDS, 2020; Avert, 2020) indicate positive trends in the reduction of HIV prevalence in Zimbabwe, the overall number of people living with HIV remains high. A report released in August 2019 shows that Zimbabwe still has a high HIV prevalence of 13.4% (Centres for Disease Control and Prevention [CDC], 2019). The pandemic has resulted in misery, poverty and destitution on a large scale. While the cure or vaccination remains

elusive, the power of information remains the hope for many (Wangulu, 2004; United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2017).

Information has long been a vital tool for promoting health, controlling diseases, raising the quality of life in communities and families. The United Nations Economic commission for Africa (2010, p. 2) asserts "the health sector is the most information intensive sector". Availability of health information to health professionals is considered a prerequisite for achieving health for all. Information availability enhances the quality of patient care as physicians make better use of evidence and apply appropriate up-to-date tools and practices at the point of care (Godlee et al., 2004, p.296; Wang, Wang & McLeod, 2018; Ohio University, 2020).

The Regional AIDS Training Network (2009, p. 16), through its GOAL Uganda initiative programme reports that HIV and AIDS education and information sharing enhances competencies among staff and family members; mitigates work related stigma and discrimination; and creates a cascading effect as individual staff transfer skills to their communities through mass sensitization and changing attitudes to care and treatment. The programme recommended that there is need to strengthen collaboration and information sharing among training and capacity development institutions in development, delivery and evaluation of HIV training programs to ensure multiplier effects and minimise duplication of efforts.

However, healthcare professionals in Zimbabwe, especially in the rural areas, lack adequate access to information. The United Nations Economic commission for Africa (2010, p. 2) argued that most of the practical frustrations encountered by stakeholders in African health systems can be linked to lack of accurate and timely information. The commission noted that many of the deaths in Africa could have been avoided and several of the problems faced by health professionals could have been overcome by timely availability of accurate health information. Furusa and Coleman (2018) also noted that Zimbabwe's health information system is characterised by lack of ICT infrastructure and e-health technologies, lack of ICT skills and knowledge, technical support, and security concerns.

Health information systems in Zimbabwe are fragmented and their development has been hugely influenced by donor funding, (Chikuni, 2016; Furusa & Coleman, 2018). This has resulted in isolated or fragmented systems that do not have platforms for information sharing (Khumalo & Mnjama, 2019). Tapera et al. (2019) cited a number of barriers in the development and implementation of successful health information systems in Zimbabwe. The challenges included lack of training for healthcare professionals, weakness of surveillance system for cervical cancer, inadequate healthcare professionals, reliance of patients on out-of-pocket funding for treatment services, lack of back-up for major equipment.

The rise of an information economy has brought about an information age that is highly reliant on information and communication technologies (Ngulube, 2004, p. 21). Therefore, restructuring of health information systems using ICTs has become an essential trend in the entire developing world since the implementation of primary health care as a global strategy for achieving the health for all goals (Agbele, Nyongesa & Adesina, 2010, p. 17; Agustini et

al., 2020). Atinga et al. (2020) revealed a statistically significant positive relationship between e-health usage and job satisfaction, and healthcare service delivery.

Zimbabwe has been challenged to adopt ICTs in fighting HIV and AIDS and it is one of the many countries that have embraced the use of ICTs to combat the HIV and AIDS pandemic (Chawurura et al., 2019). However, the use of ICT in the health sector also known as e-health in countries, like Zimbabwe, remains disunited, with fragmented and distant pockets of activities in society and socio-technical systems. Mandaza-Mapesa (2016) reported that there are inefficiencies in systems and processes in Zimbabwe's health information system and there is lack of strategies to implement Health Information Technology (HIT). The National Health Care Trust, Zimbabwe (2015) also reported that Zimbabwe is still lagging behind in terms of ICT infrastructure. Khumalo and Mnjama (2019) reported that the current eHealth initiatives have not always produced the much-anticipated positive results in Zimbabwe's health care delivery system.



There are in addition problems which still continue to hamper the use of information and ICT in healthcare in Zimbabwe despite improved ICT through local and international efforts. Lack of coordination among stakeholders is one of the factors hindering the effective use of ICTs in sharing HIV and AIDS information in Zimbabwe (Mandaza-Mapesa, 2016). The e-health strategies are characterised by isolated and fragmented systems.

Jackson et al. (2006) and Michelsen et al. (2015) advocated for the integration of health information systems. However, integration of health information across service systems is a

challenge for most countries. The heterogeneity problems of health information can be attributed to the fact that players in the health sector work in isolation. Moreover, the tension between the government and non-governmental organisations makes it impossible to share health information. As a result, heath information systems have evolved in an erratic, piecemeal fashion, shaped by administrative, economic, legal or donor pressures. This has resulted in fragmentation of health information systems, dispersal and dilution of responsibility, and competing interests of different role players from different sectors (Shahmoradi & Habibi-Koolaee, 2016; Kikoba, 2018; Agency for Healthcare Research and Quality, 2019).

The World Health Organisation (2002) stated that health care systems in Africa have various levels of complexities. It involves decision makers, policy makers, and groups of people in institutions, organisations, and agencies that shape the way in which health care is delivered to society. The health care system also encompasses different levels of care, from providing services for the prevention of diseases, to providing palliative or end-of-life care. Health care is provided by multiple health professions, such as physicians, nurses, social workers, occupational therapists, pharmacists, and many other types of professionals (Cordon, 2013, p.14). This results in health care professionals working independently, and in silos. Using systems theory, silos between the various healthcare professionals can be addressed, which can also help in identifying an overarching goal to enhance patient care. To do this, members of the interdisciplinary team first need to be unified as a team, and identify as a team an overall goal for the HIV and AIDS patient (Cordon, 2013, p.14). Amlung et al. (2020) found that existing health information systems in the United States face interoperability challenges and recommended that successful development of health information technology requires a comprehensive, intentional, well-communicated, and multidisciplinary approach.

This study proposes the use of emerging technologies to complement older technologies. Most telephone lines linking health centres in Zimbabwe have been vandalised, making the use of this technology in sharing information a problem. In the light of the shortcomings of older technologies, the adoption of e-health, that is the use of electronic information and telecommunications technologies to support long-distance healthcare, will provide a synchronous solution in sharing HIV and AIDS information among key stakeholders (Love et al., 2001; Maryati, Ray & Lampros, 2006; Gao, 2010). This study offers a new approach towards ICT design. While previous studies tended to be prescriptive in nature, this study is based on the social constructivist paradigm which recognises the importance of users of the system during design. Appropriate ICT development is an endogenous aspect of the capabilities of the user community to decide on its future and implement its decisions. Technology can be acquired and adapted, but not transferred, for it to be appropriately developed (World Health Organisation, 2008; Soriyan et al., 2010). Therefore, there was a need to locally develop an ICT platform which is based on local needs and structures.



Chiasson and Davidson (2004) challenged the Information Systems (IS) and allied fields to expand its "contextual envelope" by embracing the health care sector as a socially important and theoretically interesting context to develop and refine information systems theory as well as to provide contextually-relevant insights on health care information systems development and use. This view was reiterated by Davidson, Baird and Prince (2018) who challenged researchers to do more research in the area of health information technology theory.

### 1.3 Problem statement

While the cure of HIV and AIDS remains elusive and many people in Zimbabwe are still being infected and affected by the pandemic, information remains a powerful solution to the problem (National AIDS Council of Zimbabwe, 2014). Information availability enhances the quality of patient care as physicians make better use of evidence and apply appropriate up-to-date tools and practices at the point of care (Wang, Wang & McLeod, 2018; Ohio University, 2020). The use of ICTs in accessing HIV and AIDS information has been hailed and embraced by health practitioners such as physicians, nurses, social workers, occupational therapists, pharmacists, and many other types of professionals, in improving access to health information.

Healthcare professionals in Zimbabwe often lack timely access accurate information (Furusa & Coleman, 2018). This has been attributed to lack of effective ICT infrastructure, especially in rural areas. The development of ICT initiatives in the health sector has been haphazard, resulting less coordination among key players. The HIV and AIDS sector is characterised by individual players without a common platform for accessing and sharing HIV and AIDS information. This leads to duplication of effort, policy and data inconsistencies and lack of standardisation amongst the key stakeholders.

A locally developed ICT platform based on local needs and structures and accessible by all healthcare professionals will enhance accessibility of HIV and AIDS information and advance the quality of care in the health services. This study attempts to solve these challenges by proposing a framework for the development if information access platform which will enhance accessibility of accurate HIV and AIDS information.

### 1.4 Objectives of the study

The general objective of this study was to determine the information needs of the Zimbabwean health workers working with HIV and AIDS organisations and to propose a needs-based ICT platform for accessing the information. The specific objectives are:

a) To identify the information needs of Zimbabwean healthcare professionals working in HIV and AIDS organisations;
b) To use the HOT-fit model to evaluate the ICTs currently being used in accessing information by Zimbabwean healthcare professionals; and
c) To establish and recommend appropriate ICTs for accessing HIV and AIDS information by healthcare professionals in Zimbabwe.

### 1.5 Research questions

The research questions of the study are as follows:

a) What are the health information needs of healthcare professionals working in Zimbabwean HIV and AIDS organisations?
b) Are the ICTs currently being used in Zimbabwe appropriate for accessing information by health practitioners?
c) What are the appropriate ICTs that can facilitate access to HIV and AIDS information by healthcare professionals?
d) How can an effective platform for accessing health information in Zimbabwe be established?
e) How will such a platform enhance Zimbabwean HIV and AIDS health services?

### 1.6 Significance of the study

The value of technology to the development process is generally accepted. In particular, electronic networking is seen as a tool for attacking developmental problems. Thus, there is a need for 'appropriate' technology to be deployed in all spheres of development; health is one of the more fundamental areas on which all the others depend (National Health Care Trust, Zimbabwe, 2015).

The researcher believes that the establishment of an integrated health information network accessible by all healthcare professionals will benefit the fight against HIV and AIDS in Zimbabwe (Jackson et al., 2006; Kikoba, 2018; Agency for Healthcare Research and Quality, 2019). An integrated system promotes information sharing and eliminated duplication of research effort. The following benefits, classified into technological, political, economic, and social, are envisaged:



#### 1.6.1 Technological significance

A synchronous ICT platform will be a good solution to Zimbabwe's health information system design (WHO, 2008). The health sector is an information intensive sector which requires timely information. ICT applications in Zimbabwe`s health care are in many instances characterised by islands of donor-supported projects that have little impact on the AIDS crisis because they often prove too costly to be replicable, or are implemented in an uncoordinated way. The importance of information and communication technologies was highlighted by the decision of the World Health Organisation (WHO, 2008) "...to take immediate steps for telematics to

become part of its health-for-all strategy for the 21st century". The potential cannot simply be ignored by Zimbabwe in its fight against HIV and AIDS.

This study involves the key stakeholders in the design of information access platform, which are the users and the ICT personnel. Appropriate ICT development is an endogenous aspect of the capabilities of the user community to decide on its future and implement its decisions. Therefore, technology can be acquired and adapted, but not transferred, for it to be appropriately developed and accepted by users (Soriyan et al., 2010). Therefore, there was a need to locally develop information systems which is based on user needs and expectations.

### 1.6.2 Economic significance

It was expected that this study will promote the value and utility of information. Information is considered the lifeblood of organisations. Studies revealed that effective information use directly influences organisational productivity. There appears now to be a consensus that the value of information can only be considered in the context of its use and is, therefore, a user-driven concept not a producer concept.

ICTs provide a cost effective way of combating HIV and AIDS. Information availability has proved to be a cost effective way of combating the disease in the absence of and HIV cure. ICTs can help reduce disparities between the services available in urban and rural areas. They reduce the costs involved in transporting patients to urban facilities by transferring diagnostic information to specialised centres and promoting information exchange among healthcare professionals (World Health Organisation, 2008, p. 9).

### 1.6.3 Social significance

Technologies enable society to contribute to the cause of health. HIV and AIDS wikis and blogs enable patients to contribute their feeling, attitudes, behaviour and experiences. This reverses the rigid top-down approach in information provision. The envisaged platform will provide society an opportunity to contribute information relevant to the needs of people who are infected and affected by HIV and AIDS. Availability of accurate and timely HIV information enables healthcare professionals to improve service delivery in society and reduce medical errors. Local communities may also benefit from timely availability of HIV and AIDS information, allowing individuals to make better and informed decisions on matters pertaining to their health.



## 1.7 Originality of the study

This study is one of its kind in Zimbabwe. This study is unique in the sense that there has not been a study that attempted to develop an information sharing platform in the HIV and AIDS sector. Similar study was carried out by Matingwina and Raju (2015) which developed an information access platform for university students at the National University of Science and Technology. This study focused mainly on information sharing and not information access. Moreover, this study used the mixed methods approach in collecting data. The results of this study provide a new framework of how an information access platform in the health sector can be developed in the Zimbabwean context. Information needs of healthcare workers in Zimbabwe had not been studied before. Therefore, this study provides valuable original data on all the variables that were studied.

## 1.8 Delimitation of the study

Study delimitation is a boundary to which a study was confined (Pyrczak, 2005, p. 79). Delimiting factors in research include: the choice of objectives, the research questions, variables of interest, theoretical perspectives, study location and many others. The study focused on HIV and AIDS organisations that work in partnership with the National AIDS Council (NAC) of Zimbabwe. These organisations have headquarters located in the Zimbabwean capital city of Harare. Therefore, the researcher collected data from the headquarters. The researcher engaged healthcare workers and IT professionals in collecting data.

## 1.9 Limitations

According to the Sacred Heart University Library (2020), any study has limitations which have to be duly noted by the researcher. The limitations for this study include the following:

i) The sensitivity surrounding HIV and AIDS might have affected the study in relation to collecting data necessary to address all the variables that the study intended to address. However, the researcher sought permission and also observed ethical issues of confidentiality and anonymity of respondents.

ii) The study assessed the information needs of healthcare professionals from a subjective perspective. It is possible that some of the healthcare professionals had limited knowledge on some dimensions of information needs, particularly those that relate to Information Technology (IT). To mitigate this, the researcher engaged ICT professionals to solicit IT related information needs of healthcare workers.

iii) The findings of this study may not be generalised easily because it focused on the information needs and recommendations by HIV and AIDS organisations. While

useful insight may be drawn from the study, the findings are unique to the select organisations.

**iv)** The data was collected during the outbreak of COVI-19 pandemic. Therefore, there were restrictions in terms of travel and contact with study respondents. To overcome these challenges, the researcher resorted to telephone interviews with the IT professionals. Distribution of the questionnaire was done by a research assistant staying in Harare who utilised collection periods and workshops when lockdown restrictions were still relaxed.

### 1.10 Ethical statement

Ethical considerations involve getting the informed consent of the individuals or organisations to be interviewed, questioned, observed or take materials from (Bell & Waters, 2014, p. 43). The following ethical issues were considered:



#### 1.10.1 Institutional approval

The researcher gained ethics clearance from the University of Western Cape, where the study has been registered (Appendix A). Based on this clearance, the researcher adhered to the ethical guidelines of the Senate Research Committee of the University of the Western Cape, obtained the informed consent of the research participants and respected the participants' human dignity, privacy and confidentiality. The anonymity of the participants was assured as no form of identity was required from the respondents. The respondents were informed beforehand that participation in this study was on a voluntary basis, that they could withdrew at any time if they wished so and that their identity would remain confidential. In addition, participants were allowed to decline to answer some questions if they felt like it.

The researcher also obtained institutional approval from the National AIDS Council of Zimbabwe to study the involved health organisations (Appendix B). Approval from the individual institutions where the data was collected, were also gained.

### 1. 10.2 Informed consent

Potential research participants need to be given information that enables them to make informed decisions on whether to participate in a study or not (Bryman, 2012, p. 138). The study engaged healthcare professionals and IT administrators in the development of the ICT platform. For the purposes of confidentiality, the participants were assured that information provided would be used for the purposes of the study only and not for any other use that may be likely to cause harm or loss of dignity and opportunities, furthermore, the researcher did not divulge the identity of participants by anonymising data. Where interviews were used, participants were informed that their participation is voluntary and not compulsory.



### 1.11 Chapter concluding summary

This chapter introduced the study by providing a background and the triggers of the research. The challenges that relate to fragmented health systems in Zimbabwe were highlighted. These challenges have led to duplication of effort among the HIV and AIDS organisations. The study aimed at proposing the development of an information access platform that facilitates collaborative efforts and resource sharing among the HIV and AIDS organisations. The study assessed the information needs of healthcare workers, evaluated the current ICTs and solicited recommendations from the participants as part of the establishment of the information access platform. The study has technological, social and economic significance in the sense that collaboration is cost effective and improved accessibility to information improved the quality

of healthcare in society. The study focused on HIV and AIDS organisations that work in partnership with the National AIDS Council of Zimbabwe. Ethical issues that relate to informed consent and institutional approval were addressed in this chapter.

### 1.12 Outline of chapters

The research report is made up of seven chapters. Chapter One introduces the study and addresses the background to the study. This chapter provides the context of the problem being studied. Chapter Two addresses the theoretical framework, while Chapter Three discusses and analyses relevant literature paying particular attention to information needs of healthcare workers and a review of the ICTs used by healthcare workers. Chapter Four outlines the adopted research philosophy, research design and methodology and also addresses the validity and reliability issues of the study. Chapter Five presents and interprets the data collected. Chapter Six further analyses and interprets the findings framed by the literature reviewed, the theoretical concepts adopted and observations. Chapter Seven provides conclusions by answering the research questions and provides recommendations based on the findings and discussions thereof.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

This chapter reviews literature related to the study. A literature review is a systematic method of identifying, evaluating and interpreting existing knowledge on all aspects of the topic. It can be defined as a systematic, explicit, and reproducible method of identifying, evaluating, and synthesizing the existing body of knowledge produced by researchers (Booth, Papaioannou, & Sutton, 2012, pp. 2-3; Arshed & Danson, 2015, p. 31). It is also an important component in research because it enables the researcher to identify gaps in the literature and to avoid unnecessary replication by reviewing what has been covered previously. This thematic review focuses on information needs of healthcare professionals and ICTs used by healthcare professionals. The study starts by critically interrogating the concept of information needs, with the aim of establishing an operational definition to be used for the study. The review will also critically evaluate the efficacy of ICTs in managing HIV and AIDS information, and propose possible solutions.



It is important for a researcher to understand the literature in his field of study (Boote & Beile, 2005). When a researcher conducts a literature review he demonstrates his knowledge about a particular field of study, including vocabulary, theories, key variables and phenomena, and its methods and history (Randolph, 2009, p. 2). According to the University of Southern California (2021), the purpose of literature review is to:

i. Place each work in the context of its contribution to the understanding of the research problem being studied,

ii. Describe the relationship of each work to the others under consideration,

iii. Identify new ways to interpret, and shed light on any gaps in previous research,

iv. Resolve conflicts amongst seemingly contradictory previous studies,

v. Identify areas of prior scholarship to prevent duplication of effort,

vi. Point the way in fulfilling a need for additional research, and

vii. Locate your own research within the context of existing literature

This particular review provides literature that is related to the study. An attempt was made to provide contexts and interrelationships within the existing literature. The literature was grouped into themes derived from the study objectives and research questions. Contradictory studies were noted and the researcher critiqued certain concepts.



**2.2 The concept of Information Communication Technology (ICT)**

Information technology (IT) and ICTs are used nearly synonymously in a somewhat broad sense. The term ICT is preferred for this study because it add the communication dimension that relates to information sharing. The terms designate the information processing interaction between providers and users of information. Chowdhury (2000, p. 13) writes that ICTs encompass technologies that can process different kinds of information (voice, video, audio, text and data) and facilitate different forms of communications among human agents, among humans and information systems, and among information systems. They are used for capturing, storing, processing, sharing, displaying, protecting, and managing information (Food and Agriculture Organisation, 2020).

ICTs are regarded as the building blocks of the networked world (Chikonzo, 2005). As noted by Giuseppe, Valerio and Antonio (2018), ICTs enable the processing and storage of huge amounts of health information, and its rapid dissemination through computer networks. These innovations enable the processing and storage of enormous amounts of information along with rapid distribution of information through communication networks. The utilisation of ICTs is inevitable in today's networked world. Organisations have tapped into the potential of ICTs across all disciplines (Islam, 2016, p. 1). The health sector as an information intensive sector has widely applied ICTs for managing health information. Information continues to play a critical role in mitigating the effects of HIV and AIDS in the absence of a cure. Healthcare workers need timely access to information to make appropriate and informed medical decisions about treatment and referrals (Sutton et al., 2020, p. 1). Therefore, ICTs are considered pivotal in the fight against HIV and AIDS.



**2.3 Health Information Technology and Information access challenges in the health sector**

The efficient sharing of health information is needed to maximize delivery of health care (Institute of Medicine, 2001; Chu et al., 2018). However, health care provision is a complex and uncertain process. Internationally the fragmentation of the care delivery process and the insufficient access to information are recognized as factors impacting on efficient health care services. The Organisation for Economic Co-Operation and Development (OECD) (2010b) observed that health care systems across OECD countries including Austria, Belgium, Canada, Denmark, and France are characterized by separate "silos" of health care facilities like large and small medical practices, treatment centres, hospitals, and the people that manage them. It these isolated systems are not linked, sharing of information is restricted.

Soule (2020) noted that improving healthcare interoperability is a top priority for health systems, clinicians, patients, and even legislators the world over. Amlung et al. (2020) and Gandhi et al. (2005) found that existing health information systems in the United States face challenges, like data conversion, regulatory, functionality, and interoperability requirements and they recommended that organisations must iteratively and collaboratively define the technological, infrastructure, organisational, and workflow changes required for a successful HIT modernization effort.

In the African context, there is evidence that sharing health information is still unacceptably low (Akhlaq et al., 2016; Oleribe et al., 2019). Oluyemi and Olayanju (2020) found that medical records of individual patients are "seldom" used in in sub-Saharan Africa due to lack of collaboration in the design of healthcare systems. Azevedo (2017) reported that rampant corruption and lack of funding is affecting health information systems in Africa and as a result, information sharing is poor among key role players.



Iyamu (2020) reported that the health information systems in South Africa are characterised by data inconsistency and incompleteness and lack of cohesion among key stakeholders; resulting in challenges in bringing patient's big data together within a facility or from different health programmes. Kankanhalli et al. (2016) also attributed challenges that relate to data accuracy to lack of integration and analysis of a variety of healthcare big data. Therefore, integration and scalability are fundamental in addressing accuracy and accessibility of data in the health sector.

Health care workers need timely access to individual patients' medical records to make appropriate and informed medical decisions about treatment and referrals (Sutton et al., 2020, p. 1). The provision of care by this multiplicity of providers must be co-ordinated if wasteful duplication of diagnostic testing, perilous poly-pharmacy, and confusion about conflicting care plans are to be avoided (Bates, 2002; Colombani et al., 2019). However, Levine (2008) noted that due to the lack of co-ordination of care among multiple providers, medication errors occur. Timely and adequate exchange of information will enhance continuity of care and provide comfort to patients, their families and caregivers.

OECD (2010b, p. 16) noted that despite their potential, the implementation of ICTs in clinical care has only reached varying degrees of success and their potential has not yet been fully utilized. Despite promotion and public investment over many years, adoption has been slow and uneven despite. Amlung et al. (2020) stated that HIT development modernization is an opportunity for organisational and technological change and to be successful there should be a comprehensive, intentional, well-communicated, and multidisciplinary approach.



**2.4 ICT platforms and health information**

Sharing of information can also be instrumental in identifying aspects of health systems which are underperforming, areas of improvement and best practices in a value-driven health care system (AbouZahr & Boerma, 2005; Smith & Häkkinen, 2006; American Nursing Association, 2019). Information should also enhance quality and transparency in a health system and assist patients and care providers to make informed decisions also has a central role in guiding patient choice. It can also assist to identify national objectives and policy makers resulting in equitable allocation of resources, reducing disparities in health care and enhancing public health

supervision (Savel & Foldy, 2012, p. 23; Baridam & Govender, 2019). ICTs have been developed to ensure accurate collection and sharing of health care data resulting in timely exchange of data, fostering better care and efficient utilization of resources (Lee et al., 2010). ICTs can also contribute to the reduction of operating costs of clinical services as time will be saved with data capturing, processing and retrieval of health and patient information and should reduce or totally prevent the multiple handling of documents (Chu et al., 2018, p. 33). The ongoing development of ICTs part of the fourth industrial revolution provides potential of entirely new ways of delivering health care (Negandhi et al., 2015; Ji et al., 2017).

As elucidated in the previous section, the fragmentation of the delivery of health care process and poor transfer and sharing of health and patient data are contributing to inefficiencies in health care systems. As stated by Edelstein (2017, p. 28) the efficient sharing of health information is indispensable for the effective health care. An additional benefit of functional improvement of systems, as experience in other sectors has shown, is increased staff productivity. However, in the health sector mixed evidence is evident as it is dependent on the context and the technology used (Negandhi et al., 2015).



Most countries have established programmes and initiatives to provide care providers with information on especially patients' potentially serious health conditions or risks. The substantial benefits of enhanced communication between care providers have increased health care results (Bates, 2001; Bates, 2003; Alhuwail, AlMeraj & Boujarwah, 2018).

The Punjub Information Technology Board has been developing IT-based solutions and systems in Pakistan for fatal diseases like dengue, hepatitis and polio. One notable system is the Health Complaint Management System that was designed to address complaints and inquiries on cases that relate to HIV and AIDS, measles, polio, tuberculosis, dengue, and spurious drugs. The system also uses robot calls to raise awareness of these infectious diseases (Haider, 2019).

WHO initiated the development of a web-based platform and integrated data warehouse to ensure easy access to the best available information and evidence and to provide support for collaborative networks and communities of practice. The platform, called the African Health Observatory (AHO) is a repository of the best information available on health in the African Region. It also supports strengthening the functionality of AHO's integrated health database system as an interactive online database of all the best available and authoritative data and health information, including a data dictionary (a compendium of indicators and metadata) and related reference publications (World Health Organisation, 2021).



In the South African context, the African Population and Health Research Centre drafted a data access and sharing policy in 2007, and the executive director led the INDEPTH data sharing and access policy process. This facilitated the development of a micro data portal that is part of their core funding to make 28 datasets publicly available as part of the INDEPTH Sharing and Access Repository (iSHARE) project (INDEPTH Network, 2013).

The African Population and Health Research Centre and other partners working through the Knowledge Sharing Network on Non-Communicable Diseases (KSN-NCD) launched the Kenya NCD-info, an online platform designed to be a one-stop portal for all information related to NCDs in Kenya. KSN-NCD was launched with the express aim of bringing together NCD experts in a collaborative venture to share information and explore ways in which they could inform policy and contribute to efforts designed to combat non-communicable diseases in Kenya. By launching the portal, the network aims to consolidate information on NCDs in a single, highly accessible and user friendly way, that will act as a rich resource for Researchers, academics and program implementers who want to share their work on NCDs; policymakers and health planners who want quick and easy to access information on NCDs in Kenya; and anyone who wants to learn more about NCDs in Kenya (African Population and Health Research Center, 2014).

OECD (2010a) reported that the use of the chronic disease management (CDM) toolkit and associated decision support tools in the Canadian province of British Columbia, has provided guidelines on chronic disease care to such an extent that significant improvements in chronic care were recorded. Findings indicate that, for example, people with diabetes who had HbA1c, blood pressure and lipid tests complying with guidelines from the Canadian Diabetes Association, improved between 2001/02 and 2004/05 from 21.8% to 48.6%. This has proven that relatively modest investment in IT like the CDM toolkit has resulted in major changes in diabetes care leading to reduced costs of diabetes care and significant financial benefits (OECD, 2010b).

Hillestad et al. (2005) carried out a study based on a broad literature survey of evidence of health IT effects and estimated that potential IT-enabled efficiency savings for in-and outpatient care could average more than 77 billion USD per year. Additionally, the study noted the potential for significant patient safety benefits from electronic record systems, especially those that can reduce 200 000 inpatient adverse drug events, some of which are due to poor information transfer, possibly saving about 1 billion USD per year. Reminders to patients and clinicians regarding preventive care guidelines can also improve short-term preventive care (Hillestad et al., 2005; Zhao et al., 2019).

Determining and measuring the cost benefits of investing in ICTs are difficult. As indicated in the previous paragraphs, various health care organisations have reported different intangible gains from different technologies (Chilundo & Aanestad, 2004; Congressional Budget Office, 2008; Agustini et al., 2020). In addition, many care providers rate qualitative impacts of ICT implementation on health care more important than financial gain. In Western Australia, for example, confidentiality and speed of communication (e.g. prompt receipt of hospital discharge summaries) were recorded as intangible benefits (Chaudhry, 2006; Khalifa, 2017).



A benefit applauded by many Western Australian and Canadian general practitioners and health care professionals is the possibility of accessing patient information at multiple locations (e.g. private practice, residential aged care facility or hospital) as it saved time and improved decision making, quality of care and patient satisfaction (Chaudhry, 2006; Atinga et al., 2020).

Many researchers (Coye et al., 2009; Shahmoradi & Habibi-Koolaee, 2016; Kikoba, 2018; Agency for Healthcare Research and Quality, 2019) have drawn attention to the fragmented

approach towards health care as well as the geographic, socioeconomic, and cultural disparities creating care gaps and/or inaccessibility to care facilities. ICTs can bridge this gap as it can supply cost effective means to deliver quality care to remote or under-served populations. Sæbø et al. (2011) have shown that integrated health care systems in South Africa, Zanzibar, Sierra Leone and Botswana ca be used to overcome some problems like workforce shortage and the often skewed distribution of health care facilities.

However, despite the real and potential benefits of ICTs in the health sector, there has been an ongoing international debate about whether envisaged benefits can be measured against financial input required. Arguments are based on notable successes, but also significant public investments, costly delays and failures as well as the lack of widespread understanding of the values of electronic record keeping and information exchange (Congressional Budget Office, 2008). Older studies like those of Ash and Bates (2005), Taylor and Bower (2005) as well as Simon et al. (2007) identified that a barrier to investment in ICTs is that resulting cost savings may not always accumulate to the implementer, but to a third party or that benefits will not be experienced in all divisions. Hillestad et al. (2005) showed that health providers like physicians and hospitals in America, would suffer short-term revenue losses as a result of investing in health information systems, while consumers like medical insurance companies would most likely reap the significant savings.

A more recent study by Wang, Wang and McLeod (2018), however, found that American hospitals where health information technology (HIT) was implemented, recorded positive financial performance and productivity. This question on potential benefits of HIT investment

is pivotal to the adoption of health ICT. A report by the Agency for Healthcare Research and Quality (2019) concluded that:

> "It is not possible to draw firm conclusions about which health information technology functionalities are most likely to achieve certain health benefits – and the assessment of costs is even more uncertain. Existing evidence is not sufficient to clearly define who pays for and who benefits from health information technology implementation in any health care organisation" (p. 22).

### 2.4.1 Overview of Health Information Systems in Zimbabwe

Health information systems in Zimbabwe are fragmented and having been influenced by donor funding, they are idiosyncratic to the organisations that develop them (Chikuni, 2016; Furusa & Coleman, 2018). This has resulted in fragmented systems characterised by silos of information and lack resource sharing among key stakeholders (Khumalo & Mnjama, 2019). Furusa and Coleman (2018) noted that the concept of e-health is relatively new to healthcare centres in Zimbabwe and its implementation has not been adequately addressed. Khumalo et al. (2017) were also concerned that the inclusion of records management and archival concerns during system design in healthcare informatics has not been prioritised, resulting in systems which fail to produce authentic, reliable and records.

A study by Tapera et al. (2019) showed that Zimbabwe's health system and its organisation present barriers to the uptake of cervical cancer treatment and care. The study recommended the development of a health information system improve the organisation and distribution of cervical cancer screening and treatment services and monitoring systems. Tapera et al (2019) cited a number of barriers in the development and implementation of successful health

information systems In Zimbabwe. The challenges included lack of training for healthcare professionals, weakness of surveillance system for cervical cancer, inadequate healthcare professionals, reliance of patients on out-of-pocket funding for treatment services, lack of back-up for major equipment.

Taderera (2019) asserts that in an attempt to improve the coverage of health systems and services, Zimbabwe adopted the Human Resources for Health (HRH) reform. The study carried out by Taderera (2019) revealed that implementation of these reforms was undermined by technical, financial and material incapacity thereby resulting in continued use of manual methods.

A study by Furusa and Coleman (2018) showed that Zimbabwe's health information system is characterised by lack of ICT infrastructure and e-health technologies. The same study study revealed that the implementation of e-health by medical doctors in public hospitals in Zimbabwe is influenced by both internal and external factors. Internal factors include ICT infrastructure and e-health technologies, ICT skills and knowledge, technical support, security concerns, lack of basic medical facilities, demographic factors such as age and doctor–patient relationship. External factors are health policy, funding and bureaucracy.

However, despite the challenges, significant progress is being made in the development and implementation of health information systems in Zimbabwe. The genesis of the modern national health information and surveillance system in Zimbabwe started in 2010, with the adoption of the first version of the District Health Information System (DHIS-1), followed by

DHIS-2 in 2013. Since 2013 the system has been successfully rolled out country-wide to the national offices of the Ministry of Health and Child Care (MoHCC) in Harare, as well as to 63 districts, 8 provincial and 4 city health information offices (Ministry of Health and Child Welfare [MoHCC], 2014).

The DHIS system was implemented for processing facility registers, service availability mapping, logistics management, and mobile tracking of pregnant mothers in rural communities. The system incorporates mobile phone based reporting of weekly data, using Frontline SMS messaging. (United Nations Development Programme [UNDP], 2014). However, a study by Furusa and Coleman (2018), revealed that Zimbabwe still has few hospitals that have successfully implemented the system.

The Ministry of Health and Child Care Zimbabwe in its Electronic Health Record Roadmap of 2016 observed the need for an Electronic Health Record (EHR) system to improve accuracy and timeliness of health information for management, disease outbreak detection, control and program performance reporting. The Ministry of Health in collaboration with its partners introduced the Impilo EHR system in Uzumba-Maramba-Pfungwe (UMP) district of Mashonaland. The pilot project is intended to be spread across all public health facilities in the country (Kaerasora, 2017).

The Ministry of Health and Child Welfare (2020) carried out a study to validate the Impilo system and established that the EHR system was generating 100% complete and accurate registers and users were satisfied with EHR system in UMP District. The study recommended

that a combined national and subnational implementation team should be set up to work with the district during the trial of paper reduction and that an evaluation be conducted at the end of the trial.

Other information system initiatives in Zimbabwe are disease specific and are confined to certain geographic locations. One good example is the Health Information Management System (HIMS) used for Malaria Case reporting in Chipinge district. An evaluation of the system by Kureya et al. (2017) showed that the surveillance system is acceptable, flexible, useful and simple. However, the system has some limitations on usefulness, stability, timeliness and completeness of Village Health Worker (VHW) reports. Some healthcare professionals at health facility levels were not yet able to interpret the surveillance data for early detection and management of outbreaks hence the need for further training.



Ndarukwa et al. (2020) developed an algorithm for diagnosing and managing asthma in Zimbabwe. The system was developed to mitigate diagnostic challenges often lead to under diagnoses, over diagnoses, misdiagnoses and sometimes unreported cases of asthma. The system is intended to be implemented in all public health centres across Zimbabwe.

In the context of HIV and AIDS, Zimbabwe developed and implemented a pilot of HIV case surveillance (CS) based on the 2017 World Health Organisation (WHO) person-centred HIV patient monitoring (PM) and case surveillance guidelines (World Health Organisation [WHO], 2019). An evaluation of the system by Nsubuga et al. (2020) revealed that the HIV CS system was adequately designed for Zimbabwe's context and it was integrated within existing health

information systems at the facility level. The system performed well in terms of surveillance and informatics attributes. However, the training was minimal, and an opportunity to train the data entry clerks in data analysis was missed. The viral load test results return was a significant problem and an electronic link needs to be made between the health facilities and the laboratory to reduce viral load test results delays.

### 2.5 ICTs and HIV/AIDS information

Ajuwon (2006, p.14) pointed out that, "…the use of ICTs has grown relatively rapidly in the developing world in the last five years". Chikonzo (2005) in her paper on the use of ICT, for AIDS prevention in developing countries suggested the use of a variety of ICT "tools" including mobile cellular phones, telephone (landline), radio, satellite television, the internet and electronic mail in the fight against HIV and AIDS. These can be powerful tools in providing information on supporting the response to HIV/AIDS. A study that that was carried out by Ojuondo and Kwanya (2014) in Kenya revealed that e-mail discussion groups, social media, the World Wide Web (WWW), radio, television and distance learning systems are some of the ICT tools being used in the fight against HIV/AIDS in the slums in Kenya's cities.



ICTs have a great potential to enable People Living with HIV and other vulnerable groups such as women and the youth to respond appropriately to and participate effectively in programmes aimed at managing the impacts of the disease. Ojuondo and Kwanya (2014) argued that the use of Information and Communication Technologies (ICTs) for behaviour change communication is one of the approaches civil society in Kenya has embraced to confront the HIV/AIDS scourge.

ICT enhances access to and communication on HIV/AIDS information (United Nations Development Programme [UNDP], 2006; Joint United Nations Programme on HIV/AIDS [UNAIDS], 2016a, p. 8). Recent enhancements in ICT in relation to public health, education and public (internet based), networking provide a growing arsenal of instruments in terms of ICT based interventions for combating HIV/AIDS and for mitigating the effects of the epidemic. On-going and planned HIV/AIDS initiatives may be boosted by improving capacities for communication and information processing and dissemination through innovative use of ICTs (UNAIDS, 2016a, p. 12). The focus of these HIV/AIDS initiatives may vary from creating awareness and prevention to strengthening the provision of health care services and the setting up of research networks and resources for monitoring the epidemic.

In addition, ICTs are recognised as tools that can support the implementation of National strategic Plans on HIV/AIDS. As an illustration Peter Benjamin of Cell-Life (2005) cited by Geers and Page (2007) advocated that ICT can assist in rolling out the National strategic plans on HIV/AIDS in South Africa by:



i. Improving the efficiency of the "back office" of HIV/AIDS organisations especially at community level;
ii. Strengthening mass communication of prevention, treatment, anti- stigma and other HIV messages; and,
iii. Providing a medium for research, advocacy and other forms of information sharing".

ICT and new technologies can provide support in the implementation of HIV/AIDS prevention, care and treatment interventions in a number of areas. The majority of ICT interventions within

health and development work in Africa have used low-tech solutions in combination with older technology such as radio, television and print media in fighting the epidemic (Geers & Page, 2007; Liang et al., 2020).

### 2.6 Information needs of healthcare professionals

Power and Hunter (2001) opined that a precursor to devising health promotion interventions is the identification of information needs. Therefore, the design of the information access platform should be informed by the information needs of healthcare professionals. There is a need for collaboration in the design of the information access platform because close working between designers and users leads to cross pollination of ideas in the design process. The information and learning needs of healthcare professionals have been ignored for too long.

This section reviews literature on the information needs of healthcare professionals focusing on Africa. The review starts by critically interrogating the concept of health information needs, which has been looked at by scholars wearing glasses of different tints. The concept of health information needs has also been surrounded by a lot of limitations. It is therefore important to amalgamate literature from different studies across disciplines to come up with a workable definition of health information needs to be used in this study.

Little progress has been made in meeting the information needs of healthcare professionals, especially those working in research and tertiary institutions (Godlee et al., 2004; Alhuwail, AlMeraj & Boujarwah, 2018). Pakenham-Walsh, and Bukachi (2009) argued that this disparity is due to several factors, including unequal distribution of internet connectivity, and also a failure of international "information for development" policies and initiatives, which have

tended to focus on "innovative" internet-based approaches for higher-level health professionals and researchers while ignoring, relatively speaking, other approaches that remain essential for the vast majority of primary and district healthcare professionals.

Information needs of public health workforce had become more urgent and mandatory due to the emergency of new infectious diseases like severe acute respiratory syndrome (SARS), Asian bird flu, HIV and AIDS, malaria and tuberculosis (LaPelle et al., 2006). Pakenham-Walsh and Bukachi (2009) used the term "information poverty" to express the dire need for health information among healthcare professionals in the developing world. Lack of health information communication creates such situations that produce medical errors, which are common in today's health care organisations (Ngwakongnwi, Atanga & Quan, 2014; Mandaza-Mapesa, 2016). This situation has the potential to cause miss-diagnosis, wrong treatment, increase multi drug resistance, severe injury and unexpected patients death (Dubow & Chetley, 2011).



The current COVID-19 pandemic has again emphasised that healthcare professionals are at the centre of efforts to address medical crises. Healthcare professionals are affected especially by uncertainty about treating unknown diseases and how to deliver safe as well as effective care. Therefore, the information and training needs of healthcare professionals are essential in supporting healthcare, especially in the area of HIV and AIDS.

### 2.6.1 Conceptualising health information needs

The concept of information needs is complex and heterogeneous. Pakenham-Walsh and Bukachi (2009) suggested that information needs encompasses the following elements:

i. information needs or "wants" as perceived by health care providers;
ii. information needs inferred by assessment of knowledge; and,
iii. information needs inferred by assessment of health care practice.

Information needs usually include gaps in health care providers' knowledge and useful information to improve their practice. Information provision based on perceived needs is important as it is more likely to be used and applied in practice (Pakenham-Walsh & Bukachi, 2009).



However, expressed needs are not the same as actual needs. Previous studies indicated a poor correlation between perceived knowledge deficiencies as reported by health care providers and actual knowledge deficits. Pakenham-Walsh and Bukachi (2009) observed that if one poses a question "What books do you need?" respondents often limit their response to what they perceive to be available, and the titles of books they once used.

Information needs of healthcare professionals are not static and individual health worker has unique information needs. A health worker's perceived and actual needs change with time, place and context. Ingwersen and Jarvelin (2005, p. 448) concluded that the context and situation of the individual information searcher are key dimensions to be considered in relation to understanding information need. This is in line with the opinion of Case (2002, p. 226) that

"...information needs do not arise in a vacuum but rather owe their existence to some history, purpose and influence".

Ormandy (2010, p. 92) argued that information needs should be looked at within the context in which the information searcher is. Ormandy assimilated theories originating from Information Science and proposes a definition of an information need as "...recognition that their knowledge is inadequate to satisfy a goal, within the context or situation that they find themselves at a specific point in the time" (Ormandy, 2010, p. 92).

Miranda and Tarapanoff (2008) also supported this view by partitioning an information need into cognitive, affective and situational dimensions. The cognitive dimension suggests that people are mediated, in their interactions, by states of knowledge about themselves, about those whom they interact with and or about the problematic situations they face. The affective dimension is related to the progression of thoughts, feelings and perceptions experienced by individuals in moments of confusion, uncertainty, anxiety, expectation, accessibility and objectivity. The situational dimension refers to the beliefs and suppositions that are part of the individual's culture and environment. It related to characteristics, opportunities and difficulties caused by the environment, structures of the existing problems and beliefs about what constitutes the solution of a problem.

Miranda and Tarapanoff (2008) also suggested that information needs are defined by the processes to search for information and to use retrieved information. They argued that information use depends on how the individual evaluates the retrieved information and that evaluation skills to determine the cognitive and emotional relevance of the received are

decisive for information usage. Information Science scholars like Wilson (1999) and Choo (2006) also supported this view. Miranda and Tarapanoff (2008) further linked information needs with competences as illustrated in Figure 2.1.

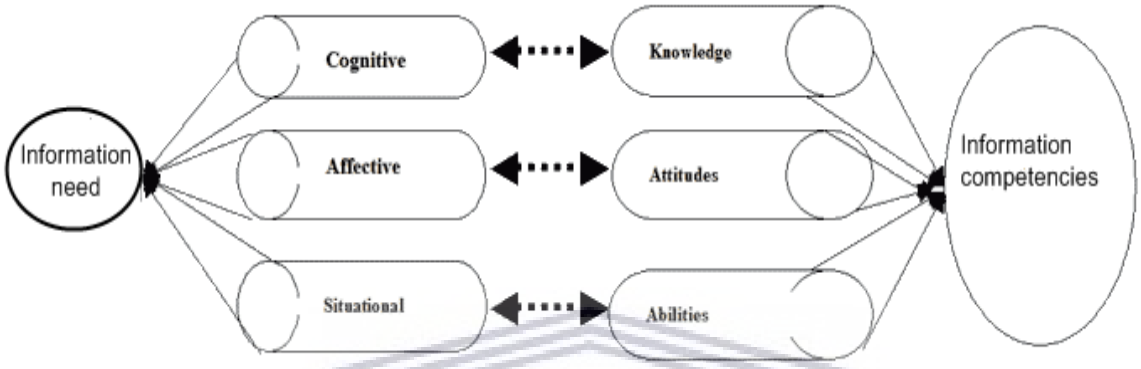



*Figure 2.1: Relating information needs and information competencies (Miranda and Tarapanoff, 2008, p. 5)*

From the literature it is clear that information needs arise and develop for various reason. It might be to look for answers, to reduce uncertainty, to bridge gaps in knowledge, to make informed decisions, to solve problems, to understand an issue, to reduce stress and to cope in a given situation. Case (2002) argued that in everyday life information itself can sometimes increases the stress and uncertainty of individuals as in some situations, individuals may not demand information even if they need it because they may be afraid of the consequences of having this information. If applied to healthcare professionals it might be the risks of being infected or the consequences of being exposed to illness and diseases.

This researcher agrees that information needs are not always the recognition and expression of the lack of information as information needs are often not realised. Alzougool, Chang and Grey (2008, p. 2) suggested that information needs are recognised or unrecognised. They used

the iceberg analogy to illustrate the comprehensiveness of information needs revealing that in most cases, the information that is usually demanded by individuals, is usually only a tip of the iceberg. Alzougool, Chang and Grey (2008, p. 3) also argued that information needs are explicit or less explicit. Less explicit information needs might be the information needs that have been satisfied already, that individuals choose not to demand, and information needs that individuals have not recognised. Healthcare professionals, for example, may not be aware of health information possessed by other health institutions, hence the need for integrated systems.

### 2.6.2 Common health information needs as perceived by healthcare professionals

Information needs of public health workforce had become more urgent and mandatory due to the emergency of new infectious diseases like severe acute respiratory syndrome (SARS), Asian bird flu, HIV/AIDS, malaria and tuberculosis (LaPelle et al., 2006). One of the main reasons medical doctors tend to use online sources is to provide improved treatment to their patients (Bennett et al., 2006). Stressing on the danger of lack of information on treatment options, Dubow, and Chetley (201, p. 12) warned that "…this situation has the potential to cause miss-diagnosis, wrong treatment, increase multi drug resistance, severe injury and unexpected patients death".



However, healthcare workers in developing countries continue to lack access to basic, practical information to enable them to deliver safe, effective care. Studies reveal that health care workers need information on a variety of topics to enable them to effectively deliver health care. However, in developing countries, many health care workers have little or no access to basic, practical information (Bailey & Pang, 2004). Similarly, Girma, Alenko and Agenanew

(2020) revealed a significant knowledge gap on treatment options of COVID-19 among healthcare professionals in Ethiopia.

A study by Othieno, et al. (2001) from the Kenyatta National Hospital (Nairobi, Kenya) found that most (56%) of the 130 doctors working at Kenyatta expressed a need for further training to deal with psychiatric conditions in their patients. Psychiatric disorders are extremely common, yet in Africa there is only one psychiatrist per million people, (compared to 134 per million in the USA), so it is especially important that non-psychiatrically trained healthcare professionals, whether working in hospitals or the community, are able to deal effectively with common disorders.

A study by Andualem, Kebede and Kumi (2013) showed that healthcare workers also need information on policy issues that support their daily activities, and information to update their existing knowledge on symptoms and recent developments on HIV and AIDS. The American Nursing Association (2019) also reiterated the need for adequate knowledge and information dissemination on policies on HIV related to ethics and values.

In the African context traditional medicines and natural health products are often used as primary HIV treatment and as therapy for HIV-related symptoms including dermatological disorders, nausea, depression, insomnia, and weakness (Babb et al., 2004). UNAIDS (2000) asserts that the World Health Assembly adopted a series of resolutions to encourage training and research in the area of traditional medicine. Several specific measures governing the practice of traditional medicine were incorporated into the national health legislations to allow

the promotion of traditional medicine and collaboration with traditional healers (Sibanda, Naidoo & Nlooto, 2016). The WHO reported that 80% of the emerging world's population relies on traditional medicine for therapy (Mahomoodally, 2013). Therefore, health professionals often seek information on these traditional remedies because of the dual health systems.

A study by Lialiou and Mantas (2016) showed that physicians and nurses rely heavily on online medical databases for their information needs. Aquil and Sulaiman (2017) also found that medical students frequently used medical databases as compared to electronic journals. Databerry (2021) concurred that healthcare databases are an important part of running the entire health operation that include labs, finances, patient identification, tracking, billing, payments, among others. Healthcare systems generate data that requires delicate handling and sometimes a patient's life depends on this information, and it is therefore important for healthcare providers to be able to access it in the shortest time possible. Medical databases provide accurate and critical data in a timely fashion. Databerry (2021) cited numerous advantages of medical databases that include efficiency, exchange of information, monitoring and improving the value of healthcare, assessing the quality of healthcare, and tracking healthcare usage.



Burton, Howard and Beveridge (2005) carried out a questionnaire survey of 37 East African surgeons and found that they prefer electronic journals to textbooks. Journal published in the "Western" world (in the case of the study Canada, the United Kingdom or the USA) were rated as the most useful by most of the respondents in their clinical (76%), teaching (73%), and research (68%) activities. Local journals, defined as those from the region where the physicians practise, were regarded as most useful by far fewer respondents for their clinical (22%),

teaching (14%), and research (11%) activities. A total of 62% said that they would change their practice based on "Western" journal information, in contrast to only 11% who would change it based on information from local journals.

A study by Singh and Singh (2012) demonstrated that electronic journals were effective in meeting the research needs of the medical professionals. Similar results were found by Bansode (2013) who found that the use of electronic journals improved the productivity of faculty and helped in citation analysis. Most of the faculty staff admitted that their quantity of paper publication increased due to the use of electronic journals only and overall, journals met their information requirements were fully satisfied with the electronic journals. Similarly, a study by Akussah, Asante and Adu-Sarkodee (2015) indicated a significant positive relationship between the impact of electronic journals and their usage among the users.



However, a multicentre survey that was carried out by Page et al. (2000) in China, Egypt, Kenya, India, and Thailand showed that textbooks remain the most commonly used source of information for information on the management of common medical conditions. Journals were less popular and computer searching was uncommon. Local textbooks and journals were used more than those from North America and Europe, except in Kenya, where the opposite trend was recorded. The study concluded that personnel in health centres have different information needs. The study by Musoke (2000) in primary care health centres in rural Uganda discovered that books donated to these facilities were too technical, contained inappropriate content and were generally irrelevant to the local needs. As one doctor puts it "...Information in some of the textbooks we have about paediatrics, public health, internal medicine and pathology is not

very relevant to our current tropical health situation because they were written in the West ... the focus is not tropical medicine" (Musoke, 2000, p. 200).

March, Vaikosen and Akporoghene (2020) showed that textbooks are widely consulted by nurses at Rivers State University Teaching Hospital in Nigeria. Commenting on the effectiveness of textbooks, Tez and Yıldız (2017) believed that medical textbooks are considered by many to be the definitive sources of medical information. These textbooks are published and updated periodically with the goal of providing readers with the most current information. They contain detailed analyses of medical topics by experts of the particular fields covered in the book. These books often are the main source of information for medical students and residents, and these readers usually believe the information found there is indisputable. Jeffery et al. (2012) also documented that medical textbooks have some ways to go in keeping pace with high quality, clinically relevant new evidence. This new evidence has the capacity to impact their clinical recommendations, and potentially the quality of patient care. These sentiments reveal that textbooks are still important sources of health information and therefore they should be options of providing them in electronic formats.



A study that that was carried out by Ojuondo and Kwanya (2014) in Kenya revealed most healthcare professionals preferred using web based platforms in accessing and disseminating information. E-mail discussion groups, social media, the WWW, radio, television and distance learning systems are some of the ICT tools which were being commonly used in the fight against HIV/AIDS in the slums in Kenya's cities.

### 2.6.3 Unexpressed or unrecognised information needs

Lack of skills and knowledge are the most common unexpressed information needs among healthcare professionals. A Kenyan study by Obimbo, Musoke and Were (1999, p. 34) identified inadequate national guidelines as a cause of insufficient knowledge and practice. The study concluded that "the knowledge of 50% on type of care [for umbilical cord] was incorrect by international standards, but was in keeping with Nursing Council of Kenya teaching". The authors "...recommend that the local Nursing Council policy be updated, and that all primary HW receive education, or in-service re-education on appropriate cord care".

A cross-sectional study in Somalia by Suleiman et al. (2003) assessed the knowledge and practices of registered practitioners in management of Tuberculosis (TB). Only 66% of the doctors knew the most important symptoms and only 64% were able to identify sputum-smear microscopy as the most important diagnostic test. Only four doctors prescribed the correct regimen and only seven advocated direct observation (DOTS) as recommended by the WHO. Suboptimal knowledge was more common among doctors working in private practice.



A similar problem was highlighted in a South African study of doctors in public-sector primary health care centres (Haque et al., 2005, p. 5). In the findings of the study, "Many participants noted inconsistencies between the maximum OGLA [oral glucose lowering agent] doses in the South African Medicines Formulary and the doses mentioned in the guidelines. Consequently, there was confusion as to whether insulin should be introduced or the dose of OGLAs increased". The study showed a gap in knowledge and training on when and how to initiate insulin therapy for poorly controlled type 2 diabetes. Participating doctors stated that most of their undergraduate training had focused on hospital treatment of acute complications of

diabetes rather than on practical diabetes management in a primary-care setting. Many did not know the benefits of insulin for poorly controlled type 2 diabetes. And contrary to information in their national guidelines, some of the doctors believed that insulin was not beneficial in obese patients, while others questioned its value in the presence of established complications. As one doctor reported, “For me insulin [was not an option]. It frightened me because I had no idea how to [determine] the dosage for the patient” (Haque et al., 2005).

Ahmed (2007) after conducting a questionnaire-based study in Saudi Arabia, concluded that 60% of all respondents, including consultants, junior doctors and nurses in a large teaching hospital, had insufficient knowledge of some of the basic medical practices like measuring blood pressure. Similar lack of knowledge was found in a study by Bjork et al. (2003) in India as the study concluded that patients and medical practitioners didn’t realise the importance of constant disease monitoring.



A qualitative study in the Gambia by Bij de Vaate et al. (2002) used semi-structured interviews followed by group discussions to assess the knowledge, attitudes and practices of 22 trained Gambian Traditional Birth Attendants (TBAs) in the prevention, recognition and management of postpartum haemorrhage. The TBAs had received six weeks’ training. Although all the TBAs were illiterate, some information from training had been incorporated into their knowledge. For example, 20 of 22 TBAs were able to describe the correct sequence for management of the third stage of labour. However, the review highlighted the importance of relevance of content in training manuals.

A multicentre study (21 hospitals in Bangladesh, Dominican Republic, Ethiopia, Indonesia, Philippines, Tanzania and Uganda) assessed knowledge of five important clinical problems: pneumonia, diarrhoea with dehydration, sepsis, severe malnutrition and hypoglycaemia. The majority of the doctors (70%) had inadequate knowledge in at least one area, compared with 91% of nurses and medical assistants. Knowledge was much better among doctors in teaching hospitals than doctors in district hospitals, but nurses and medical assistants had poor knowledge in both district and teaching hospitals (Nolan et al., 2001). In the light of the knowledge gaps among healthcare professionals, Haque et al. (2005) suggested that healthcare professionals need training to more effectively provide health education support for their patients.

In Nigeria, a cross-sectional study involving 56 randomly selected primary and district health care facilities and 1000 consecutive hypertensive patients found a considerable knowledge and awareness gap related to hypertension and its complications, both among patients and health care providers (Mendis et al., 2004). The study also revealed drug prescription patterns regarding blood pressure were not evidence-based and cost-effective.



**2.7 ICTs used by healthcare professionals and their benefits**

The information challenges facing healthcare professionals worldwide include lack of routine systems for seeking and sharing information, lack of high-quality and current health information, and lack of locally relevant materials and tools (D'Adamo, Fabic & Ohkubo, 2012, p. 23). ICTs play an important role in the design of effective information sharing platforms. This section reviews literature on the various ICTs used by healthcare professionals in distributing, sharing and accessing health information.

### 2.7.1 The Electronic health record

A large body of literature has recently emerged that addresses the experience of specific organisations or providers in implementing a variety of ICT technologies such as electronic medical records (EMRs), e-prescriptions, and Computerised Physician Order Entry systems (Scott & Rundall, 2005; Chaudhry, 2006; Shekelle & Glodzweig, 2009).

There are large variations particularly in the adoption and use of electronic health records (EHRs) by general practitioners (GPs). In the United States, a 2018 survey showed that the current state of EHR in the country leaves much to be desired, with problems stemming from lack of interoperability, non-adoption, and regional disparities. The study recommendation focused on financial support, interoperability, and training of technical health personnel. In Australia, the United Kingdom, the Netherlands and Norway, as in many other Scandinavian countries, EHRs are almost ubiquitous in primary care, but exchanging health information with other parts of the system remains often largely paper-based (OECD, 2010a).



Purchasing and implementing a patient management system has significant financial implications. Considerable financial investment is required not only for the initial purchase and installation, but also for the maintenance and technical support thereof. According to Walker (2005), for many small to mid-size primary care practices the costs of implementing an electronic medical record system might be to excessive (Walker, 2005).

### 2.7.2 The Internet as a source of health information

The internet is regarded as the current media of choice for quick, real time exchanges of information or discussions via websites or e-mail. Ajuwon (2006) carried out a study in Nigeria and discovered that the internet was widely used by health professionals. The study revealed that virtually all (98%) the respondents had used the internet; 76% accessed it from internet cafes; e-mail was the most commonly used internet service (64%), and 90% of the respondents reported they had obtained information from the internet for patient care. Chikonzo (2005) also reported how the Asian Harm Reduction Network, an internet based platform for health information access, has been a growing arsenal of instruments for combating and for mitigating the effects of HIV. A decline of 2.6 % in HIV prevalence was reported in Asia by the Monitoring the AIDS Pandemic in Asia in 2004. This was solely attributed to the activities of Asian Harm Reduction Network in ensuring a positive behaviour change among the youth (Chikonzo 2005).



A study by Zigdon, Zigdon and Moran (2020) showed that healthcare workers viewed the internet as effective source of health information by nurses in Israel. The attitudes of nurses towards the utility of online medical information for personal needs increased with better participant health status ($F_{2,118}$=3.63, $P$=.03). Ajuwon (2006) also carried out a study in Nigeria and discovered that the internet was widely used by health professionals. Similarly, Adebayo, Michael and Akole (2017) found that the internet was the mostly widely used source as compared to other sources by medical students at the college of medicine, University of Ibadan, Nigeria. However, Gund et al. (2012) cited that the internet has challenges that relate to the authority, accuracy and reliability of the information, and irregular power supply.

### 2.7.3 The computer

A study that was carried out by Akintola (2008) in Nigeria revealed that the computer had been used together with a CD ROM to provide information to the community townships and villages who understand simple English, have been trained to use the computer and to operate the video tape recorder with HIV and AIDS information. In collaboration with information practitioners they then work hand in hand to interpret information CD ROMs into the local language, hence the use of radio, computer and television to disseminate HIV and AIDS information can be accomplished. This resulted in information on developments in HIV and AIDS being disseminated and people educated to at least have an idea of what HIV and AIDS is all about, how the disease is spread and how to live positively with it (Akintola, 2008).

Batambuze (2003) reported that the National Library of Uganda through the Nakaseke Multipurpose Community Telecentre and Library has been facilitating children and young adults in the rural areas covered by the project to access HIV/AIDS information and knowledge. Nakaseke has a collection of books, brochures, posters, CD ROMs, videos and audio cassettes - some of which has been done in the local language - on HIV/AIDS (Uganda National Commission for UNESCO, 2002). According to the National Library of Uganda (2001) the National Library has earmarked a programme entitled Information in support of the HIV/AIDS as well as the care and support for those infected with and affected by the disease. Currently there is no published data on the impact of this programme in fighting against HIV and AIDS.

Sturges (2001) observed a similar case in Kenya. The Kenya National Library Service is associated with an AIDS awareness project that repackages and translates information from

foreign sources. The AIDS service includes provision of books, brochures, screening of videos and seminars that target young adults and children as user groups. Batambuze (2003, p.4) argued that although in other places, "…libraries use drama, poetry, singing and dancing as some of the mediums used to disseminate information on HIV/AIDS, however, in many other countries like South Africa, Tanzania, Libya and Nigeria ICTs play a pivotal role in the provision of HIV/AIDS information".

### 2.7.4 Mobile cellular phones and smartphones.

Zambrano and Seward (2013, p.12) observed that "With the development of technology mobile cellular phones have become more and more accessible to everyone including the rural community". In the health sector, the use of cell phones in health care is often called mHealth (for mobile health), Gordon (2013, p.13) asserted that mHealth is "one of the fastest growing technological areas in medicine, particularly in the developing world". The Office of the U.S. Global AIDS Coordinator and the Bureau of Public Affairs (2009) reported that leading players in the mobile phone industry and the U.S. Government joined forces to fight HIV/AIDS and other health challenges in ten African countries. The initiative called Phones for Health was introduced to bring together mobile phone operators, handset manufacturers and technology companies, working in close collaboration with Ministries of Health, global health organisations, and other partners to use the widespread and increasing mobile phone coverage in the developing world to strengthen health systems.

Gold et al. (2011) argued that the efficacy of mHealth programs is not limited to developing countries. They observed that in Australia, adolescents who received text messages about

sexually transmitted diseases demonstrated increased knowledge about STDs and had fewer sexual partners compared to a group that only received texts about sun safety.

Statistics produced by the Office of the U.S. Global AIDS Coordinator and the Bureau of Public Affairs (2009) revealed that the majority of the population in the developed world now lives in areas with mobile phone coverage. This makes it feasible to use mobile phones to relay this information directly into health authorities' computer systems, allowing rapid interventions such as distribution of medication and education programmes for those at risk. According the report, MTN, which operates in 21 countries in Africa and the Middle East, is the first operator partner in using mobile phones to fight HIV and AIDS.

Nyamai (2002, p. 23) commented that because the majority of the Zambian population is youths, mobile cellular phones will make a significant impact on the fight against the HIV/AIDS pandemic. One University of Zambia fourth year student who participated in the study said, "Accessing HIV/AIDS information through written materials like books and brochures or visiting is an archaic method that I don't think I can use. Everything should be simple, I should just go on the internet and have everything at my fingertips about AIDS" (Nyamai, 2002, p. 22).

In Zambia Nyamai (2002), reported that, AfriAfya has been using mobile cellular phones to promote access to comprehensive and reliable youth friendly information inquest of behavioural changes. Cellular phones have been used widely in disseminating HIV/AIDS information though instant messages and push advertising process. In Nigeria mobile cellular

phones have been used to access internet information, as result adolescents and youth in the rural community have been able to create and exchange knowledge and experiences with their peers (Ajuwon, 2006). In Zambia where some remote areas still lag behind in terms of infrastructure development, mobile cellular phones had provided a unique opportunity for easy access to the much needed information. Telehealth and online medical interaction have taken a new dimension. The use of mobile cellular phones in Zambia makes HIV/AIDS information easily accessible, confidential and user friendly (Seidenberg et al. 2012).

Kinyua et al. (2013) revealed that in Kenya the majority of individuals (99%) had access to cell phones and 99% of the HIV infected patients interviewed supported the idea of cell phone use in management of their HIV infection. A large proportion (46%) claimed that they needed cell phone access for medical advice and guidance on factors that hinder their adherence to medication. A later study by Ware et al. (2016) in Uganda demonstrated the efficacy of cell phone usage in the management of patients taking antiretroviral drugs. The study revealed that SMS reminders prompted taking individual doses of antiretroviral therapy, and helped to develop a 'habit' of adherence. Both SMS reminders and real-time monitoring were interpreted as signs of 'caring' by the healthcare system workers.



Boulos et al. (2011) stated that smartphones and tablets combine both computing and communication features in a single device that can be held in a hand or stored in a pocket, allowing easy access and use at the point of care. In addition to voice and text, new mobile device models offer more advanced features, such as web searching, global positioning systems (GPS), high-quality cameras, and sound recorders. They also stressed that powerful processers

and operating systems, large memories, and high-resolution screens, mobile devices have essentially made mobile devices to become handheld computers.

### 2.7.5 Satellite television

Television has been seen as an effective tool in addressing issues on HIV/AIDS. An example of a successful programme is an initiative by Mindset (2013) which introduced the Mindset Health Channel, applying audio-visual and computer technology. This technology has empowered health professionals and lay counsellors to access HIV/AIDS and related information via satellite transmission using computers and TV screens installed in the health facilities for the patients. The content aired is aimed at patients and people who attend public clinics and hospitals or who access Mindset content in the waiting areas. The videos consist of dramas, documentaries, interviews and discussions as well as public service announcements covering a wide range such as multiple concurrent partnerships, prevention of mother-to-child-transmission and infection prevention and control.



### 2.7.6 Electronic mail

This is an insidious, invaluable and above all very cheap means of communication and of accessing current information. It can be used to send for files of information, or receive regular newsletters, briefings and updates on a huge range of medical topics, some of which are also accessible as Websites. Specialists can join discussion groups in their particular field with colleagues all over the world. A good example is the HealthNet News, practical Pointers for Primary Care, WHO's Library Digest, E- drugs (Essential drugs), ProCARRE (Programme for Collaboration against AIDS and Related Epidemics) and ProMED (programme for Monitoring Emerging Diseases). A study many years ago by O'Connor et al. (2009) already demonstrated

the effectiveness of email in improving collaboration among healthcare professionals in a community hospital in Mississauga, Canada. The majority of the respondents reported that wireless e-mail improved speed (92%) and reliability (92%) of communication, improved coordination of intensive care unit (ICU) team members (88%), reduced staff frustration (75%), and resulted in faster (90%) and safer (75%) patient care. The study concluded that interdisciplinary ICU staff perceived wireless e-mail to improve communication, team relationships, staff satisfaction, and patient care.

Ajuwon (2006) noted that in Nigeria information specialists spread HIV/AIDS information through e-mail and by way of discussion groups as well as through list serves. Information practitioners in Nigeria have been working with professionals in other fields such as medicine, the media and people from the local communities to effectively disseminate HIV/AIDS information to the majority of people (Ajuwon, 2006). Macchiusi and Trinidad (2001) argued that the use of innovative technology appears to have great potential in addressing some of the communication challenges faced by Australian HIV service providers and their patients.



Electronic mail has been widely used for communication and dissemination of health information by healthcare professionals in Zimbabwe. Chikonzo (2005) reported that the University of Zimbabwe College of Health Sciences Library uses Health Net e-mail to disseminate information on different health issues to provincial hospitals. In turn health personnel in provincial hospitals send their information request through the Outreach Librarian who sends back the request through the Health Net e-mail and the process goes on like that.

### 2.7.7 Web 2.0 and social media applications

The Web 2.0 phenomenon has emerged as a buzzword that people use to describe a wide range of online activities and applications (Madden & Fox, 2008). Social media is defined by Kaplan and Haenlein (2010, p. 10) as "a group of internet-based applications that build on the ideological and technological foundations of the Web 2.0, and that allow the creation and exchange of user-generated content". Schein, Wilson and Keelan (2017) reported on the effectiveness of social media in public health applications while Gough et al. (2017) asserted that social have the advantage of tailored messaging at low cost and large reach media and therefore are ideal for public health campaigns. The main characteristic of Web 2.0 is the opportunity for social interaction, which is understood as the opportunity to have an internet mediated conversation (Hardey, 2008). Web 2.0 trends identified: opportunity for social interaction; new ways of developing content (collaboration) using different media formats (multimedia) and applications (mashup); new possibilities of access, control and assessment of the information. This technology has been widely used for sharing HIV and AIDS information among health care providers and patients (Lupianez-Villanueva, Mayer & Torrent, 2009).



Blogs are simple content management tools enabling non-experts to build easily updatable web diaries or online journals (Barsky, 2006, p. 33). They are published chronologically, with links and commentary on various issues of interest. Frequently, blogs are networked between several users who post thoughts that often focus upon a common theme. There are medical/health related blogs. Examples include DrugScope, DrugData, Updated blog, the TRIP Database blog, and the DLnet blog for health librarians and trainers. This technology has offered health practitioners and information managers to network and participate in sharing health related information (Maged, Boulos & Wheeler, 2007).

Wikis have also provided a platform for sharing health information. A wiki is a collaborative software that allows users to add content but also allows that content to be edited by anybody (Sharp, 2006). A good example of a wiki that is being used for sharing knowledge in the health sciences is the Wiki Surgery (Maged, Boulos & Wheeler, 2007). Wikis can be used by medical libraries to encourage medical practitioners to collaboratively develop medical databases that are easily and freely accessible by health information seekers.

Social media tools have proven to be effective in the fight against HIV and AIDS. Social media is a relatively new type of online communication in which users engage with one another via the development of online communities, through which they can create and share information and ideas. Some common websites that have been integral to the growth and popularity of social media include MySpace, Facebook, Twitter, and YouTube. Cell Press (2014) argued that although public health researchers have focused early applications of social media on reliably monitoring the spread of diseases such as the flu, Twitter and Facebook posts could help curb the spread of HIV. The role of social media that has recently gained attention is the impact of social media sites on facilitating HIV prevention. Research has demonstrated that social media use is an effective tool for sending HIV prevention messages to previously unreached and underserved populations (Bevilacqua, 2016). The European Centre for Disease Prevention and Control (ECDC) (2017, p. 6) asserted that Facebook can be a valuable tool for monitoring and evaluating HIV campaign effectiveness and also allow for real-time feedback to facilitate on-the-fly campaign corrections.

ECDC (2017, p. 6) as well as Taggart et al. (2015) stated that social media can be used to promote HIV services by raising awareness about sexual health clinics. Their location, services

offered, opening hours, and tips on how to take advantage of services while maintaining privacy and anonymity can, for example, be part of face book pages. Interactive rating functions allow for service users to share their experience of the facility, which allows for other users to make informed choices, and enables the facility to improve, on the basis on feedback.

Social media can also be used to provide HIV and AIDS information and links to valuable information sources (ECDC, 2017, p. 6). Social media platforms allow for short messages to announce new interventions, to expose and discredit myths, aa well as to link to webpages that provide in-depth information and evidence (Hughes et al., 2012). Social media can also be used to promote required behaviour regarding HIV and AIDS. Trustworthy and supportive users can share posts, blogs, podcasts, tweets and wikis about safe-sex behaviour and raise the profile of underused interventions (Hughes et al., 2012; ECDC, 2017, p. 6).



A study by Cubbage (2014) among African Americans showed that social media can be used to fight stigma by promoting discussion of HIV and other STIs. The contributively nature of social media can assist in lifting 'the shroud of secrecy' surrounding sexual health matters, facilitating a platform and environment for open discussion of taboo issues. It will also provide an easy to access channel for people to seek help and support (ECDC, 2017, p.6). In contexts where the importance of sexual health is under-valued, or the subject is taboo, generalised messaging on the topic can raise interest and awareness, to help mainstream the idea of sexual health as a routine aspect of self-care (Young et al., 2013; Muessig et al., 2015).

Young et al. (2013) reported that social media promotes growth of mutual support networks among at-risk groups. A distinctive aspect of social media is the ability to connect people through networks of mutual interest (Lenhart et al., 2010). Creating and maintaining groups devoted to sexual health issues in at-risk groups can create a safe and supportive space for users to seek information and share their experiences (Madden et al., 2013; Young et al., 2014; ECDC, 2017, p. 6).

Masoni and Guelfi (2020) stated that WhatsApp is a popular messaging application frequently used by physicians and healthcare organisations to improve the continuity of care and facilitate effective health services provision, especially in acute settings. In March 2020, the World Health Organisation launched the WHO Health Alert on WhatsApp to improve awareness and access to COVID-19 information. Similarly, a study by De Benedictis et al. (2019) showed that a growing number of healthcare professionals have adopted WhatsApp in their daily work in order to share information with peers and patients.



Gomes and Coustasse (2015) found that that the utilization of Twitter by hospitals has the capacity to generate opportunities for cost savings, increase communication for both patients and employees, and expand patient outreach. The Patient Empowerment Network (2020) stated that social media is one of the most popular channels used by healthcare providers to communicate with their patients and promote health. They cited that 99% of hospitals in the USA have an active Facebook page and the use of other social networking platforms like Twitter and Instagram in healthcare is also on the rise.

Compared to traditional information sources, social media applications would be considered as non-authoritative. Hughes et al. (2009) as well as Allcott and Gentzkow (2017) have however, recorded that healthcare professionals are using various social media platforms resulting in non-authoritative information sources being used equally or to even greater extent than authoritative sources to complement knowledge deficiencies. Madathil et al. (2015) noted that although YouTube has been criticised of containing ambiguous content that contradicts reference medical standards, it remains a highly preferred health information platform. Healthcare professionals appreciate the increased convenience, accessibility and ease of use of these sources compared with authoritative ones (Metzger & Flanagin, 2011; Moorhead et al., 2013).



### 2.7.8 Gamification

With on-going concerns about the sexual health and wellbeing of young people, there is increasing need to innovate intervention approaches. Converting existing HIV programmes into interactive game based options has the potential to broaden learning access whilst preserving behaviour change technique fidelity (Bayley & Brown, 2015). "Gamification is the enhancement of educational or other media through the incorporation of game-like elements (such as scorekeeping, rules-based competition and structured achievement milestones) to increase interactivity, engagement, and motivation" (ECDC, 2017, p. 14). A wide variety of gamification techniques including avatars, achievement-based rewards, and social network sharing buttons have been implemented on sites that include educational content on sexual health and an STI symptom checker (ECDC, 2017, p. 14). A study by Bayley and Brown 2015) in the United Kingdom proved that gamification is an advanced approach to health promotion that can be integrated into social media campaigns.

## 2.8 Challenges of using ICTs in the context of the Developing world

UNAIDS (2016) stated that while ICTs are recognised as important factors in the attainment of sustainable development, developing countries, especially Africa lags behind in accessing and utilising appropriate and relevant ICTs. Most of the studies reviewed in previous sections are dated, but for Africa those results are still pertinent. The digital divide has the potential to marginalize the vulnerable groups even further resulting in the an ever increasing gap between the information rich and poor. Mutula (2005) bemoaned that Sub-Saharan Africa has largely relied on models of the developed countries to bridge the digital divide without paying close attention to how various technologies can effectively be integrated in the lives of the people to alleviate poverty and consequently stimulate ICT uptake. Other challenges include lack of technological infrastructure due to financial costs, delayed benefit realisation, lack of expertise and accuracy of internet information (Karim, 2011). This section reviews literature on these challenges.



### 2.8.1 Delayed benefit realisation

Cresswell, Bates and Sheikh (2013) suggested that the financial benefits from ICT implementation are often realised only many years after the investment was made or until a level of functionality is reached to ensure that all needs are met by the system. An example is given by Hamilton (2005) indicating that the national, systemic fiscal cost-benefit of the health system Canadian Health Infoway had a positive cash flow after seven years, broke even after eleven years and started showing savings by the twentieth year.

The challenge of delayed benefit realisation is further highlighted by a 2007 study by Pricewaterhouse Coopers of nearly 2 000 hospitals in the USA. The study concluded that “the

attainment of productivity improvements and improved service efficiency followed on average two years behind initial health care ICT investment. The same study, however, concluded that the financial breakeven point will strictly depend on the levels of investment. Above a certain level of ICT investment, or tipping point, the cost impacts level off and is associated with cost reductions. The levelling off occurs despite the added costs of more ICT capital; that is, ICT capital at some point pays for itself by displacing costs elsewhere in the hospital" (Pricewaterhouse, 2007, p.7). Similarly, the European Union's e-Health Impact Project, covering ten case studies in different countries and contexts, identified a 2:1 return on e-health investment. The average breakeven point for the ten e-health initiatives studied was five years (Shekelle & Goldzweig, 2009). This is particularly a huge challenge especially in developing countries whereby they invest their meagre budgets expecting quick returns from ICT investments.



### 2.8.2 Cost and sustainability

There are essentially two financial challenges for an investing in ICT based health systems. First is the cost of obtaining initial seed money to plan and build the health system and second the cost of building a sustainable business model to keep the system in operation (Stroetmann et al., 2006). Initial ICT investments are expensive, especially for developing countries which often rely on donor funding for such projects. ICT investment ultimately creates a situation whereby an organisation or a nation needs to keep on investing in technology after the initial investment, with maintenance costs often surpassing initial projections (Hofmann, 2002; Marchewka, 2003).

All ICT projects needs a sustainable business model to cover costs of long-term sustainability and to cover unknown or unexpected aspects of the ICT initiatives (Gichoya, 2005, p.180).

On-going financial, institutional and political support for ICT projects support are needed by both public and private health care organisations to ensure financial and other gain (Gilhooly, 2005). Problematic is when health care organisations need to improve care and address public health needs using ICTs and at the same time demonstrate an economic benefit or improved financial performance (Hofmann, 2002; Marchewka, 2003).

Proving return on investment from implementation of health ICTs is challenging (OECD, 2010a) as the financial and other benefit are not always immediately visible and realised or financial benefits might be realised by other role players. For example, if an ICT can save money by reducing emergency department and inpatient care for congestive heart failure, the local hospital may well suffer a loss of revenue (OECD, 2010a).



Health care organisations build business cases based on improved quality care and satisfaction of patients resulting in no clear evidence of cost savings or cost-effectiveness (OECD, 2010b).

### 2.8.3 Lack of technological infrastructure

Most developing countries lack ICTs infrastructure. In Zimbabwe, telephone facilities have, for instance, been unreliable especially at the rural health centre level. Radio communication equipment linking rural health centres and districts hospitals, has largely been vandalised and is now unreliable. As a result, the movement of information among healthcare professionals is compromised. Although a lot of effort has been put towards the development of ICTs, internet

connectivity is still a problem. Those who have browsed the web in Zimbabwe with serious intent have generally found the experience frustrating because of narrow bandwidths and congested lines (Chikonzo, 2005; Mandaza-Mapesa, 2016).

A study by Norbet and Lwoga (2013) in Tanzania revealed that in order to fulfil their information needs, physicians preferred to seek information from formal sources, which included printed textbooks, electronic resources and printed journals due to lack of technological infrastructure. The study also revealed that there was low use of the internet for prescribing various drugs and diagnosis due to poor ICT infrastructure, lack of access to a computer, frequent power cuts and lack of time.

Providing health information and knowledge to health practitioners in rural parts of Zambia is also a major problem (Chanda & Shaw, 2010, p. 133). Where computers were available their usefulness is being restricted by low bandwidth, making access to the many free resources on the internet very difficult and generally too slow to download. The current communication infrastructure to deliver such services is patchy. Zambia Telecommunications Company Limited, Zamtel, is the only telecommunications operator with the monopoly for fixed lines in Zambia. The urban - rural disparity of fixed telephones is typically high. Seventy eight (78%) of fixed lines are in the Lusaka and Copperbelt provinces, which enclose the larger cities of Lusaka and Ndola where 30% of the population live. This has left 70% of the population living outside this comparatively narrow strip of development with only 28% of the fixed lines (Chanda & Shaw, 2010, p. 136). Nkanata et al. (2018) found that a number of respondents in both hospitals strongly agreed the system is still slow and keeps going on and off due to poor technological infrastructure.

Kamau and Ouma (2009) revealed a lot of loopholes in Kenya's technological infrastructure. Most of the respondents indicated that their internet access is through the Post and Telecommunication system with a leased line. A few had access to the internet through direct satellite. Impediments in the infrastructure were listed as unreliable connectivity, limited bandwidth and repeated virus infections. The responses on the problems experienced while accessing the internet were:

i. Technical hitches both internal and external;
ii. Lack of IT personnel to readily address troubleshooting;
iii. Restriction of access to some sites due to limited bandwidth;
iv. Power fluctuations;
v. Unreliable connectivity;
vi. Speed of internet slow at times; and
vii. Viruses (Kamau and Ouma, 2009).



These findings reveal that developing countries still face a challenge in keeping up with recent technological trends. Laki (2016) concluded that commonest source of health information for health providers in the Tanga region were textbooks as a result of lack of technology to provide online resources.

### 2.8.4 Training and education

High illiteracy rates among the people living in the rural areas as well as language barriers due to the inability to use international languages – especially English - prevented them from familiarising themselves with the benefits of information resources. Many believe that search

engines such as Google is a panacea to their information problems. Studies by Spring (2010, p. 160) as well as Kamau and Ouma (2009) concluded that many medical students have to be trained to effectively utilize medical databases and e-resources independently.

Lack of training and education has also resulted in the underutilisation of ICTs in the developing world. SAfAIDS, an organisation focusing on mitigating HIV and AIDS in Zimbabwe, partnered with several organisations to create electronic discussion forums (e-Forum) that was dubbed Partners Zimbabwe. The platform was established to enable people from different geographical locations and cultures to discuss issues on HIV and AIDS, TB and other related health issues.

A study by Khalifa (2013) showed that unavailability of trained staff was a barrier in the adoption of health information technology in Africa. A study by Baridam and Govender (2019) in the Niger Delta region revealed that there was significant agreement that staff needed assistance in using the HIS. Studies by both Anwar and Shamim (2011) and Ngwakongnwi, Atanga and Quan (2014) showed that unavailability of trained staff was a barrier in the adoption of health information technology in Africa. Asangansi et al. (2013) concluded that unawareness of technology, applications or processes were the most frequent individual barriers to adopt health information technologies. Previous studies have shown that healthcare workers need training on ICT relates skills that include computer skills, information retrieval, information evaluation and ethical use of information (Anwar and Shamim, 2011; Asangansi, et al., 2013; Ngwakongnwi, Atanga & Quan, 2014).

### 2.8.5 Reliability of health information on the internet

Literature suggests that health information on the internet varies significantly and web users have been warned regarding the possibility of incomplete, misleading or inaccurate medical information available on the web (Eysenbach & Diepgen, 1998; Chou et al., 2009).

Although health information on social media is accessible and free information sources, information quality and authority frequently become the most concerned issue when people consider using the information (Zhao & Zhang, 2017). Hunt, Matthew and Chuan (2018) American study showed that user interactions with false content rose steadily on both Facebook and Twitter from 2016. Health websites giving information on a variety of topics like breast cancer, gynaecological problems, thyroid cancer, colorectal diseases, back pain, anaesthesia, bone tumours, and rheumatoid arthritis have been evaluated in various studies and described to have inconsistent information in terms of quality of contents and reliability (Hanif et al., 2009).



The limited accuracy of information is often the result of one of the distinctive features of the internet, that is, that anyone can potentially publish health-related information (Diviani et al., 2015). Online health information seeking thus poses several major challenges to health information users, as it requires them to undertake an active role in evaluating a vast amount of often unverified health information on the internet (Flanagin & Metzger, 2008, p.5). As a result, people experiencing difficulties evaluating online health information may be exposed to wrong or in complete information, which has been shown to be related to adverse health outcomes, such as low participation in screening programs or low adherence to treatments (Cline & Haynes, 2001).

Incorrect or misleading information may lead to potentially dangerous health behaviour. This is a challenge for medical information practitioners in that they may end up being sued for providing misleading information. Litigation may also arise when a librarian provides wrong prescription information with undesirable consequences. Meric et al. (2002) evaluated 184 breast cancer websites for quality of contents using the Journal of American Medical Association benchmarks and found significant variation in accuracy. Of the 184 sites, twelve (7%) contained inaccurate medical statements.

However, previous studies suggested that healthcare professionals appreciate the increased convenience, accessibility and ease of use of these sources compared with authoritative ones (Hughes, Wareham & Joshi, 2010; Metzger & Flanagin, 2011; Moorhead et al., 2013). Social media and Wikis provide information free of charge and facilitate information sharing in media rich forms such as multimedia and interactive content as expected from modern day information users. Healthcare organisations need to develop innovative, custom made social media platforms supply easily accessibility reliable, accurate and authoritative information.



### 2.8.6 The problem of accountability, confidentiality and security

OECD (2010b) observed that health information can be extremely sensitive and professional ethics in health care demands a strict adherence to confidentiality. Sharing sensitive patient data in a large and heterogeneous environment through the use of web-based applications raises a series of privacy and security issues. International research consistently recorded the need for privacy and security. Privacy laws and protection are often the reason for governments not accessing critical health data or for health care workers not sharing patient information (OECD, 2010b). This sentiment was echoed by Nelson (2006) stating that privacy and security

requirements are challenging, especially with electronic health records and constitutes barriers to system-wide exchange of information in many countries. In Sweden, a county enjoying virtually countrywide e-prescribing, general practitioners are, due to legal restrictions emanating from privacy concerns, unable to access the full list of medications previously prescribed to patients (Deetjen, 2016). In such cases, privacy regulations prevent full utilization of the e-prescription system.

If electronic health records are shared more widely, Kelly and William (2014) warned that the risk of stigmatising disclosures could affect areas such as employment status, access to health and other forms of insurance and participation in community activities might increase. This might result in patients engaging in "privacy protective behaviours", avoiding screening tests, treatment, or taking part in research protocols if they are not confident that the privacy of their medical information is adequately safeguarded.



The issue of privacy is a particularly difficult problem to resolve in Australia, Canada, and the USA where rules for the protection of personal information have been established at both the national and local levels. Implementing locally developed web-based electronic messaging and patient management systems cutting across several jurisdictions might therefore be prohibited (OECD, 2010b).

Another barrier in creating a co-ordinated information system for patient care might be patient consent. Patients need to be informed during data recording of the purposes for which data might be used (Hawkes, 2007). If patient don't feel comfortable, they might not give consent.

Some health care workers adapted a basis of an implied consent model for disclosure of health information for treatment purposes, coupled with the individual`s right to object to disclosure.

The OECD (2021) recommended that appropriate privacy protection must be incorporated into the design of new health ICT systems and policies from the outset and not retroactively. The variety of technical solutions available to protect patients must be coupled with privacy policies. Maintaining privacy and security should be balanced against the need to retrieve information quickly and easily, particularly in the case of an emergency (Deetjen, 2016).

The development of ICT based health systems is often riddles with dilemmas that emanate from privacy concerns. A survey conducted by Patel et al. (2011) with Beacon Community in New York residents showed that a majority of the participants were interested in viewing their medical records, and had interest in access to family member's healthcare information. However, Nguyen (2011) observed that the same people express concerns about the privacy of their medical records, thereby creating a dilemma for health systems. The same results were reported by the 2007 Canada Health Infoway survey (OECD, 2010a). Although 87% of Canadians agreed that timely and easy access to personal health information is integral to the provision of quality health care, over 50% were concerned about serious mistakes in diagnosis or treatment due to incomplete, inaccurate, or illegible patient information.

An interesting study on the issue of privacy was carried out by EKOS (2007) which concluded that certain personal health information needs more protection. Participants were concerned about health information accessed for malicious or mischievous purposes (45%) or being used

for purposes not related to their health (42%). As many as 37% were worried that privacy and security procedures may not always be followed.

The Center for Democracy and Technology (2008) stated that public trust needs to be built from the outset as individual health information needs to be accessed by a variety of health providers (physicians, nurses, radiologists, medical students, or care takers). A smooth interface between privacy and confidentiality policy and security requirements for defining access to and use of personal health care information is needed (Collins et al. 2011).

### 2.8.7 Lack of standards and interoperability

For optimise use, information systems in separate health care systems must be able to share clinical information on patients. Not all software and systems are compatible limiting health information exchange (Shahmoradi & Habibi-Koolaee, 2016). Healthcare providers also struggle with inconsistent medical terminology, clinical records and data storage, as well as a multiplicity of schemes introduced to facilitate interconnection and communication between specific ICT systems. Meyer et al. (2005) were of the opinion that fragmentation can be prevented by industry-wide standards and compliances. Hence the ability to share information and/or the interoperability of systems are dependent on the adoption of common standards by all stakeholders and compliance with them (Adebesin et al., 2013). Consistent implementation of standards and appropriate organisational changes are necessary to facilitate this process. Different computer systems are said to be interoperable when they can exchange data with and use data from other systems. Interoperability depends primarily on all the computer systems that need to exchange information being able to communicate (OECD, 2010b).

Chaudhry (2005) warned that in addition to these technological issues, are also legal and business rules that need to be co-ordinated between organisations. Once these are established, health care role players will feel comfortable exchanging confidential patient data. At present, both health care delivery and the ICT that supports it are fragmented. The current health care delivery system is composed of a patchwork of care and services where patients interact with providers in a variety of settings (*e.g.* GP practice, specialist office, and clinical laboratory) that are rarely linked up (OECD, 2010b; Chikuni, 2016; Furusa & Coleman, 2018; Khumalo & Mnjama, 2019).

Lack of technological expertise and infrastructure to enable different systems (legacy and recent) communicate with one is one of the factors affecting health information systems (Tapera et al (2019). Amalgamating existing health information systems require substantial development resources (OECD, 2010b; Tapera et al., 2019). Even with such an investment, differences in the underlying architecture of electronic health record systems, and the way that the systems are configured and used in individual institutions limit the quantity and quality of data that can be conveyed (Greenhalgh et al., 2013; Kriznik et al., 2019). The need for standards has been recognised for a number of years now (Institute of Medicine, 2001; Government Accountability Office, 2005). However, the development, approval, and adoption of standards for health ICT are proving a difficult and drawn-out process (Geissbuhler, 2013; Kriznik et al., 2019).



**2.9 Other possible solutions**

Older technologies like radio and television have major shortcomings that rely heavily on electricity, which is a major problem in Zimbabwe, especially in the rural areas. Most telephone

lines linking health centres in Zimbabwe have been vandalised, making the use of this technologies in sharing information a problem. In the light the shortcomings of older technologies, the adoption of Telehealth, mobile technology, supported by Web 2.0 technologies will provide a synchronous and more effective solution in sharing HIV and AIDS information among key stakeholders.

Web 2.0 technologies can play a significant role in encouraging information sharing among healthcare professionals. The technology allows users to control the web to get things done through social networks. Web 2.0 websites allow users to do more than put information on the web or just retrieve information. Users can build on the interactive pages, run software-applications entirely through a browser or own the data and exercise control over that data. Although the tools of Web 2.0 are developed and used by active users; there are significant opportunities for adapting Web 2.0 tools to collect, organize and share health information.



Web 2.0 technology software applications are normally free of charge. This offers healthcare professionals an open platform to share information, ideas, experiences in issues related to HIV and AIDS through wikis, blogs, video sharing, social networking and podcasting. These technologies also facilitate online collaboration, lessening duplication of effort among healthcare professionals and making health information easily accessible.

Introduction of ICTs in the health sector should be accompanied by intensive training and awareness programmes. The problem of accountability and security of health information can be solved by introducing encryption standards on health information that is communicated over

insecure networks. Health information systems should introduce telecommunications and biometric controls which include secure passwords, user validation systems and the use of unique identifiers such as eye and voice patterns, and fingerprints.

Another interesting solution is the introduction of open source software in developing health information systems. "Open source software is developed with an open code that is made available, at no cost, in the public domain to download and change as needed and again share with the community" (Smith, 2002). Open source could provide compatible information systems and ensure broader interoperability. It will also imply significantly lower upfront costs. It does not mean free software for everyone or necessarily implies higher guarantees of reliability and quality than commercial products. The success of any open source software depends on the community of developers who participates in its development (California Health Care Foundation, 2006). Smith (2002, p.19) concluded that:

> "Open source health care applications would provide healthy competition to the existing closed source commercial market, encouraging innovation whilst promoting compatibility and interoperation. This ultimately will lead to systems that are lower cost, better quality and more responsive to changing clinical and organisational requirements".



**2.10 Summary**

The literature review covered broad areas relating to information needs of healthcare professionals, and ICTs that are being used in the management and dissemination of HIV and AIDS information. The review started by conceptualising information needs of healthcare professionals and constructed a refined and broader definition of health information needs,

covering both recognised and unrecognised information needs. Results from the review showed that healthcare professionals' information needs differ on the basis of the level of the health system in which a health worker is located, regardless of country or cultural context. It is important to note that the literature demonstrated a persistent need for a variety of information types, including from research syntheses, job aids, and case studies. The literature also revealed that communication channels tailored to healthcare professionals' needs and preferences are vital for improving information access and knowledge sharing.

The review analysed the different ICTs that have been utilised by healthcare professionals. Several studies demonstrated how ICTs have been successfully utilised for communication of HIV and AIDS information and for collaboration purposes. Notable ICTs currently in use include the internet, Web 2.0 and Social media applications, mobile phones, email, and satellite television. Several authors suggested the need to invest in multifaceted knowledge management systems and approaches that take advantage of expanding technology, especially mobile cell phones. The new systems should support existing professional and social networks and should be tailored to the varying needs of health professionals across health systems. However, the major challenges highlighted in the literature, especially in developing countries include, costs of technology, leading to lack of technological infrastructure, reliability of internet information, lack of interoperability, lack of technological skills and problems of privacy and confidentiality. Possible solutions include incorporating security and standards during system design, use of social media, and use of open source software. The next chapter focuses on the theoretical framework of the study.

# CHAPTER 3

# THEORETICAL FRAMEWORK

## 3.1 Introduction

This chapter presents the theoretical framework of the study. The study is based on the deductive-inductive approach. This is whereby the researcher is guided by a broad theoretical lens in developing a model. In the process of generating an information access platform, the research is guided by existing theory. The study used an integrated theoretical framework. This approach is also referred as theory diversification (Ngulube, 2020). The General Systems Theory (GST) acts as the broad theoretical lens of the study. The Human, Organisation and Technology-fit (HOT-fit) framework provides the basis of evaluating existing systems in the health sector and the Social Construction of Technology (SCOT) Theory guided the design of the information access platform.



Grant and Osanloo (2014, p.123) defined a theoretical framework as "a structure that guides research by relying on a formal theory…constructed by using an established, coherent explanation of certain phenomena and relationships". Theoretical frameworks are important in the fields of social and health sciences. Alavi et al. (2018, p.527) advised that explicitly identifying one's theoretical foundation can provide an orderly schematic for linking different variables, thereby facilitating understanding and guiding research designs where complex phenomena are aspects of the subject of inquiry. Alavi et al. (2018) further cautioned that when a theoretical framework is not clearly linked to research methods, the researchers risk designing flawed studies. Therefore, the theoretical framework was used in crafting the research design and also in delimiting the conceptual scope of the study.

### 3.2 ICT theories on health related research

There are a variety of theories that have been used to influence the development and adoption of ICT in the health sector. The Diffusion of Innovations theory, Technology Acceptance Model (TAM), Unified Theory of Technology Acceptance (UTAUT), and the Actor Network Theory are worthwhile to mention.

The Diffusion of Innovations theory is one of the theories that has been used in the development of ICTs in the health sector. The theory was developed by Rogers in 1962 to explain how institutions and society adopt new innovations, especially technology. The theory is one of the most conceptually useful models for understanding the relationship between technology, individuals and society. The theory came out of the modernisation paradigm, evolving as the local-level framework to guide communications planning for modernisation (Melkote & Steeves, 2001, p. 120). The diffusion of innovations theory analyses and explains the adoption of a new product or new technology, especially in developing countries.



According to the theory, modernisation is a process of diffusion whereby individuals move from a traditional way of life to a more complex, more technically developed, and more rapidly changing way of life (Melkote & Steeves, 2001, p. 122). Adoption of a new idea, behaviour, or product (i.e., "innovation") does not happen simultaneously in a social system; rather it is a process whereby some people are more apt to adopt the innovation than others. Researchers have found that people who adopt an innovation early have different characteristics than people who adopt an innovation late (Meade & Islam, 2006).

The theory posits that when promoting an innovation to a target population, it is important to understand the characteristics of the target population that will help or hinder adoption of the innovation. Rogers (1983) proposed five adopter categories, namely:

i. Innovators - These are people who want to be the first to try the innovation. They are venturesome and interested in new ideas. These people are very willing to take risks, and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population.

ii. Early Adopters - These are people who represent opinion leaders. They enjoy leadership roles, and embrace change opportunities. They are already aware of the need to change and so are very comfortable adopting new ideas. Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need information to convince them to change.

iii. Early Majority - These people are rarely leaders, but they do adopt new ideas before the average person. They typically need to see evidence that the innovation works before they are willing to adopt it. Strategies to appeal to this population include success stories and evidence of the innovation's effectiveness.

iv. Late Majority - These people are sceptical of change, and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this population include information on how many other people have tried the innovation and have adopted it successfully.

v. Laggards - These people are bound by tradition and very conservative. They are very sceptical of change and are the hardest group to bring on board. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups.

However, this theory was not adopted for the study because of several reasons. Firstly, the theory relies on 'outside' innovations and assumes that what has worked elsewhere should be adopted and can work for an institution. The theory also assumes that all innovations are desirable. However, in reality, some innovations are not desirable and innovations that have worked elsewhere might not provide a solution in a different context due to differences in the internal and external environment. The same innovation may be desirable for one adopter in one situation but undesirable for another potential adopter in a different situation. This study proposes a needs-based ICT platform that is informed by the unique needs of the healthcare professionals.

Other limitations of Diffusion of Innovation Theory, as highlighted by the Boston University School of Public Health (2016), and equally apply for this study, include the following:

i. Much of the evidence for this theory, including the adopter categories, did not originate in public health and it was not developed to explicitly apply to adoption of new behaviours or health innovations.
ii. It does not foster a participatory approach to adoption of a public health program.
iii. It works better with adoption of behaviours rather than cessation or prevention of behaviours.
iv. It does not take into account an individual's resources or social support to adopt the new innovation.

Another theory relevant to the adoption of technology in the health sector is the Technology Acceptance Model (TAM). The Technology Acceptance Model developed by Davis Bagozzi, and Warshaw in 1989 is considered one of the most popular research models to predict use and

acceptance of information systems and technology by individual users. TAM proposes that there are two factors; ***perceived usefulness*** and ***perceived ease of use*** that are relevant in computer use behaviours. Davis defines perceived usefulness as the prospective user's subjective probability that using a specific application system will enhance his or her job or life performance. Perceive ease of use can be defined as the degree to which the prospective user expects the target system to be free of effort (Surendran, 2012).

According to TAM, ease of use and perceived usefulness are the most important determinants of actual system use. These two factors are influenced by external variables. The main external factors that are usually manifested are social factors, cultural factors and political factors. Social factors include language, skills and facilitating conditions. Political factors are mainly the impact of using technology in politics and political crisis. The attitude to use is concerned with the user's evaluation of the desirability of employing a particular information system application. Behavioural intention is the measure of the likelihood of a person employing the application (Davis, Bagozzi, and Warshaw, 1989).



However, TAM has its own limitations. TAM is not a model developed specifically in or for the health care context. If used in its generic form, TAM may not capture—or indeed may contradict—some of the unique contextual features of computerized health care delivery (Holden & Karsh, 2010). Although many studies have employed TAM to explain users' intention to use IT, this model is still very general and is not designed for any particular profession. Each profession has special contextual characteristics that may affect IT adoption behaviour. For instance, unique characteristics of IT users should be included in IT adoption models in order to better address their intention to accept new technologies. Chismar and

Wiley-Patton (2003) suggested that professional characteristics of healthcare professionals should be considered in their IT acceptance to obtain a better understanding on healthcare professionals' IT adoption.

Due to the weaknesses of TAM, a number of modified TAM models were proposed, which are applicable to contemporary technologies. Venkatesh et al. (2003) and Venkatesh, Thong and Xu (2012) unified and completed the various models of IT acceptance and they integrated the elements of eight well-known models such as the Theory of reasoned action (Davis, Bagozzi & Warshaw, 1989), the Technology acceptance model (Davis,1989), the Motivational model (Davis, Bagozzi, & Warshaw, 1992), the Theory of planned behaviour (Ajzen, 1991), a model combining the Technology acceptance model and the Theory of planned behaviour (Taylor & Todd, 1995), the model of PC utilization (Thompson, Higgins & Howell, 1991), the Innovation diffusion theory (Rogers, 1995), and Social cognitive theory (Compeau and Higgins, 1995). These theories were amalgamated and resulted in the Unified Theory of Acceptance and Use of Technology UTAUT. The purpose of formulating UTAUT was to integrate the fragmented theory and research on individual acceptance of information technology into a unified theoretical model (Venkatesh et al., 2003; Venkatesh, Thong & Xu, 2012).



The UTAUT model uses behavioural intention as a predictor of the technology use behaviour. In addition to behavioural intention and use behaviour, the UTAUT model consists of four constructs:

i. **Performance Expectancy:** The degree to which the individuals believe that the use of the technologies will result in performance gains.

ii. **Effort Expectancy**: The ease of use of the technologies.

iii. **Social Factors**: The extent to which the individuals believe that important others believe that they should use the technologies.

iv. **Facilitating Conditions**: The perceived extent to which the organisational and technical infrastructure required for the support of the technologies exists (Venkatesh et al., 2003).

The UTAUT model also includes four moderating variables, namely age, gender, education and voluntariness of use. In the UTAUT model, performance expectancy, effort expectancy, and social factors have direct effects on behavioural intention, which along with facilitating conditions have direct effects on use behaviour. The effects of interactions of each of performance expectancy, effort expectancy and social factors with each of age and gender; interactions of experience with each of effort expectancy and social factors; and an interaction of voluntariness of use and social factors on behavioural intention are also included. Finally, there are effects of interactions of age and facilitating conditions and experience and facilitating conditions on use behaviour (Venkatesh et al., 2003).



The limitation of Unified Theory of Acceptance and Use of Technology model is its inflexibility to adapt to different contexts. As Gahtani, Hubona and Wang (2007) reported in their research about information technology acceptance in Saudi Arabia, cultural difference of Saudi Arabia from that of a typical western country became an obstacle for them to use UTAUT to analyse worker's adoption of computers in Saudi Arabia. Workers in Saudi Arabia had different work-related values from that of workers in western countries. Arab cultural beliefs include resistance to information technology, and this difference negatively interacted with

social influence and hence exerted negative influence on workers' acceptance of IT (Liu, 2013). Also in the research on students' acceptance of educational portal in Peru, Maldonado et al. (2010) had to do some adjustment on moderators such as experience, voluntariness and age to region.

Another limitation of UTAUT is behavioural intention, which is a reflection of an individual's internal schema of beliefs (Venkatesh, Davis & Morris, 2007). It also does not represent the external factors that can affect the performance of a behaviour, thus, the role of external variables that can potentially impede or facilitate the performance of a behaviour is not fully captured by behavioural intention (Sedigheh, Noor & Masoud, 2013). Moreover, behavioural intention has a weak predictive and explanatory ability to deal with uncertainty and unforeseen events between the time the intention is formed and the behaviour is performed. In the face of new information, an individual belief and behavioural intention can and might change. According to Venkatesh, Davis and Morris (2007), various internal and external stimuli can drastically change the provisional intention over time, rendering behavioural intention inaccurate, unstable and less predictive of behaviour. Behavioural intention also has a weak ability to predict behaviours that are not completely within an individual's volitional control (Venkatesh, Davis & Morris, 2007), or the so-called intention-behaviour gap (Sedigheh, Noor & Masoud, 2013).

Self-efficacy and attitude are another limitation of the UTAUT model. Venkatesh et al. (2003) did not include self-efficacy as a direct determinant of behavioural intention in the UTAUT model, and it is considered as an indirect construct, measuring a specific self-efficacy, not an overall computer self-efficacy toward a particular technology (Straub, 2013). Inexperienced

users view new technology (IT innovation) as complex, and the confidence in one's ability to handle them has a significant influence on their acceptance (Yuen et al., 2010). A higher level of self-efficacy will lead to higher intentions to adopt and use innovation (Sedigheh, Noor & Masoud, 2013). Furthermore this study did not adopt UTAUT because of its focus on individual intention to use technology, overlooking organisational aspects.

Another theory used in health related research on ICT adoption, is the Actor-Network-Theory (ANT). The ANT has been useful in the conceptualization of the relationship between the technical and the social aspects of information systems. ANT deals with the social-technical divide by denying that purely technical or purely social relations are possible. The theory considers both social and technical determinism to be flawed and proposes instead a socio-technical account (Tatnall & Gilding, 1999). ANT assumes that the world is constituted by a heterogeneous network of actors, in which humans, artefacts, manuals, norms, routines and organisational arrangements all shape the network. Each of the actors has "interests" and each will act in accordance with these to achieve their own individual goal (Latour, 2005). According to Latour (1987), "interests" lie between the actors and their goals, creating tension that will make actors select only what, among many possibilities, helps them reach these goals in their own eyes. The actors in a network may include users, project participants, existing systems, practices, and so forth. In order to make technology work in organisations, it is important to take into account all the different actors and factors that exercise an influence on the network (Law, 2008).

However, several weaknesses of ANT have been highlighted in the literature. For example, the use of concepts such as actors and network has been criticized as it may cause confusion about

which actor to "follow" as there may be multiple actors within any given network (Cressman, 2009). Furthermore, the choice of selecting the actor is left upon the researcher who may make a wrong judgment. The terminology is often confusing and in many work of literature an Actor-Network is taken to be an equivalent of its conventional sociological or technical concept (Cressman, 2009). Furthermore, ANT argues for the equivalency of all actors within a network, hence does not take into account any pre-existing structure (Doolin & Lowe, 2002). The theory has also been criticized for failing to provide means to differentiate between human and non-human actors. In addition since each network is influenced by other network in an Actor-Network, it is quite difficult to explain the complexity of the network completely (Williams-Jones & Graham, 2003).

Therefore, instead of the theories discussed, this study supports the idea of "Social Embeddedness". There is a need to embed technology within the context they exist. Each setting has its unique needs. Therefore for technology to succeed, it should be developed with the needs of individuals in mind and the unique economic, social, political and cultural factors that exist. Volkoff, Strong, and Elmes (2007) supported this notion by stating that while various theories have been proposed to explain how technology leads to organisational change, in general they have focused either on the technology and ignored the influence of human agency, or on social interaction and ignored the technology. This study therefore adopts the HOT-Fit Model which integrates technological and human aspects in the design of ICT systems.

### 3.3 Theoretical Framework

Evans, Coon and Ume (2011) bemoaned the dearth of theoretical frameworks in the field of health sciences. They further argue that there is need for integrated theoretical frameworks when conducting mixed methods research. Ngulube (2020) recommended that researchers should restrict their theories to three in a single study depending on the variables and concepts that are outlined in their objectives. This study is based on an integrated theoretical framework combining the General System Theory, the Social Construction of Technology and the Hot-Fit Model. These theories are directly linked to each of the study objectives.

#### 3.3.1 General Systems Theory (GST)

The GST was used to provide a general understanding of how ICT initiatives in the health sector should be viewed. Systems theory was proposed in the 1936 by the biologist Ludwig von Bertalanffy, and further developed by Ross Ashby. Von Bertalanffy was both reacting against reductionism and attempting to revive the unity of science. The GST theory posits that everything is a system in the sense that the concept system can be applied to everything in a meaningful and practical sense. Everything is a system composed of sub systems that interact to create that system and so too for each of these sub systems (Laudon, & Laudon, 2014).



Von Bertalanffy (1968) emphasized that real systems are open to, and interact with, their environments, and that they can acquire qualitatively new properties through emergence, resulting in continual evolution. Rather than reducing an entity (e.g. the human body) to the properties of its parts or elements (e.g. organs or cells), systems theory focuses on the arrangement of and relations between the parts which connect them into a whole. This

particular organisation determines a system, which is independent of the concrete substance of the elements (e.g. particles, cells, transistors, and people). Thus, the same concepts and principles of organisation underlie the different disciplines (physics, biology, technology, sociology, etc.), providing a basis for their unification (Markus, Majchrzak & Gasser, 2002).

Von Bertalanffy (1968) identified the need to develop a general theory that can be applied to any system, regardless of the properties or elements of the system (Von Bertalanffy, 1968). As a result, the GST was developed. The goal of the GST is to integrate various sciences such as natural sciences and social sciences, in order to address the metaphysical fields of science (Von Bertalanffy, 1968). The GST was developed in order to identify universal principles applying to systems in general. In addition, a GST was needed to avoid duplication because there have been "many instances where identical principles were discovered several times because the workers in one field were unaware that the theoretical structure required was already well developed in some other field" (Von Bertalanffy, 1968). The principle of avoiding duplication is one of the major arguments of this study. Zimbabwe has a number of HIV and AIDS organisations operating in isolation. As a result, there is a danger of duplication of effort. Duplication of research results in wastage of research funds in a health sector characterised by financial constraints. This also leads to data inconsistencies and lack of data standardisation. A common platform, enshrined in system thinking will solve the problem of duplication by facilitating coordination of activities.

A system is defined by a set of interactions exchanging information (Vladimir, 2007, p. 217). This introduces a primary system, whose elements or interactions enable forming subsystems, systemic relations, and processes between them, if these interactions are capable of

cooperation. Thus, the interaction's exchange is a necessary condition, defining a system establishment, while the capability for cooperation is a sufficient condition of the system's functioning and development. A system can therefore be defined as a set of interactions exchanging information capable of integrating them into common units (systems, subsystems) (Vladimir, 2007, p. 195). To fulfil the goal and the systems' definition, the GST joins two main concepts:

i. Unified information description of interacted flows, initiated by the sources of different nature, with a common information language and modelling methodology, applied to distinct interdisciplinary objects.

ii. General system's information formalism for building the model, which allows expressing mathematically the system's regularities and main systemic mechanisms (implementing the regularities) (Vladimir, 2007, p. 218).



Systems theory offers a framework for quality improvement in healthcare systems because systems theory supports systems thinking. System thinking allows healthcare professionals to see the whole system and the relationships of the parts rather than just the isolated parts. High-quality care is more likely in systems where relationships and interrelationships are considered important. When relationships are considered important, greater emphasis is placed on effective communication, team building, conflict management, behavioural competencies and skill competencies, process management, and education, because these elements strengthen relationships (National Association for Healthcare Quality, 2005, p. 20).

Over the last half century, Systems Theory has spread across disciplines, from psychology to engineering. By the 1980s and 1990s management science began to apply Systems Theory broadly (Straub, 2013). Application of this theory rests on the assumption that most individuals strive to do good work, but that they are acted upon by diverse influences, and that functional and efficient systems not only account for, but also embrace, these influences. Causal Analysis based on Systems Theory asserts that when errors occur, one ought not to focus solely on individual failings, but on the surroundings that allowed such events to transpire. It further asserts that outcomes can be influenced by smart interventions, developed after studying common patterns and behaviours across time (Anderson, 2016).

The deliberate application of systems theory can support quality improvement in healthcare systems. When systems-like thinking that underpins systems theory is applied to healthcare systems, within the system are recognized as being as important as the component parts. Interdisciplinary relationships, such as those among disciplines like nursing, medicine, social work, and administration that are central to social processes in a healthcare system, cannot be taken for granted (White & Hewes, 2003). Planning in healthcare systems often involves little attention to these relationships and frequently fails because unanticipated behaviours emerge from the unanticipated interaction of the component parts. According to Petula (2005) system thinking helps to prevent system failure and therefore supports quality improvement by enabling healthcare workers to:

i. improve communication among subsystems within the larger system;
ii. create and manage effective teams ;
iii. establish trust through generative relationships;
iv. support interdisciplinary collaborative practices;

v. recognize the importance of conflict management education;

vi. focus on processes rather than staff;

vii. reduce power differentials between groups and subsystems;

viii. embrace on-going education;

ix. improve morale through autonomy and point-of-service involvement;

x. encourage creativity and innovative problem solving;

xi. strengthen the hierarchical components that support quality; and

xii. emphasise behavioural competency as well as skill competency.

Examples of effective systems theory applications include information technology applied to key clinical systems. These systems include medication administration, electronic documentation, patient order entry, and physiological monitoring (Plsek, 1999). A few magnet hospitals in the United States have applied systems theory to facilitate staff involvement in making decisions, ensuring professional autonomy, and creating supportive environments of care. These hospitals are demonstrating best-practice quality outcomes, improved collaboration among all disciplines, and decreased vacancy rates for key healthcare positions (American Nurses Credentialing Center, 2003). Those applying systems theory will recognize the need to see through the lens (Bem, 1993) of other disciplines and foster improved interdisciplinary relationships. This will be important for the different HIV and AIDS organisations in Zimbabwe who often work in isolation.

Applying system theory in the health sector improves interdisciplinary collaborative practice and diminishes tensions related to practice boundaries. Healthcare system employees are generally averse to conflict and often avoid rather than seek new ways forward (White &

Hewes, 2003). Greater tolerance for conflict and more education regarding conflict management in the health sector are needed. Conflicting viewpoints and diverse opinions need to be appropriately expressed in order to strengthen existing positions or allow people the opportunity to change their positions on a specific issue. Conflicting or controversial viewpoints must be honestly expressed in an atmosphere of cooperation that allows the flexibility and patience necessary to build new relationships. Understanding these system relationships provides insight into the subtle but powerful factors that contribute to an organisation's ability to progress or digress along the interdisciplinary quality continuum and support its respective community through health-promotion efforts (Petula, 2005). The objective of this study is to achieve cohesion in the health sector by establishing a common information access platform. The GST therefore was chosen because of its ability to influence tolerance and conflict management.

Systems theory can be used to clearly and concisely understand health care structures, processes and outcomes processes and their interactions within a health care system (Raman, et al., 2016). Systems theory can be used as a framework to describe the components of systems and the relationships between these components, the boundaries of the system, the goals of the system, and system's ability to change and adapt in response to internal and external forces (Dekker & Leveson, 2014). Systems theory and thinking can help in understanding how health care organisations and systems behave and it allows one to clearly assess, visualize, analyse and understand the structure, processes, and feedback loops that make up the organisation. This correct and clear understanding of the organisation as a system is a necessity to be able to manage organisations effectively and efficiently and to achieve organisation's goals (Hayajneh, 2007).

The systems theory and its related theories and concepts have been applied to the study of organisations being used as theoretical frameworks to understand how organisations function in relation to the various environments and factors surrounding them (Chih-Hui & Sapphire, 2017). Several studies in the health sector have used the GST in developing strategies to improve quality in health care. Bielecki and Stocki (2010) made an overview of national health care systems in the United States and analysed them using the systems theory. The aim of the study was to analyse the effectiveness of health information systems at national level. Bar-Yam (2006) carried put a similar study in the United States. The aim of the analysis was to identify and recommend strategies for improving the effectiveness of public health care services. Stressing the importance of the systems theory in health care in an article on improving health care by embracing Systems Theory, Anderson (2016, p.594) concluded that, "Applying Systems Theory, … lumps adverse events together across types and allows us to detect patterns and system failures".



### 3.3.2 Social Construction of Technology Theory

The Social Construction of Technology (SCOT) argues that human action shapes technology. In the construction of the technology determinism theory, there is this belief that technology determines human action (Burns, Corte & Machado, 2016; Leonardi & Barely, 2010) and technology is a product of the social, political, economic, and cultural environment in which it is situated (Humphreys, 2005). Supporters of this approach, referred to as social constructivists, believe that without the understanding of the social context, a technology cannot be understood (Burr, 2015). This theory, that is within the field of Science and Technology Studies, and has roots in the sociology of science, is a response to the technological determinism that identifies the technology as the determiner of human acts.

Harty (2005) argued that successful innovation requires the consideration of the social and organisational contexts in which it is located. The complex context of construction work is characterized by inter-organisational collaboration, a project based approach and power distributed amongst collaborating organisations. The second is that innovations can be divided into two modes: 'bounded', where the implications of innovation are restricted within a single, coherent sphere of influence, and 'unbounded', where the effects of implementation spills over beyond this.

A major advantage of using the SCOT theory is that it allows researchers to look at the dynamic development of the technology without considering technological determinism (Humphreys, 2005). Thus a success or failure of a technology can be better explained by using the Social Construction of Technology as it attempts to provide sociological explanation to technology as well. However, the Social Construction of Technology has been criticized in the literature as well. For example, it has been pointed out that though Social Construction of Technology relies of the theory of existence of social groups in a society, no specific method has been specified to determine that (Klein & Kleinman, 2002).



The theory claims that users are important participants in the projects and that system designers and suppliers regard users as important contributors in the development process. This make this theory applicable to the study because the design of the information access platform was influenced by the needs and preferences of the healthcare professionals. Users have traditionally had a passive role in such projects because they are often separated from the designers. To improve reciprocity, users should increase their influence in ICT projects. In this

sense, users should have far greater opportunity to participate in creating the conditions for the systems. This can reduce the distance between designers and users.

The SCOT approach has positively contributed to understanding technological development by providing a consistent methodology for studying technology design and it reveals the various social forces that influence and shape the life-course of a technology. It offers clear guidelines for performing case studies of technological innovation (Prell, 2009). The theory has been widely applied in different settings in understanding how social actors adopt and develop technology in their own contexts (Van Baalen, Van Fenema, & Loebbecke, 2016).

Several writers have advocated the application of the SCOT theory in developing context specific technological innovations (Klein, & Kleinman, 2002; Prell, 2009; Djordjevic, Spirtovic & Acimovic, 2016). In the health sector, Dijkema (2016) used the SCOT theory to study "The Interpretative flexibility of smart wearables". The study attempted to discover the interpretative flexibility of the 'practice of wearable technology', identify the main issues surrounding wearable technology and explore the implications for the further diffusion of this technology in the health sector.

### 3.3.3 Hot-Fit Model

The evaluation of Health Information Systems (HIS) is crucial to ensure their effective implementation and positive impact on healthcare delivery. This study therefore adopted an evaluation framework to evaluate existing ICT with the objective of improving information access and service delivery among HIV and AIDS organisations. The Human-Organisation-

Technology Fit (HOT-fit) Model developed by Yusof, Kuljis, Papazafeiropoulou and Stergioulas in 2008 (Figure 3.1) was used to evaluate the ICT because of its comprehensiveness.

The HOT-fit model was advanced from the Information System Success Model developed DeLone and McLean in 1992. The main purpose of the IS success model is to synthesize system success into a more coherent body of knowledge and to provide guidance to future researchers. Thus, to create a comprehensive taxonomy model consisting of six interrelated dimensions for evaluating IS success (DeLone & McLean, 1992; DeLone and McLean, 2003). These interrelated dimensions of IS success and their associations are: ***System Quality*** and ***Information Quality*** which affect ***Use***, and ***User Satisfaction*** have an influence on ***Individual Impact*** which in turn affects ***Organisational Impact***.

i. **System Quality** defined as a measure of the information system processing itself (DeLone & McLean, 1992).
ii. **Information Quality** defined as "measures of the information system output" (DeLone & McLean, 1992).
iii. **Use** is defined as the utilization of an IT application by individuals, groups or organisations (Kim & Malhotra, 2005).
iv. **User Satisfaction** is defined as "the net feeling of pleasure or displeasure that results from aggregating all the benefits that a person hopes to receive from interaction with the information system" (Seddon & Kiew, 1996, p. 95).
v. **Individual Impact** refers to the effects of the outputs of IS systems on users' behavior (DeLone & McLean, 1992).

vi. **Organisational Impact** refers to the effects of the system's output on the organisation (DeLone & McLean, 1992).

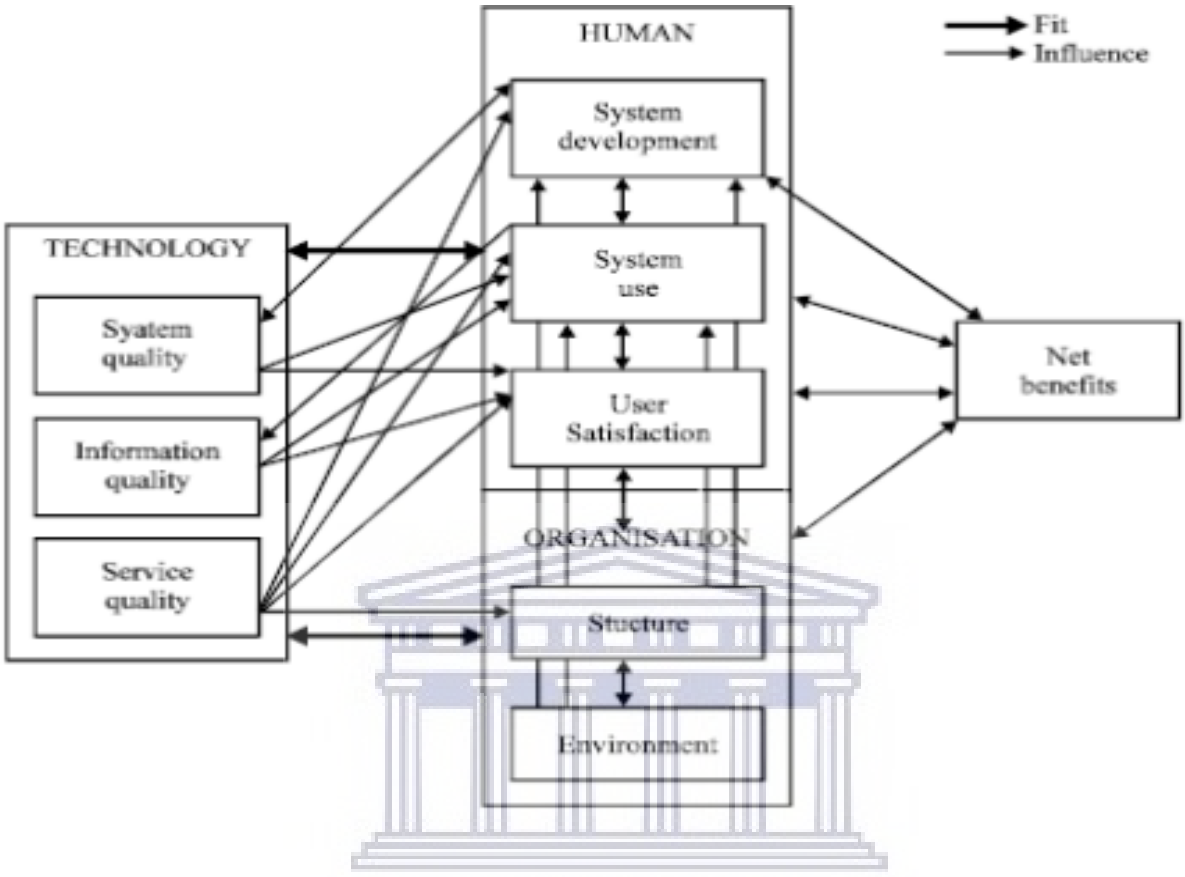



*Figure 3.1 The Human-Organisation-Technology Fit (HOT-fit) Model* (Maryati, Ray & Lampros, 2006)



However, the IS Success Model overlooks organisational aspects which are equally important in the success of health information systems. The HOT-fit model was also identified as being capable of identifying the main organisational elements which can affect IS as well as emphasizing the essential alignment or fit between them. Moreover, the model is comprehensive as it includes the following factors: technology (IT), human (Roles and Skills) and organisation (Strategy, Structure and Management Process) (Maryati, Ray & Lampros, 2006). However, these factors can be categorized into more detailed dimensions to provide more specific evaluation dimensions. For instance, IT can be further classified into system quality and information quality (DeLone & McLean, 1992).

The importance of human and organisational factors in the development and implementation of IS has been advocated in IS and Health Informatics literature. A study conducted by Brender, Nohr and McNair (2000) indicated that 'soft issues' including methods, human and organisational issues are emphasised more in health care than 'technical issues'. Health Information Systems (HIS) are not useful unless healthcare professionals use them, and they will not use them if there are barriers that impede the system use. Barriers to using HIS are also important to consider in HIS evaluation as they explain the failure and success of these systems. Culture and process changes are reported to be the barriers to the wider use of health care systems (Kuhn & Giuse, 2001).

This study used a broader evaluation framework because research shows that broader organisational issues that include culture, expertise and processes have a direct bearing in the use and success of HIS. Studies cited by Anderson (1997) identified a number of barriers to direct physician use of HIS including low level of expertise, lack of acceptance, lack of medical staff sponsorship and alteration of traditional workflow patterns. Examples of organisational challenges include hospital culture, such as being risk adverse, reluctance to invest much in IT and resistance to change (Lorenzi & Riley, 2003). In short, human and organisational factors are equally important as technical issues with regards to system effectiveness (Kaplan & Shaw, 2002). Human, organisational and technical elements should also have a mutual alignment or 'fit' in order to ensure successful HIS implementation. It is crucial that HIS fit organisational aspects as well as align with work routines, management assumptions, patient care philosophies and users' needs as the introduction of a system affects different dimensions of fit in complex ways (Kaplan & Shaw, 2002).

Muslimin, Hadi, and Nugroho (2017:86) argue that the HOT-fit model is quite a popular model in information systems research. The model has been widely used in the health sector in assessing information system success. A study by Marques, Oliveira, and Martins and (2011) used the model to assess the adoption of a medical records system in European Hospitals. Erlirianto, Ali, and Herdiyanti (2015) implemented the HOT–Fit model to evaluate the Electronic Medical Record (EMR) System in a Hospital in Indonesia.

### 3.3.4 Integrated Theoretical Framework

There is lack of a comprehensive theory that covers the study objectives. The nature of and breadth of the study necessitated what Ngulube (2020) referred to as theory diversification. Theory diversification is preferred for interdisciplinary studies like this current study where the researcher has the freedom to borrow theories from different disciplines. The study therefore amalgamated the General System Theory, the Social Construction of Technology Theory and the Human-Organisation-Technology Fit (HOT-fit) Model to create an integrated theoretical framework. The GST acted as a broad theory used to view the different fragmented HIV and AIDS organisations as one system. The SCOT theory emphasized the importance of healthcare professionals in the design of successful ICT systems and the HOT-fit Model acted as a broad evaluation framework. Figure 3.2 illustrates the integrated theoretical framework used in this study.

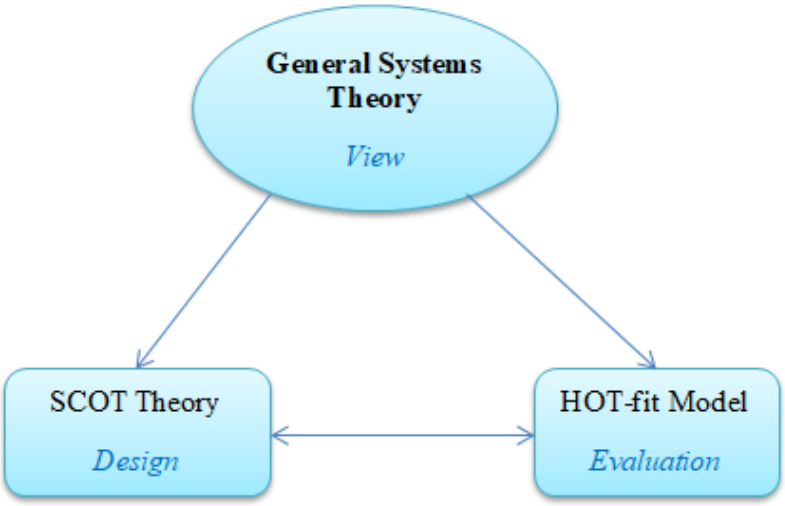



*Figure 3.2 Integrated theoretical framework (Source: Researcher)*

### 3.4 Summary

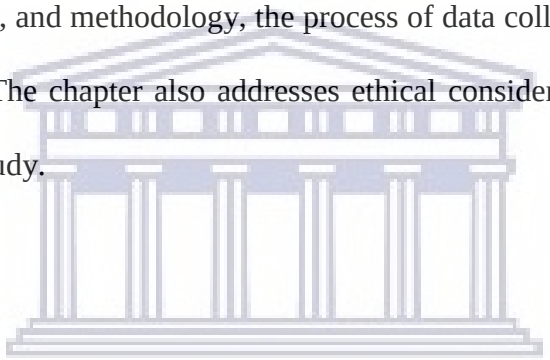
The chapter presented the theoretical framework of the study. It highlighted some of the theories used in the design and adoption of health systems, including their limitations. The study adopted an integrated theoretical approach, combining three theories which were deemed relevant for the study. The General Systems Theory acted as the broad theoretical lens of the study. The Human, Organisation and Technology-fit (HOT-fit) framework provided the basis of evaluating existing systems in the health sector and the Social Construction of Technology Theory guided the design of the information access platform. The next chapter focuses on the research design and methodology.

# CHAPTER 4

# RESEARCH DESIGN AND METHODS

## 4.1 Introduction

Researchers propose various research methods involving several forms of data collection, analysis and interpretation. This chapter presents the research design and methods used to collect and analyse data. It starts by laying out the philosophical foundation of the study, including the ontological and epistemological perspectives. The chapter describes the underlying research design, and methodology, the process of data collection, and presentation and analysis of the data. The chapter also addresses ethical considerations and validity and reliability aspects of the study.



## 4.2 Research paradigm

Deciding on a methodology starts with a choice of the research paradigm that informs the study. To ensure a strong research design, researchers must choose a research paradigm that is congruent with their beliefs about the nature of reality. Consciously subjecting such beliefs to an ontological interrogation in the first instance will illuminate the epistemological and methodological possibilities that are available (Mills, Bonner & Francis, 2006, p. 26). The methodological process, therefore, is guided by philosophical beliefs about the nature of reality, knowledge, and values and by the theoretical framework that informs comprehension, interpretation, choice of literature and research practice on a given topic of study (Wagner, Kawulich & Garner, 2012, p. 53). Easterby-Smith, Thorpe and Jackson (2008) identified three reasons why the exploration of philosophy may be significant with particular reference to research methodology, these reasons were applied to this study:

1) Firstly, it helped the researcher to refine and specify the research methods to be used in the study, that is, to clarify the overall research strategy was used. This included the type of evidence gathered and its origin, the way in which the evidence was interpreted, and how it helped to answer the research questions;

2) Secondly, knowledge of research philosophy enabled and assisted the researcher to evaluate different methodologies and methods to avoid inappropriate use and unnecessary work by identifying the limitations of particular approaches at an early stage; and,

3) Thirdly, it helped the researcher to be creative and innovative in the selection and adaptation of methods that were previously outside his or her experience.

This study uses the structure (Figure 4.1) proposed by Dudovskiy (2018) to explain the interrelationships among the concepts of ontology, epistemology, approach, strategy and methods. Identification of ontology at the start of the research process is critically important as it determines the choice of the research design (Patton, 2002). This section will look at the ontological and epistemological foundations of the study.

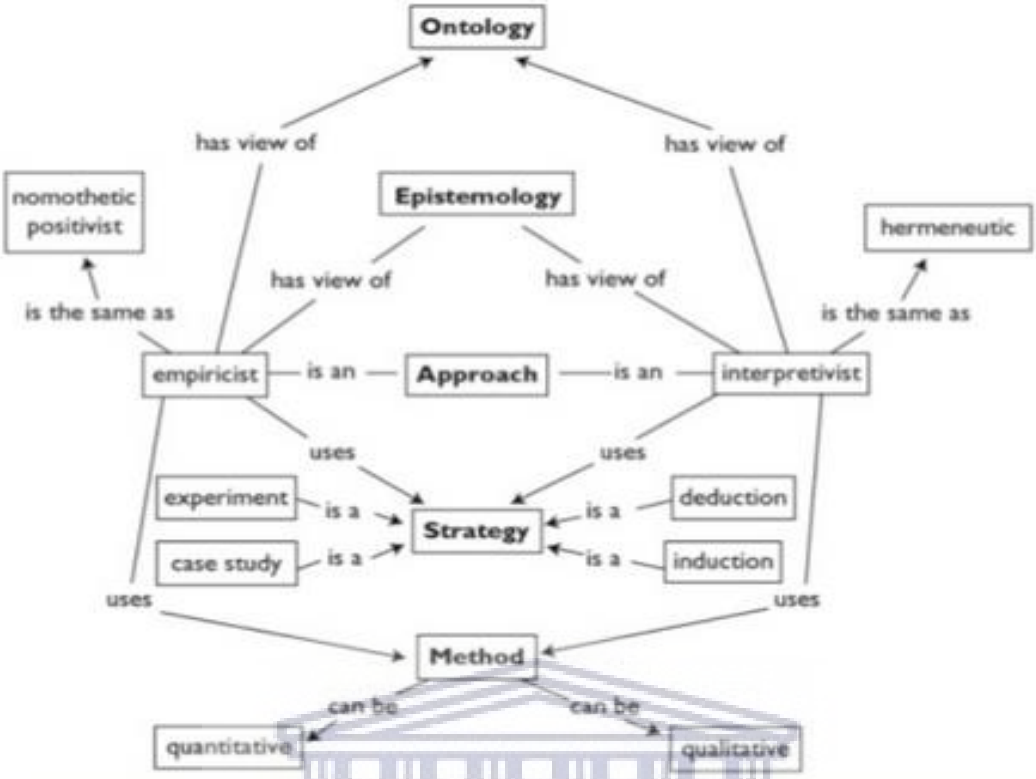



*Figure 4.1 Impact of research philosophy on the choice of research method* (Dudovskiy, 2018)



### 4.2.1 Ontological assumptions

Ontology is a branch of philosophy concerned with the assumptions we make in order to believe that something makes sense or is real, or the very nature or essence of the social phenomenon we are investigating (Scotland, 2012). It is a shared world view that represents the beliefs and values in a discipline and that guides how problems are solved (Schwandt, 2001). Ontology relates to whether we believe there is one verifiable reality or whether there exist multiple, socially constructed realities (Patton, 2002). Ontology in research can be defined as "the science or study of being" (Blaikie, 2010) and it deals with the nature of reality. Ontology is a system of belief that reflects an interpretation by an individual about what constitutes a fact. In other words, ontology is associated with a central question of whether social entities should be perceived as objective or subjective.

Objectivism and subjectivism can be specified as two important aspects of ontology. Objectivism "portrays the position that social entities exist in reality external to social actors concerned with their existence" (Saunders, Lewis & Thornhill, 2012, p. 152). Alternatively, objectivism "is an ontological position that asserts that social phenomena and their meanings have an existence that is independent of social actors" (Bryman, 2012, p. 125). Subjectivism on the contrary, perceives that social phenomena are created from the perceptions and consequent actions of those social actors concerned with their existence. Bryman (2012, p.23) defined constructionism as an "ontological position which asserts that social phenomena and their meanings are continually being accomplished by social actors".

Both objectivism and subjectivism have strengths and weaknesses in research. Ratner (2002) observed that objectivity is said to negate subjectivity since it renders the observer a passive recipient of external information, devoid of agency. And the researcher's subjectivity is said to negate the possibility of objectively knowing a social psychological world. In an attempt to provide an answer on the tension between objectivism and subjectivism, Mertens (2009) argued that it is the investigator's values that define the world that is studied. The researcher however chose the subjectivist approach not only because of the value of subjectivism in qualitative studies but because of the nature of the research topic which involve the researcher in developing an information access platform. Different topics call for the application of different paradigm, depending on the nature of the data to be collected and the nature of the research questions to be answered. Gergen (2001, p. 806) supported this stance by saying that "Arguments about what is really real are futile!" The researcher values the subjective propositions by the participants in developing a context specific and a needs based information access platform, hence the choice of subjectivism.

### 4.2.2 Epistemological foundations

This study was based on the pragmatic epistemological view. According to Saunders, Lewis and Thornhill (2009, p.109), pragmatism is based on the argument that "the most important determinant of the epistemology, ontology, and axiology you adopt is the research question". Pragmatism was selected as the philosophical basis for this study to enable the researcher to be flexible in the choice of research methods. The adoption of the pragmatic stance is therefore justified as Creswell and Plano Clark (2011, p. 26) view pragmatism as one of the epistemological positions most compatible with methodological eclecticism, a methodological approach used for this study. Creswell (2009, p. 9) notes that with pragmatism researchers are free to choose the methods, techniques, and procedures of research that best meet their needs and purposes. The pragmatism position asserts that there are many ways of interpreting the world and undertaking research, that no single point of view can ever give the entire picture and that there may be multiple realities (Bryman & Bell, 2011, p. 32). According to pragmatism, your research design should be planned and conducted based on what will best help you answer your research questions; the result is pragmatic knowledge (Creswell & Plano Clark, 2011). This epistemological view enabled the researcher in collecting, analysing and, where necessary, combining qualitative and quantitative data in answering complex research questions in designing the information access platform. The rationale for using the mixed methods approach is explained in detail under section 4.5.

Whilst the research was positioned and approached with a pragmatic viewpoint, the nature of the research questions meant that the research was narrowed towards interpretivism. Interpretivism, also known as interpretivist involves researchers to interpret elements of the study, thus interpretivism integrates human interest into a study. Myers (2008, p.21) states that interpretive researchers assume that access to reality (given or socially constructed) is only

through social constructions such as language, consciousness, shared meanings, and instruments. As discussed in the next sections, interpretivism emphasizes qualitative analysis of data over quantitative analysis. The goal of interpretivist research is to understand and interpret the meanings in human behaviour rather than to generalize and predict causes and effects (Neuman, 2006; Phillips & Burbules, 2000). For an interpretivist researcher it is important to understand motives, meanings, reasons and other subjective experiences which are time and context bound (Neuman, 2006). This makes interpretivism ideal since the study gathered data from HIV and AIDS organisations with the objective of providing a solution that is relevant to their unique needs.

The major advantage of interpretivism that necessitated its adoption for this study, is that it allowed the researcher to understand unique information needs of healthcare professionals and their preferences on the information access platform. Dudovskiy (2018, p.18) interposes that "thanks to adoption of interpretivism, qualitative research areas such as cross-cultural differences in organisations, issues of ethics, leadership and analysis of factors impacting leadership … can be studied in a great level of depth". Dudovskiy (2018) further supports interpretivism by stating that "primary data generated via interpretivism studies might be associated with a high level of validity because data in such studies tends to be trustworthy and honest".

Saunders, Lewis and Thornhill (2012, p. 12) stated that interpretivism is "associated with the philosophical position of idealism, and is used to group together diverse approaches, including social constructivism, phenomenology and hermeneutics; approaches that reject the objectivist view that meaning resides within the world independently of consciousness". This makes the

approach ideal for this study. The study sought to understand or interpret information needs of healthcare professionals as a precursor towards the design of an information access platform. The design of the platform was informed by the diverse needs of healthcare professionals. Littlejohn and Foss (2009, p. 58) supported this by stating that "it is important for the researcher as a social actor to appreciate differences between people". Moreover, interpretivism studies usually focus on meaning and may employ multiple methods in order to reflect different aspects of the issue.

### 4.2.3 Axiological assumptions

Axiology deals with the nature of value and grasps the question of the value of what is intrinsically worth. Axiology is engaged with assessment of the role of researcher's own value on all stages of the research process (Li, 2016). In this study, values played an important role in interpreting results, the researcher adopted both objective and subjective points of view. The objective stance was used for evaluating current ICTs and the subjective view was mainly used for understanding information needs of healthcare professionals. Development of the information access platform is a complex undertaking which called for multiple data sources. Moreover, there was need for artistic creativity on the part of the researcher in developing the platform from the collected data sets.



## 4.3 Research strategy

Walshe et al. (2004) stressed the point that selecting an appropriate research strategy is important in ensuring that research questions are addressed effectively and that they are congruent with the overall topic, questions and purpose of research. This study used the multiple case study strategy. Mills, Durepos and Wiebe (2010) defined a case study as a methodological approach that involves the in-depth exploration of a specific bounded system,

utilizing multiple forms of data collection to systemically gather information on how the system operates or functions. Case studies explore a bounded system through in-depth data collection, involving multiple sources of information, and reporting a description of themes (Creswell, 2007; Baxter & Jack, 2008; Creswell, 2013). A case study is conducted when: (a) the focus is on answering "how" and "why"; (b) behaviour of those involved in the study cannot be manipulated; (c) the intention is to address contextual conditions because it is believed to be relevant to the phenomenon under study; or (d) boundaries are not clear between the phenomenon and the context (Andersona et al., 2014, p. 89).

When a study includes more than one single case, a multiple case study is needed. In the multiple case studies design, there are no hard-and-fast rules about how many cases are required to satisfy the requirements of the replication strategy. Yin (1994, p. 19) suggested that five to ten cases are recommended, if the results turn out as predicted, are sufficient to "provide compelling support for the initial set of propositions". The study therefore focused on five HIV and AIDS organisations. Yin (2009) noted that single and multiple case designs should be considered as variations within the same methodological framework rather than as distinct approaches. A multiple case study design enables replication (by the use of more than one case) to independently confirm emerging constructs and identify complementary aspects of the phenomenon under investigation by analysing within and across settings (Baxter & Jack, 2008). A case study was therefore useful for this study because it allowed the researcher to combine a variety of data collection methods including interviews, questionnaires, and document analysis to gather complimentary data from multiple institutions to develop the information access platform (Yin, 2009).

The major benefits to using a multiple case design include representativeness and robustness (Andersona et al., 2014, p. 89). Another rationale of adopting a multiple case study was to improve the reliability of the results. Baxter and Jack (2008, p.11) argued that: "An all-embracing fact is that the evidence created from a multiple case study is measured strong and reliable". Another advantage of a multiple case study is that it creates a more convincing theory when the suggestions are more intensely grounded in empirical evidence. Thus, multiple cases allow wider exploring of research questions and theoretical evolution (Eisenhardt & Graebner, 2007).

## 4.4 Research approach

The study used an iterative approach combining deductive and the inductive logic in developing the information access platform. The deductive approach involves in the development of theory and hypothesis. The data or findings from questionnaire survey, guideline interview and secondary sources are the results to be tested to confirm or reject the hypotheses (Gill & Johnson, 2010). The Inductive approach allows the researcher to develop the theory base after analysis of the phenomena. The theory is developed based on the result of data analysis. When a researcher uses both approaches, this is referred as the 'deductive-inductive approach' or the quasi-inductive approach (Perry & Jensen, 2001) or abduction (Alvesson & Sköldberg, 2009).



The quasi-inductive approach or abduction is a modified version of grounded theory. Grounded theory is a methodology that seeks to construct theory about issues of importance in peoples' lives (Strauss & Corbin, 1998). It does this through a process of data collection that is often described as inductive in nature (Morse, 2001), in that the researcher has no preconceived ideas

to prove or disprove. Rather, issues of importance to participants emerge from the stories that they tell about an area of interest that they have in common with the researcher. Grounded theory starts analysis as soon as data has begun to be collected. This analysis builds theory in a very strictly laid down and hierarchical way. The influence of prior theory is clearly guarded against, for example, a researcher of beer consumption was not allowed to read any literature about her topic until after the data had all been collected (Pettigrew, 2000, p. 257). After the data analysis is complete and a grounded theory has been developed, comparisons with theories about other contexts are only allowed if those other theories are grounded ones, to cumulate findings from data.

Grounded constructivism is a mild and modified version of grounded theory. It allows the development of pre-categories from other theories before the sampling and coding processes begin, for use in those processes (Perry & Jensen, 2001, p. 1). The pre-categories of this study were derived from the Human-Organisation-Technology Fit (HOT-fit) model discussed in detail in the previous theoretical framework chapter. This development helped the researcher to be initially aware of a number of dimensions of the phenomenon to be studied.



The dimensions or the priori codes are not included to perform verifying, theory-testing upon; rather, they are merely "put on trial" within a real empirical context for contextual re-specification, refinement or elimination (Mills, Bonner & Francis, 2006, p. 26). A basic point in the subsequent stages of the research process is that the treatment of remaining dimensions should follow the same procedures as normal grounded theory. That is, during the research process, the pre-categories may or may not develop into "ordinary" grounded theory categories. Dimensions that do not "work" or "fit" the data are excluded during the data-analysis-process

and new discovered dimensions are added. The openness of the researcher towards new dimensions other than the pre-categories is fundamental. One of the advantages of this modified version of grounded theory is that it combines links to existing theories with the specified guiding principles of data sampling and analysis from grounded theory (Perry & Jensen, 2001).

### 4.5 Research method

The research design is considered "the architectural backbone of the study" (Polit & Beck, 2014). Also known as strategies of inquiry, research designs are types of inquiry within qualitative, quantitative, and mixed methods approaches that provide specific direction for data collection and analysis in the research process (Creswell, 2014, p. 40). Therefore, a research design could be defined as a plan, blueprint or guide of how you intend conducting the research which includes plans for data collection and interpretation and the set of rules that enable the researcher to conceptualise and observe the problem under study.



A mixed method approach was used for the study. Mixed methods involve combining or integration of qualitative and quantitative research and data in a research study. Although many designs exist in the mixed methods field, Creswell (2014, p. 43) proposed the following broad categories:

i) **Convergent parallel mixed methods,** is a form of mixed methods design in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In this design, the investigator typically collects both forms of data at roughly the same time and then

integrates the information in the interpretation of the overall results. Contradictions or incongruent findings are explained or further probed in this design.

ii) **Explanatory sequential mixed methods** is one in which the researcher first conducts quantitative research, analyzes the results and then builds on the results to explain them in more detail with qualitative research. It is considered explanatory because the initial quantitative data results are explained further with the qualitative data. It is considered sequential because the initial quantitative phase is followed by the qualitative phase.

iii) **Exploratory sequential mixed method** is the reverse sequence from the explanatory sequential design. In the exploratory sequential approach the researcher first begins with a qualitative research phase and explores the views of participants. The data are then analyzed, and the information used to build into a second, quantitative phase. The qualitative phase may be used to build an instrument that best fits the sample under study, to identify appropriate instruments to use in the follow-up quantitative phase, or to specify variables that need to go into a follow-up quantitative study.



There are hybrid mixed methods designs that may be derived from the Convergent parallel, Explanatory sequential, and the exploratory sequential methods. An **embedded mixed methods** design involves both the convergent or sequential use of data, but the core idea is that either quantitative or qualitative data is embedded within a larger design, for example an experiment and the data sources play a supporting role in the overall design (Creswell, 2014, p. 43). A **multiphase mixed methods** design is common in the fields of evaluation and program interventions. In this advanced design, concurrent or sequential strategies are used in tandem over time to best understand a long-term program goal (Creswell, 2014, p. 44).

This study adopts an embedded mixed methods design. The study embedded qualitative and qualitative data in the design of the questionnaire and the data was collected concurrently. As elucidated earlier, an embedded mixed methods design is an approach whereby either quantitative or qualitative data is embedded within a larger design, and the data sources play a supporting role in the overall design. In this case, the larger design is the qualitative design and quantitative data helped in providing more completeness in answering the research questions. The interviews allowed for detailed explanations and follow up questions, allowing more clarity in answering the research questions.

The qualitative research design was appropriate for the study, although some quantitative techniques were used to analyse and present some data sets. The quantitative aspect of the study did play a part in providing inferential data. Qualitative design is naturally used where a case study is conducted as was the case with this research which used the multiple case study strategy. The qualitative approach evolves from the interpretivist paradigm, where exploring and understanding the meaning individuals ascribe to a social or human problem. This allows for an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence (Saunders, Lewis & Thornhill, 2009, p. 151). Through the qualitative design, the researcher was better placed to understand the unique health information needs of healthcare professionals and to understand their perceptions of ICTs that can be implemented to enhance Zimbabwean HIV and AIDS health services.

As this study's main focus was to develop a needs-based information access platform, the qualitative design was most appropriate as it allowed for direct contact between the researcher and the healthcare professionals. Principles and strategies for developing the information access platform were co-constructed constructed through direct interaction with the research participants. Qualitative data provides the texture of real life in its many variations; it gives insight into the reasoning and feelings of individuals (Lincoln, Lynham & Guba, 2011), in this context healthcare professionals' health information needs and their preferences in using ICTs.

One cannot however, ignore the role quantitative analysis played in providing descriptive and inferential data for the study. Cresswell (2014) stated the quantitative approach is used in testing objective theories by examining relationships among variables. Kothari et al. (2015) noted that quantitative research is based on the measurement of quantity or amount, implying that quantitative method is concerned with numbers and statistics as a means of increasing objectivity. It employs the use of closed ended questions ensuring the quantification of data for easy analysis. Moreover, through the use of the quantitative approach, inferences can be drawn from a sample of the general population for the purposes of evaluation and measurement that can later be followed up qualitative methods. This study used quantitative analysis for descriptive statistics on health information need of healthcare professionals by calculating means and percentages. Quantitative techniques were also used to evaluate current ICTs by applying the HOT-fit model. Inferential statistics was used to provide an Analysis of Variance (ANOVA) and to test statistical significance between certain variables using Pearson's chi-squared test and Kruskal-Wallis H test.

### 4.6 Population

Rodd (2011, p. 18) defined population as, "the group of people (or anything else) that interests a researcher is the target population. The survey population includes only those who will potentially be included in the sample". The population for this study is healthcare professionals and IT administrators working in HIV and AIDS organisations. According to the National AIDS Council (2014) there are five key organisations in Zimbabwe whose major objectives are to fight HIV and AIDS. They are the National AIDS Council of Zimbabwe, Zimbabwe National Network of People Living with HIV (ZNPP), Zimbabwe Community Health Intervention Research Project- Behavioural Change (ZICHRe), Restless Development, and Mavambo Trust. These are sister organisations of the National AIDS Council of Zimbabwe. The total population of the healthcare professionals, including IT administrators is 314 (National AIDS Council, 2014).



### 4.7 Sampling

Sampling is the act, process or technique of selecting a suitable sample of a representative part of a population for the purpose of determining parameters or characteristics of the whole population (Mugo, 2010). The researcher selected one hundred and seventy-four (174) healthcare professionals and five (5) IT administrators drawn from HIV and AIDS organisations resulting in one hundred and seventy nine 179 participants for the study. The study used both stratified and purposive sampling for questionnaires and interviews participants respectively as will be explained in the following sections.

#### 4.7.1 The research sites

The data was collected at 5 research sites: The National AIDS Council (NAC); The Zimbabwe National Network of People Living with HIV (ZNNP); Zimbabwe Community Health

Intervention Research Behavioural Change Programme (ZiCHIRe); Restless Development, and Mavambo Trust. These were purposefully selected because they work in coordination with the National AIDS Council of Zimbabwe in the fight against HIV and AIDS. The National AIDS Council (NAC) is an organisation established by the government of Zimbabwe to coordinate and facilitate the national multi-sectorial response to HIV and AIDS (National AIDS Council, [NAC], (2017).

The Zimbabwe National Network of People Living with HIV (ZNNP) is a national umbrella body that represents and coordinates people living with HIV (PLHIV) and those affected by HIV in their diversity throughout Zimbabwe. The organisation promotes empowerment of PLHIV through skills development, counselling, education, advocacy and by lobbying for the rights of PLHIV.



Zimbabwe Community Health Intervention Research Behavioural Change Programme (ZiCHIRe) was formed by professors from the University of Zimbabwe, department of community medicine as a home grown solution to spearhead research on community health with special interest in HIV and AIDS. ZiCHIRe BC is in both research and programme implementation. ZiCHIRe ZiCHIRe is led by a team of fully qualified team of professionals who have vast experience in programme implementation, planning and monitoring and evaluation. ZiCHIRe has teams and structures at community levels making it very relevant to tackle community development issues (Zimbabwe Community Health Intervention Research Behavioural Change Programme [ZiCHIRe], 2021).

Restless Development is a Non-governmental organisation whose mission is to tackle HIV and gender based violence, advocating for women's rights, and increasing access to sexual and reproductive health information. The organisation works with young people and the work is led by thousands of young volunteers and advocates (Restless Development, 2021).

Mavambo Trust is a local non- governmental organisation established in 2001 in Zimbabwe with a mission of empowering children to develop their maximum potential by capacitating them to become socially adjusted, self-sustaining, healthy responsible citizens. Its programmes include HIV Adherence Support (Children), HTS (HIV Risk Assessment and Referral), Psychosocial support, Cognitive Behaviour Therapy (CBT), Support Groups for children living with HIV (CLHIV), Child Protection services, Counselling & HIV Disclosure Support, Community Apprenticeship (Life skills), and Economic strengthening to OVC Caregivers. It also operates an Accelerated Literacy and Learning program for children who are between 8 and 12 years of age who have never been to school. The program prepares children for entry into formal school system (Mavambo Trust, 2021).



### 4.7.2 Sampling frame of healthcare professionals

From the target population of 314 healthcare professionals, a sample size was calculated using a formula developed by Krejcie and Morgan (1970). From a population of 314 healthcare professionals, with a confidence interval of 95 percent and sampling error of 0.5 a total sample of 174 was calculated. The researcher verified the accuracy of the Krejcie and Morgan Formula by verifying with the online Raosoft Sample Size Calculator. For a population of 314 healthcare professionals, the Raosoft Sample Size Calculator also recommended a sample of 174.

Stratified random sampling was used to select healthcare professionals. Samples would be proportionately drawn from to each HIV and AIDS organisation to ensure representation. The researcher seeks to adopt the proportionate allocation technique to draw samples from each stratum. This method uses a sampling fraction that is proportional to the total population. The formula for the sampling fraction used was:

$$f = \frac{n}{N}$$

In this formula *n* is the sample size, *N* is the population size and *f* is the sampling fraction. Table 4.1 shows the sampling frame for healthcare professionals of the study.

*Table 4.1 Sampling frame: Healthcare professionals*

| **Organisation** | **Population** | **Percentage Contribution** | **Sample** |
|---|---|---|---|
| National AIDS Council of Zimbabwe | 120 | 38% | 66 |
| Zimbabwe National Network of People Living with HIV | 103 | 33% | 57 |
| Zimbabwe Community Health Intervention Research Project-Behavioural Change (ZICHREe) | 41 | 13% | 23 |
| Restless Development | 28 | 9% | 16 |
| Mavambo Trust | 22 | 7% | 12 |
| **Total** | **314** | **100%** | **174** |



### 4.7.3 Sampling frame IT administrators

Purposive sampling technique was used to identify IT administrators working in the five HIV and AIDS organisations. The researcher selected one individual from each of the five organisations to arrive at a sample of five. By using purposive sampling, also known as judgemental sampling, the researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience

(Lewis & Sheppard, 2006). The advantage of purposive sampling was that the researcher could identify participants who were likely to provide data that are detailed and relevant to the research question (Olive, 2012). This sampling technique was useful because IT administrators were the best individuals for gathering data related to the use of ICTs in managing health information. This was a cost effective sampling technique which is suitable for the population under the study.

### 4.8 Data gathering tools

Research instruments are the tools that are used by researchers to gather data from respondents or the object under study. This study used questionnaires and in-depth interviews to gather data. Gathered data was supplemented by primary and secondary literature from authoritative sources that include organisational published and unpublished literature, including policy documents and annual reports. The researcher also analysed the websites of organisations involved.



#### 4.8.1 In-depth Interviews

Creswell (2012) stated that an interview is a data collection tool accomplished either with the interviewer in the presence of the respondent, so that they have visual contact or via the telephone. An interview is a data collection tool that involves oral questioning of respondents, either individually or as a group. Interviews offer the flexibility to react to the respondent's situation, probe for more detail, seek more reflective replies and ask questions which are complex or personally intrusive. They also allowed for high rate of response as compared to other research instruments (Mohammad, 2013). Interviews (**see Appendix K**) were used to gather qualitative data on the information needs of healthcare professionals, evaluation of

current ICTs and on the proposed ICTs. The researcher conducted telephone interviews with the five IT administrators drawn from the HIV and AIDS organisations. Since the study is mainly qualitative in nature, the interviews with IT specialists helped the researcher in gaining an in-depth understanding of existing information dissemination systems and to gain an insight on how the existing systems can be synergised.

### 4.8.2 Questionnaires

A questionnaire (**see Appendix J**) was used to collect data from the 173 healthcare professionals working in HIV and AIDS organisations. Questionnaires have an advantage that they can be administered to large numbers of people simultaneously and it is relatively quick to collect information (Mohammad, 2013). The questionnaire was distributed physically by research assistants who were engaged by the researcher for data collection. Another advantage is that they provide greater anonymity for the respondents (Reja et al., 2003). The questionnaire was used to gather quantitative and qualitative data on information needs of healthcare professionals, ICT's currently used and recommended ICTs for accessing and sharing health information.



### 4.8.3 Website content analysis

The abundance of web pages and their diversity of form and function provide seemingly endless opportunities for research. As media of communication, websites and web pages lend themselves prima facie to content analysis (Weare & Lin, 2000). Content analysis is a systematic technique for coding symbolic content (text, images, etc.) found in communication, especially structural features (e.g., message length, distribution of certain text or image components) and semantic themes (Bauer, 2000). The study used web content analysis as a data collection tool. The researcher developed a rubric to evaluate websites and insights for

designing the rubric was gleaned from Galileo Educational Network (2008), Pareek and Gupta (2013), and Azusa Pacific University (2019). The website evaluation rubric **(See Appendix L)** was used to evaluate all the HIV and AIDS organisations from the point of view of the users (healthcare professionals). The rubric was designed to obtain scores from the respondents on seven aspects of the websites, namely: Authority, Purpose, Content, Currency, and Design, Navigation and Interactivity. The rubric was distributed physically by research assistants who were engaged by the researcher for data collection.

### 4.9 Design of data collection tools

The questionnaire was designed based on the study objectives and research questions. The questionnaire identified three underlying factors that influenced the development of the information sharing platform. These factors are information needs of healthcare professionals; evaluation of ICTs used by healthcare professionals, and appropriate ICTs recommended by the stakeholders. The three underlying factors were driven from the 3 study objectives. The questionnaire also addressed two more variables to ensure that all the research questions are answered. The study has three objectives and five research questions. Therefore the last 2 research questions of the study were also addressed by the questionnaire, i.e. how an effective platform for accessing health information can be established, and how the platform will enhance HIV and AIDS health services. The first section of the questionnaire aimed collecting demographic data, which was later used for inferential analyses. Therefore the questionnaire has six sections that address the research objectives and the research questions:

i. Demographic data
ii. Information needs of healthcare professionals;
iii. Evaluation of ICTs used by healthcare professionals;
iv. Appropriate ICTs recommended by the stakeholders;

v. How an effective platform for accessing health information can be established, and

vi. How the platform will enhance HIV and AIDS health services.

The interview guide was also designed in line with the same topics which address the research objectives and the research questions. Table 4.2 is a research dashboard which illustrates the research objectives and research questions and how they were addressed by the research tools, including the data sources.

**Table 4.2 Research dashboard**

| Specific objectives | Critical questions | Source of Data/Target population | Data collection Instrument |
|---|---|---|---|
| 1. To identify the information needs of Zimbabwean healthcare professionals working in HIV and AIDS organisations | 1.1 What are the information needs of healthcare professionals working in Zimbabwean HIV and AIDS organisations? | 1.1.1 Health practitioners | 1.1.1.1 Questionnaire<br><br>1.1.1.2 Open ended interview |
| 2. To use the HOT-fit model to evaluate the ICTs currently being used in accessing information by Zimbabwean healthcare professionals | 2.1 Are the ICTs currently being used in Zimbabwe appropriate for accessing information by health practitioners? | 2.1.1 Health practitioners | 2.1.1.1 Questionnaire<br><br>2.1.1.2 Open ended interview<br><br>2.1.1.3 Website evaluation rubric |
| 3. To establish and recommend appropriate ICTs for accessing HIV and AIDS information by healthcare professionals in Zimbabwe | 3.1 What are the appropriate ICTs that can facilitate access to HIV and AIDS information by healthcare professionals?<br><br>3.2 How can an effective platform for accessing health information in Zimbabwe be established?<br><br>3.3 How will such a platform enhance Zimbabwean HIV and AIDS health service? | 3.1.1 Health practitioners.<br><br>3.1.2 IT specialists | 3.1.1.1 Questionnaire<br><br>3.1.1.2 Open ended interview |

### 4.10 Reliability of data collection tools

Reliability is one area that is important in measuring bias and distortion of research findings. Gibbs (2007) defined reliability as the replicability which is the extent to which other researchers can come up with same conclusions if the same research process is used. According to Cooper and Schindler (2011), a measure is reliable if it provides consistent results. To improve the reliability of data generated by the study, the researcher performed a reliability test on the questionnaire and validated the respondents for the interview. This section presents the strategies in detail.

#### 4.10.1 Reliability of the questionnaire

The researcher conducted discussions with colleagues who are knowledgeable in questionnaire design. Items on the questionnaire were discussed with renowned researchers from the National University of Science and Technology and relevant comments on their suitability for the purpose of the study were made. The necessary revisions to the questionnaire items were done to ensure that they meant the same thing to participants.



Heale and Twycross (2015, p. 67) asserted that there are three attributes which treat reliability of quantitative data collection instruments which include: *homogeneity* (the extent to which all the items on a scale measure one construct); *stability* (the consistency of results using an instrument with repeated testing); and, *equivalence* (consistency among responses of multiple users of an instrument). After constructing the questionnaire, the researcher tested the instrument for reliability using Cronbach coefficient. According to Lancaster (2005) the Cronbach's alpha is a coefficient for measuring internal reliability of measurement scales such as those found in a questionnaire. The values of reliability coefficients range from 0 to 1.0. A coefficient of 0 means the instrument is not reliable whist a research instrument with a

coefficient of 1.0 has perfect reliability. The results of a Cronbach Alpha test were between 0 and 1 in which an acceptable reliability score of 0.7.

### 4.11 Validity and reliability of data

The researcher used a number of strategies to improve the validity of data.

#### 4.11.1 Validity through triangulation

Triangulation is in four categories (Flick, 2014, p. 183). Firstly, is the use of a variety of data sources (data triangulation). Secondly, is the use of several different researchers (investigator triangulation). Thirdly, is the use of multiple perspectives to interpret the results (theory triangulation); and fourthly, is the use of multiple methods to study a research problem (methodological triangulation). This study adopted the methodological triangulation which allows for the collection of both quantitative and qualitative data. The study also adopted the data triangulation in which data was collected through open ended interviews, and a self-administered questionnaire and website analysis (Patton, 2015, p. 662).

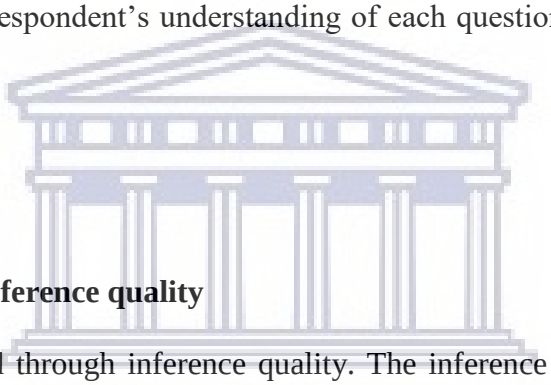


#### 4.11.2 Validity through pilot testing

In this research, data collection instruments were pre-tested in a pilot study to ensure construct validity. A pilot study at the National AIDS Council, Bulawayo was conducted prior the actual study for the purpose of pre-testing the research instruments. Ten individuals participated in the pilot study. Two participated in interviews while eight filled in the questionnaire. The pilot study was done with the aim of improving the data collection tools. Therefore, the data collected was not considered in the study due to the changes that were made to the research

instruments after the pilot study. Those who participated in the pilot test did not participate in the study.

The pre-testing is a practice that allowed the researcher to ascertain the likely problems of the research instruments, and the data that from the pilot study was also used in the study. The pre-test of a research instrument entails a critical examination of each question on how clear they are to ensure that they have been understood by the potential respondents with a view of removing possible problems and bias for information to be collected (Kumar, 2014, p. 378). Pre-testing ensures that a respondent's understanding of each question is in accordance with the study's intentions.



### 4.11.3 Validity through inference quality

Validity was also achieved through inference quality. The inference quality is in two parts (Teddlie & Tashakkori, 2011). Firstly, is the design quality in which various standards are used for evaluating the methodological rigor. Secondly, is the interpretative rigor which checks the standards of evaluation. Table 4.3 summarises common inference quality and interpretative rigor that were used for the study.

**Table 4.3 Inference quality and interpretive rigour**

| Standard | Qualitative | Quantitative |
|---|---|---|
| Veracity | Credibility-The degree to which the findings explain the phenomenon of interest. | Internal validity-The degree to which the findings represent a true reflection causal relationship |
| Consistency | Dependability-The degree to which the study account for changing contexts during the study | Reliability-The degree to which results can be replicated |
| Applicability | Transferability-The degree to which findings can be transferred to other settings. | Generalisability-The degree to which the study results hold true for other settings. |
| Neutrality | Confirmability-The degree to which the findings are shaped by the findings and not bias, motivation or interest. | Objectivity-The degree to which the researcher stands distanced from the study findings |

Source: Adapted from Curry and Numez-Smith (2015, p. 174)



### 4.11.4 Face and content validity

Examining questions of a research instrument to establish the extent of coverage of areas under the study constitutes content validity (Kumar, 2014, p. 367). In addition to linking each question with the objectives of the study as part of face validity, it is essential to examine whether the research instruments cover all the areas of interest to the study. The study used content validity by ensuring that the research questions are spread across the identified literature review gaps in order to fill the research gap. Also, the questions were aligned to critical issues around research objectives and questions.

### 4.11.5 Validation of research participants

In the case of qualitative data, respondent validation is used to validate, verify or assess the trustworthiness of interviews (Neuman, 2011, pp. 389–390). Respondent validation needs to be treated carefully as it has some disadvantages. Firstly, there is the issue of the changing nature of data with the passage of time. Secondly, there is the ethical issue of returning to the interviewees. Thirdly, there is the dilemma of anticipating and assimilating the disconfirming voices.

Birt et al., (2016, p. 1803) argued that within the interpretive epistemology, asking an interviewee to check the transcript from an interview enhances the accuracy of the data. Since the study was constructionist in nature, validation was used to reconstruct the narratives that do not represent the interviewees well. While this may result in more accurate data being obtained, caution suggests that respondent validation compromises the trustworthiness of the new data and the data to be analysed (Birt et al., 2016, p. 1803). In this study, some transcribed interview scripts were returned to the participants to ascertain their correctness depending on the prior arrangement to do so or not. No transcript data were changed by the interviewees.



### 4.12 Data presentation and analysis

The data was recorded and interpreted using both qualitative and quantitative techniques. Four techniques were used to analyse the results. Coding, analytic memos such as reflection notes, displays such as matrices, flowcharts and concept maps, and contextual and narrative analysis were applied for analysing the quantitative and qualitative data. The Statistical package for the Social Sciences (SPSS) was used for quantitative capturing and analysing of data. Tables and graphs assisted in presenting the data. Microsoft Excel was used for qualitative data analysis.

Data analysis serves three purposes in this study as expounded by Greene (2007, p. 144). Firstly, it is to reduce and organise the raw data into a manageable form that enables descriptive reporting as well as further analysis. Secondly, it is to assess patterns of interrelationships, connections, or trends and differences in the data. Thirdly, it is to support and validate conclusions and inferences. The phases of data analysis therefore include data cleaning, data reduction, data reduction, data transformation, data correlation and comparison and analysis of inquiry conclusions and inferences. Greene (2007, pp. 144-145) outlined the steps for data analysis:

### 4.12.1 Qualitative data analysis

Qualitative data from the interviews were transcribed and sorted into Microsoft Excel for analysis. The interviews were transcribed from speech and were organised first by their corresponding research question and then grouped by categories and subcategories using a predetermined coding scheme and then the codes that emerged from the data. The findings were presented using narrative descriptions. The significant statements were then grouped into larger units of information that corresponded with the research questions which Creswell (2013, p. 83) has called "textual descriptions".

### 4.12.2 Quantitative data analysis

The study used both descriptive and inferential statistics for the analysis of quantitative data. The use of descriptive statistics to present the results of these analyses has been aided by graphs, charts and tables. Inferential statistics were used to carry out certain statistical tests. Both univariate and bivariate analyses were performed where necessary. In univariate analysis, there is only one dependent variable while bivariate analysis involves two different variables (Statistics How To, 2021). For example, cross tabulations (bivariate analyses) using Analysis

of Variance (One-way ANOVA) and Kruskal-Wallis H tests were used to determine the variations of dependent variables such as health topics and health sources according to organisation type or gender as the independent variables

Bivariate analysis using the Pearson Chi-Square Test was adopted to establish the statistical significance of the relationship between categorical (nominal) data. Statistical significance is realised when the calculated value is lower than the universally accepted level of significance of p = 005 (Chu, 2013; McKenzie, 2013). In cases where there was ordinal data (Likert Scale) bivariate analysis using the Kruskal-Wallis H test was used to determine if there were statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. The following assumptions guided the use of the Kruskal-Wallis H test: the dependent variables were measured at the ordinal or continuous level (Likert Scale); independent variables (organisation and gender) consisted of categorical groups.



### 4.12.3 Data cleaning

In data cleaning the data from interviews, questionnaires, literature and websites was reviewed for indicators of variability and range. Quantitative data was cleaned using SPSS software.

### 4.12.4 Data reduction

The data from interviews and questionnaires was analyzed to reduced descriptive form. These could include descriptive statistics, factors, case summaries, descriptive forms, or other reduced displays of descriptive information.

### 4.12.5 Data transformation

In this phase data from interviews, questionnaires, and the rubric was consolidated. The approach was done to transform qualitative into quantitative or vice versa and consolidate different forms of data into one merged data set.

### 4.12.6 Data correlation and comparison

This phase investigated patterns of relationships in the data set, marking clusters and variables and themes that appear to go together with the data as differentiating one data cluster from another. Qualitative analyses in this phase included cross tabulation of themes, contexts, critical incidents, and narratives as well as comparative analyses across case or contexts or narratives.

### 4.12.7 Data presentation

Presenting the data includes the pictorial representation of the data by using graphs, charts, maps and other methods. These methods help in adding the visual aspect to data which makes it much more comfortable and quicker to understand. The data collected in this study was presented using graphs and charts that were automatically by the software after analyses. Presentation of data was done in line with the research questions in their respective sequence. The researcher presented qualitative data first, in prose, and graphs and charts supplemented and complimented the presentation.



## 4.13 Concluding summary

This chapter dealt with the methodology of the study. The chapter starts by setting out the philosophical foundations of the study, and then design issues were elucidated. A pragmatic philosophy was adopted for the study. The embedded mixed method approach was adopted to

gather both qualitative and quantitative data. Methodological triangulation was used to address the complex research questions and to improve the reliability of the findings. A questionnaire, interviews, and website analysis were used to collect data from healthcare professionals and IT specialists working in HIV and AIDS organisations. Data was collected, analysed and presented qualitatively and quantitatively using a mix of content analysis techniques. The next chapter focuses on the analysis and presentation of the results.

# CHAPTER 5

# PRESENTATION OF DATA

## 5.1 Introduction

This chapter organizes and reports data collected. Quantitative data were collected from healthcare professionals through a self-administered questionnaire and a website evaluation rubric. Qualitative data was collected from IT administrators using telephone interviews. Qualitative data were analysed using traditional transcription techniques using Microsoft Excel 2010 and quantitative data were analysed using SPSS version 23. Both descriptive and inferential analyses were performed to answer the research questions. The study employed the embedded mixed methods design whereby quantitative data is embedded within a larger qualitative design. The quantitative data sources played a supporting role in the overall qualitative design. The data was therefore analysed using both qualitative and quantitative analysis techniques. The narrative description of data is complemented by graphs, charts, tables and figures. Microsoft Excel 2010 was used to create graphs from the data imported from SPSS. Presentation of data was done according to the research instruments.

## 5.2 Response rates

A response rate is the percentage of people who respond to a survey (Survey Monkey, 2020). There are higher expectations for survey response rates and response rates approximating 60% for most research should be the goal of researchers (Fincham, 2008, p. 44). A good response rate improves representativeness, which refers to how well the sample drawn for the questionnaire research compares with the population of interest. This results in improved reliability of the findings. This study yielded 127 out of 174 responses from the questionnaire,

thereby representing 70% of the population of healthcare professionals. The response rate for telephone interviews was 71% because 5 out of the 7 targeted IT administrators participated in the study.

## 5.3 Presentation of data

This data presentation chapter will be divided into sections. The first section presented data analysed from the questionnaire responses. The second section presents data from the website evaluation rubric, and the last section presents interview data In each section, the data was systematically presented according to the research questions and sequentially according to the questions in the research instruments.

**SECTION 1 - PRESENTATION OF QUESTIONNAIRE DATA**

This section presents data from the questionnaire. The data is presented sequentially according to the order of the research questions. The same order was also used to organise the specific question in the questionnaire.



### 5.4 Demographics

In the context of research, the term demographics refer to particular characteristics of a study population (Salkind, 2010, p. 346). Examples of demographic characteristics include age, race, gender, ethnicity, religion, income, education, home ownership, sexual orientation, marital status, family size, health and disability status, and psychiatric diagnosis. Demographic information allows researchers to better understand certain background characteristics of an audience or population being studied. Demographic characteristics are reported in a study as

independent variables in the research design (Survey Monkey, 2020; Salkind, 2010, p. 346). Demographic data collected by the study were: name of organisation and gender. Demographic data assisted in understanding background information of the participants and to establish interrelationships between the independent variables (demographics) and dependent variables; for example, information needs.

### 5.4.1 Demographic distribution by name of organisation

Figure 5.1 presents the distribution of study participants by name of organisation. The study used a questionnaire to capture data from 127 participants from different HIV and AIDS institutions. Forty six (35.9%) were from the National AIDS Council; 39 (30.5%) were from the Zimbabwe National Network of People Living with HIV (ZNNP); 25 (19.5%) were from the Zimbabwe Community Health Intervention Research Project- Behavioural Change (ZICHRe); eleven (8.6%) were from the Restless Development and six (4.7%) were from the HI02, respectively.



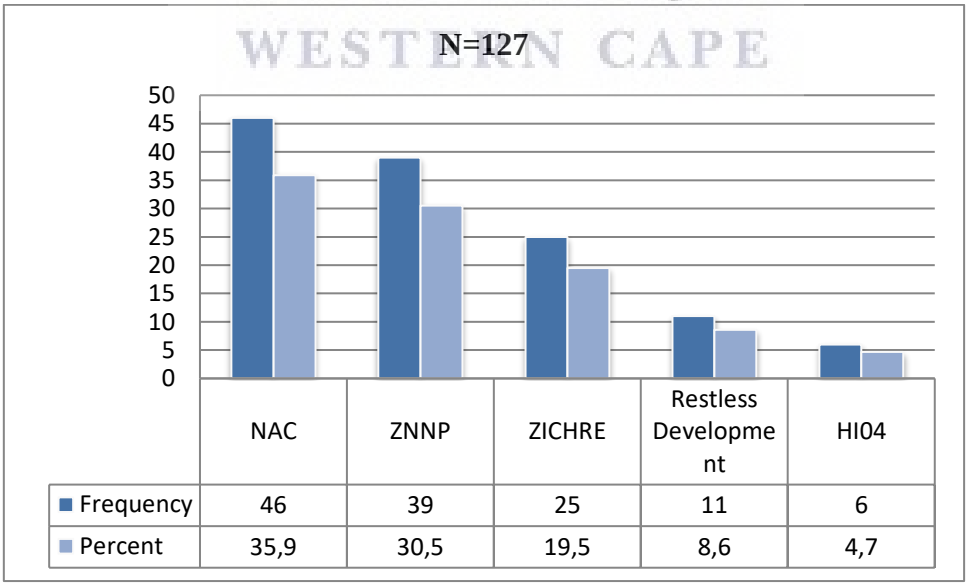



*Figure 5.1 Demographic distribution by name of organisation*

### 5.4.2 Demographic distribution by gender

Figure 5.2 shows that the study collected data from 7(59%) males and 52 (41%) females. This shows that overall; more males participated in the study than females.

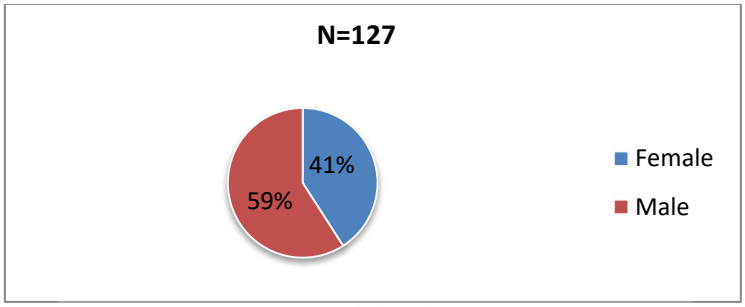



*Figure 5.2 Demographic distribution by gender*

Table 5.1 presents cross tabulated data on Gender of responses by name of organisation. The data shows that there was no even distribution of respondents by gender; except for the National AIDS Council with 22 males and 24 females. It is interesting to note that more females (10) than males (1) participated in the study at Restless Development. An analysis of the relationship between gender and other dependent variables was done in section 5.5.



**Table 5.1 Name of Organisation * Gender of Respondents Cross-tabulation**

| | | Gender of Respondents | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Name of Organisation | NAC | 22 | 24 | 46 |
| | ZNNP | 29 | 10 | 39 |
| | ZICHRE | 21 | 4 | 25 |
| | Restless Development | 1 | 10 | 11 |
| | HI04 | 2 | 4 | 6 |
| Total | | 75 | 52 | 127 |

### 5.5 Information needs of healthcare professionals

As discussed in the literature review chapter, the concept of information needs is complex and heterogeneous. This study looked at the concept of information needs to refer to the identification by healthcare professionals of what they consider would be useful to improve their practice. Questionnaire questions on information needs were grouped into sub-facets which are health topics, sources, social media, ICT gadgets, and access channels needed by the workers to access health information. Therefore, there were 5 questionnaire questions which addressed information needs. This section therefore is organised according to these sub-facets of a health information need which was operationalized for this study. The premise is that expressed needs are more likely to be put into practice than needs that are provided or "pushed" to the user (Pakenham-Walsh & Bukachi, 2009).

#### 5.5.1 Health topics

Figure 5.3 presents the data on health topics needed by healthcare professionals. A significant majority of healthcare professionals 58 (45.7%) indicated that they need information on treatment options; followed by policy issues 33 (26%), and HIV and AIDS services 23 (18.1%). The least preferred health topics were on symptoms, with eight (6.3%) respondents and causes of HIV and AIDS with five (3.9%) respondents respectively.

Qualitative data gleaned from an open-ended question in the questionnaire showed that healthcare professionals also need information on chronic illnesses related to HIV and AIDS; African traditional methods of health promotion; antiretroviral treatment use, co-morbidities and clinical outcomes among Africans and prevention measures.

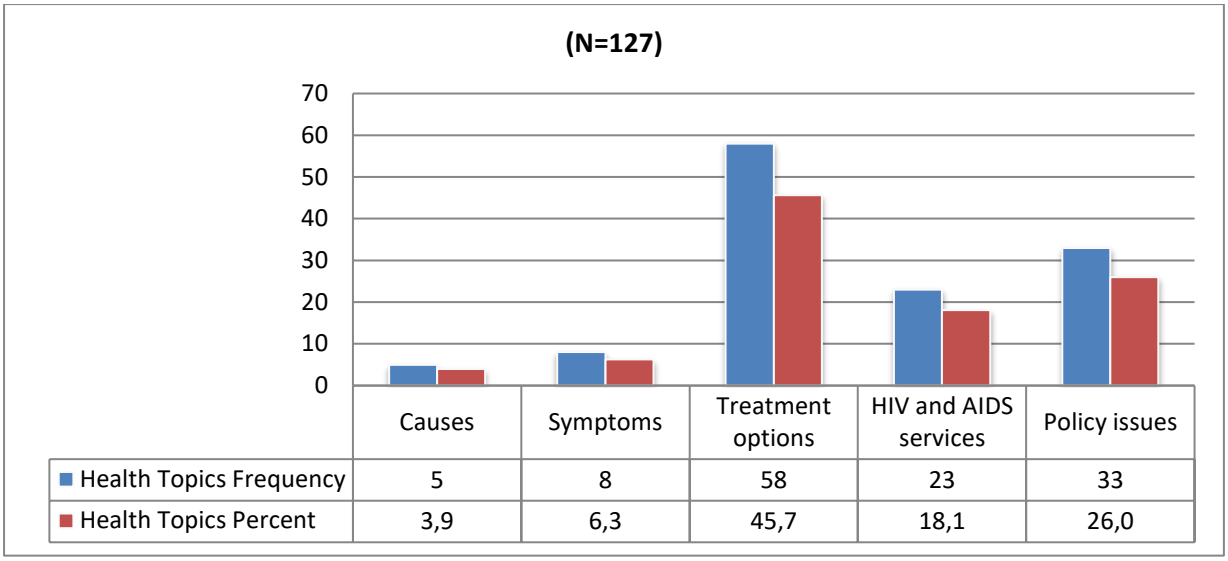



*Figure 5.3 Health topics*

An analysis of the data using analysis of variance (ANOVA) was done to determine whether there are any significant variations on health topics as dependent variables and organisation type as the independent variable. ANOVA helped in finding out whether the differences between the data on health topics from the different HIV and AIDS organisations (groups) are statistically significant. A oneway ANOVA was done because it helped to compare the effects of the independent variable (organisation type) on multiple dependent variables (health topics) (Qualtrics, 2020). Table 5.2 shows that the p-value of the independent variable is not significant ($p \geq 0.05$), it is likely that organisation type does have a significant effect on choice of health topics.

**Table 5.2 Oneway ANOVA on Health Topics and Organisations**

| Health Topics | | | | | |
|---|---|---|---|---|---|
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 2.758 | 4 | .689 | .598 | .664 |
| Within Groups | 140.549 | 122 | 1.152 | | |
| Total | 143.307 | 126 | | | |

A Kruskal-Wallis H test with the value of $\chi 2$ (2) = 0.81, p = 0.05 showed that there were no statistically significant differences in the choice of health topics across different HIV and AIDS organisations. A Kruskal-Wallis H test is a non-parametric measure of is used for comparing two or more independent samples of equal or different sample sizes. Non-parametric tests are ideal when analysing data from smaller sample sizes with uneven population distributions. In the case of this study there is no normal distribution of data due to smaller sample sizes and uneven distribution of population sizes of the HIV and AIDS organisations (Corder & Foreman, 2009).



A cross tabulation of data was done to determine the correlation between gender and choice of health topics. Cross-tabulation is a statistical tool used to examine the relationship within categorical data that is not readily evident. Cross-tabulation analysis goes by several names in the research world including crosstab, contingency table, chi-square and data tabulation, and provide a wealth of information about the relationship between the variables (Qualtrics, 2020).

A Pearson Chi-Square Test was done to determine statistical significance between gender and health topics. The Chi-Square Test of Independence is a non-parametric test which determines

whether there is an association between categorical variables, in other words, it determines whether the variables are independent or related. A non-parametric test was suitable in this case because the data that was being analysed is categorical and not continuous and there was no normal distribution of the population across HIV and AIDS organisations. The p-value of 0.103 ($p \geq 0.05$) in Table 5.3 reveals that there is no statistically significant relationship between gender and choice of health topics. However, there are some interesting trends in the data. For instance, more males [36 (28.3%)] than females [22 (17.3%)] indicated they need information on treatment options; while more females [14 (11%)] than males [9 (7%)] needed information on HIV and AIDS services.

**Table 5.3 Health Topics * Gender of Respondents Cross-tabulation**

| | | Gender of Respondents | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| **Health Topics** | Causes | 2 | 3 | 5 |
| | Symptoms | 7 | 1 | 8 |
| | Treatment options | 36 | 22 | 58 |
| | HIV and AIDS services | 9 | 14 | 23 |
| | Policy issues | 21 | 12 | 33 |
| Total | | 75 | 52 | 127 |
| **Pearson Chi-Square Test** | | | | |
| | | 7.708[a] | 4 | .103 |
| Likelihood Ratio | | 8.069 | 4 | .089 |
| Linear-by-Linear Association | | 0.107 | 1 | .744 |
| N of Valid Cases | | 127 | | |

### 5.5.2 Health sources

Determination of health sources was quintessential in understanding the information needs of the healthcare professionals. The data presented in Figure 5.4 shows that medical databases 65 (51.2%) are the most predominant source of health information for healthcare professionals, followed by the internet with 23 (18.1%) responses, electronic journals had seventeen (13.4%), and textbooks with fifteen (11.8%) respectively. The least preferred sources were printed journals with seven (5.5%) responses. Qualitative data collected from the questionnaire shows that healthcare professionals also get information from other sources that include professional and non-professional social networks, health support organisations, peers and the mass media.

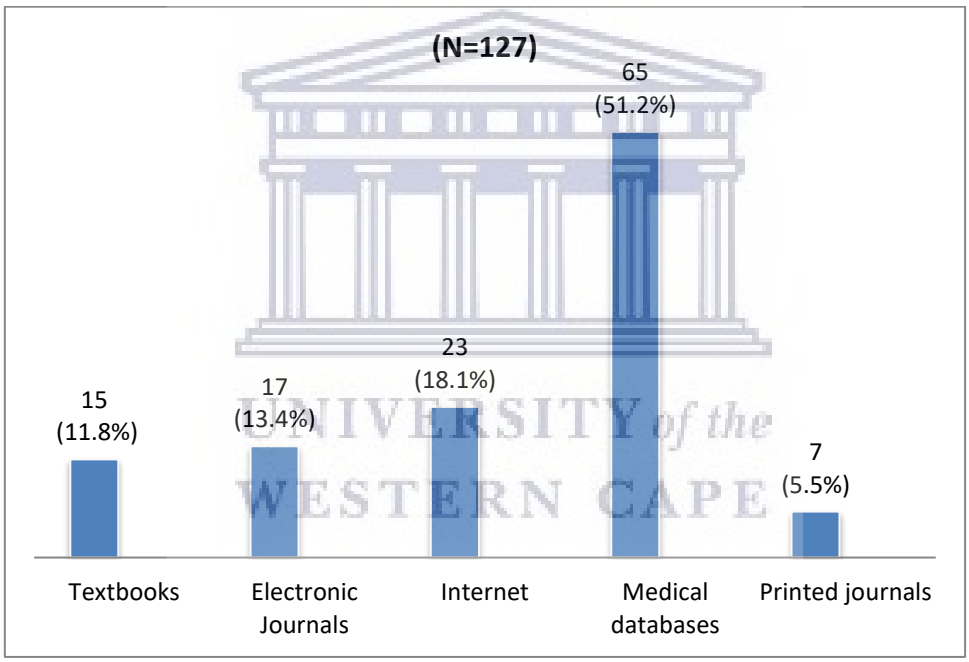



*Figure 5.4 Health sources*

A significance test using Pearson Chi-Square Test revealed that there is no statistically significant between choice of health sources and type of organisation. It was however interesting to note that all the organisations preferred medical databases with the highest being

National Aids Council (15.7%) followed by ZNNP (13.3%) and HIN04 (9.4%). There was no uniformity in the choice for the rest of the health topics.

A cross tabulation of gender and preferred health sources showed a strong relationship between the two variables. A p-value of 0.000 ($p \leq 0.05$) presented in Table 5.4 shows that gender influences the choice of health sources with fifteen (11.8%) females also preferring the internet than eight (6.3%) males. Twelve females (9.4%) also preferred electronic journals than five (3.9%) males. Forty five males (35.4%) preferred medical databases than the 20 (15.7%) females; eleven (8.6%) males also preferred textbooks than females [five (3.9%)]. There was no significant difference on the choice of printed journals.

**Table 5.4 Gender of Respondents * Preferred Sources Cross-tabulation**

| | | Preferred Sources | | | | | |
|---|---|---|---|---|---|---|---|
| | | Textbooks | Electronic Journals | Internet | Medical databases | Printed journals | Total |
| Gender of Respondents | Male | 11 | 5 | 8 | 45 | 4 | 75 |
| | Female | 5 | 12 | 15 | 20 | 3 | 52 |
| Total | | 15 | 17 | 23 | 65 | 7 | 127 |
| **Pearson Chi-Square Tests** | | | | | | | |
| | | Value | df | Asymptotic Significance (2-sided) | | | |
| Pearson Chi-Square | | 40.408[a] | 4 | .000 | | | |
| N of Valid Cases | | 127 | | | | | |

### 5.5.3 Preferred ICTs

Information needs of healthcare professionals included their preferences in terms of ICTs. Various ICTs are used to access, manage and communicate health information. There was need to determine the ICT tools that are preferred by healthcare professionals so as to inform the development of the ICT platform. Figure 5.5 shows that the most preferred ICT gadget was the iPad or tablet (53.5%), followed by laptop (22.8%). Desktops (11.8%) and cell phones (11.8%) were the least preferred. Other tools that were highlighted in the questionnaires are digital stethoscopes, Google Glass, bidirectional video feeds, smart cameras, smart TVs, robotics and Wacom Intuos. There was no statistically significant relationship between organisation and preferred ICTs (0.978). There was also no statistical significance and interesting trends worthy noting on the relationship between gender and choices of ICTs.

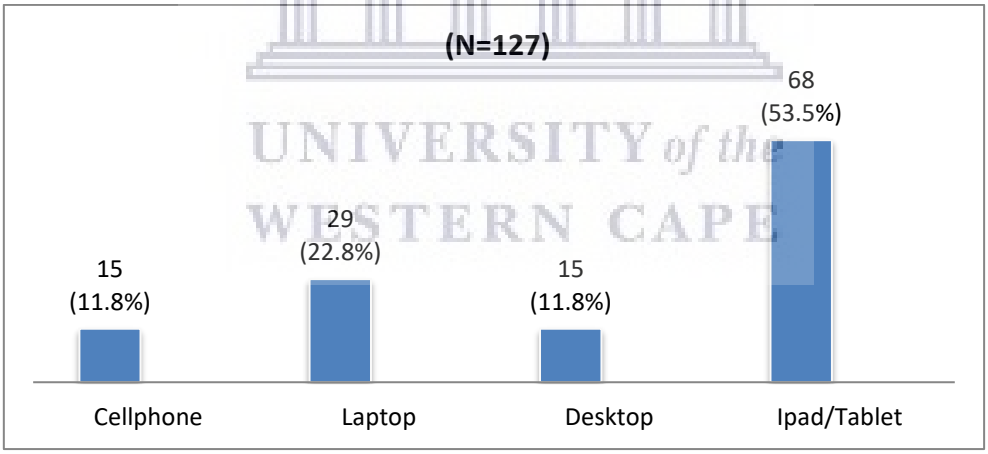



*Figure 5.5 Preferred ICTs*

### 5.5.4 Preferred social media tool

As highlighted in the literature review, social media tools have proven to be effective in the fight against HIV and AIDS. Healthcare professionals were therefore asked to indicate their most preferred social media tools. The data presented in Figure 5.6 indicate that WhatsApp

(22%) is the most preferred social media tool, followed by Twitter (18%); and LinkedIn and Skype tied at (14.2%). The least preferred social media tools were blogs (2.4%); RSS feeds (5.5%) and wikis and podcasts (6.3%) respectively.

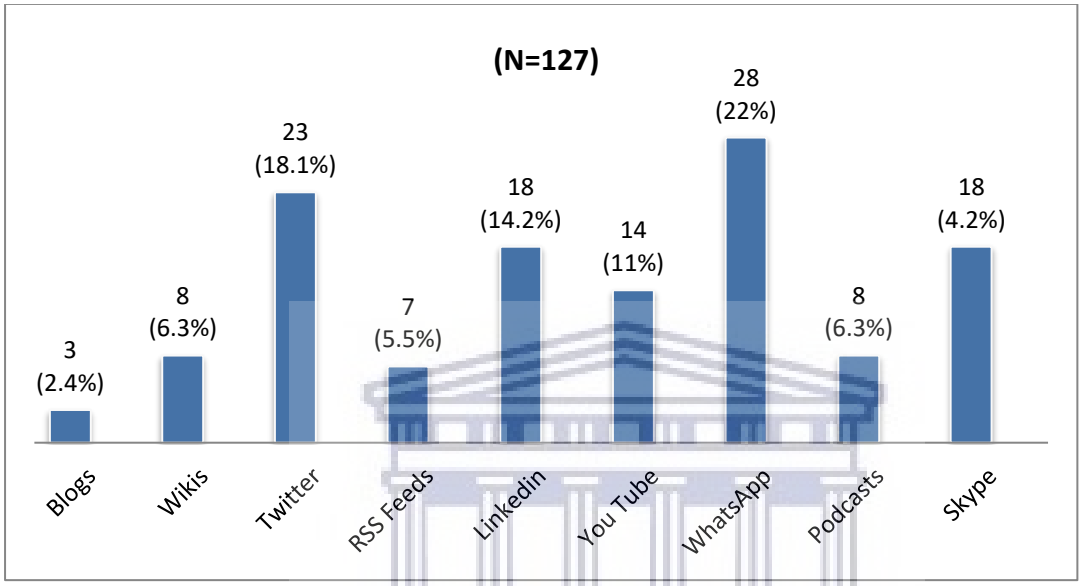



*Figure 5.6 Preferred ICTs*



A Pearson Chi-Square Test was done to determine statistical significance between gender and health topics. A p-value of 0.000 ($p \leq 0.05$) presented in Table 5.5 shows that gender influences the choice of social media tools. It was interesting to note that more males that females preferred Twitter, Skype, LinkedIn and Wikis. More females than males preferred WhatsApp and RSS feeds.

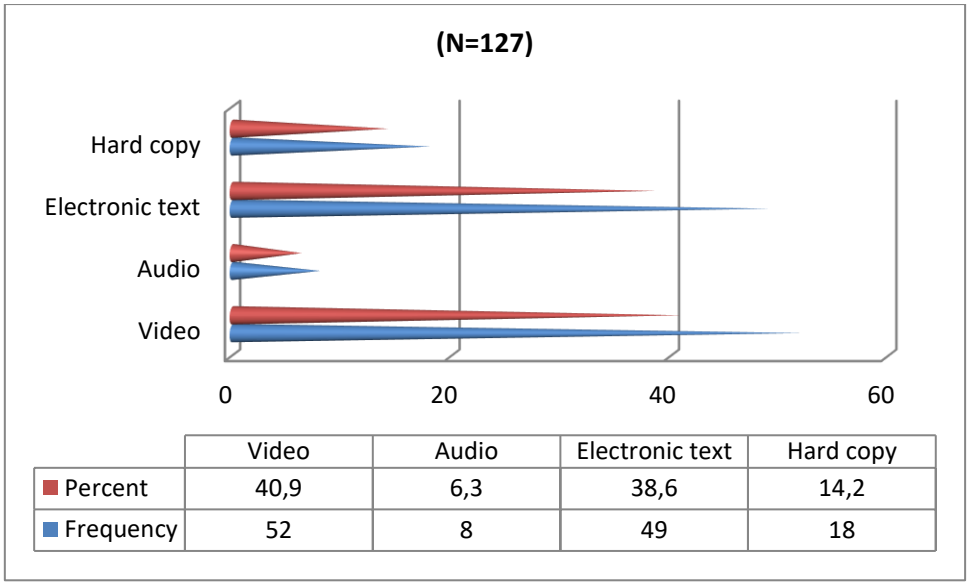
**Table 5.5 Preferred Social Media Tool * Gender of Respondents Cross-tabulation**

| | | Gender of Respondents | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| **Preferred Social Media Tool** | Blogs | 1 | 2 | 3 |
| | Wikis | 7 | 1 | 8 |
| | Twitter | 15 | 8 | 23 |
| | RSS Feeds | 0 | 7 | 7 |
| | LinkedIn | 13 | 5 | 18 |
| | You Tube | 8 | 6 | 14 |
| | WhatsApp | 9 | 19 | 28 |
| | Podcasts | 7 | 1 | 8 |
| | Skype | 15 | 3 | 18 |
| Total | | 75 | 52 | 127 |
| **Pearson Chi-Square Tests** | | | | |
| | Value | df | Asymptotic Significance (2-sided) | |
| | 30.719[a] | 8 | | .000 |
| N of Valid Cases | 127 | | | |



### 5.5.6 Media and channels

It was necessary to establish the media and channels that are preferred by healthcare professionals for accessing or communicating health information. The most preferred channels or media as depicted in Figure 5.7 were video (40.9%) and electronic text (38.6%). The least preferred media were audio (6.3%) and hard copy (14.2%) respectively. There was no statistically significant relationship between organisations and choice of media and channels. There was also no statistically significant relationship between gender and choice of media and channels.




| | Video | Audio | Electronic text | Hard copy |
|---|---|---|---|---|
| Percent | 40,9 | 6,3 | 38,6 | 14,2 |
| Frequency | 52 | 8 | 49 | 18 |

*Figure 5.7 Media and Channels*



## 5.6 Evaluation of the ICT systems

The evaluation was done within the broader framework of the general systems theory which looks at a system as a set of interrelated components which work together to achieve a common goal. Therefore, the evaluation was divided into Human; Organisational and Technological. The HOT-fit model presented in detail in Chapter 3 assisted in identifying the critical Human, Organisational and Technological factors to be evaluated. The application of the Social Construction of Technology Theory helped in giving ownership to the users of the system (healthcare professionals and IT workers) during the evaluation process. The idea was to develop a needs-based information access platform that is tailor-made to the specifications of the users.

### 5.6.1 Technological issues

Technological aspects were the first to be evaluated. This section presents data on the evaluation of the technologies used by the HIV and AIDS organisations. As a precursor of the

technological evaluation process, the study sought to establish the ICTs currently used by the healthcare professionals in different organisations. Figure 5.8 shows that the majority of participants (40%) use desktops; and laptops (26%). Twenty-six percent used cell phones and tablets were the leas used (13%).

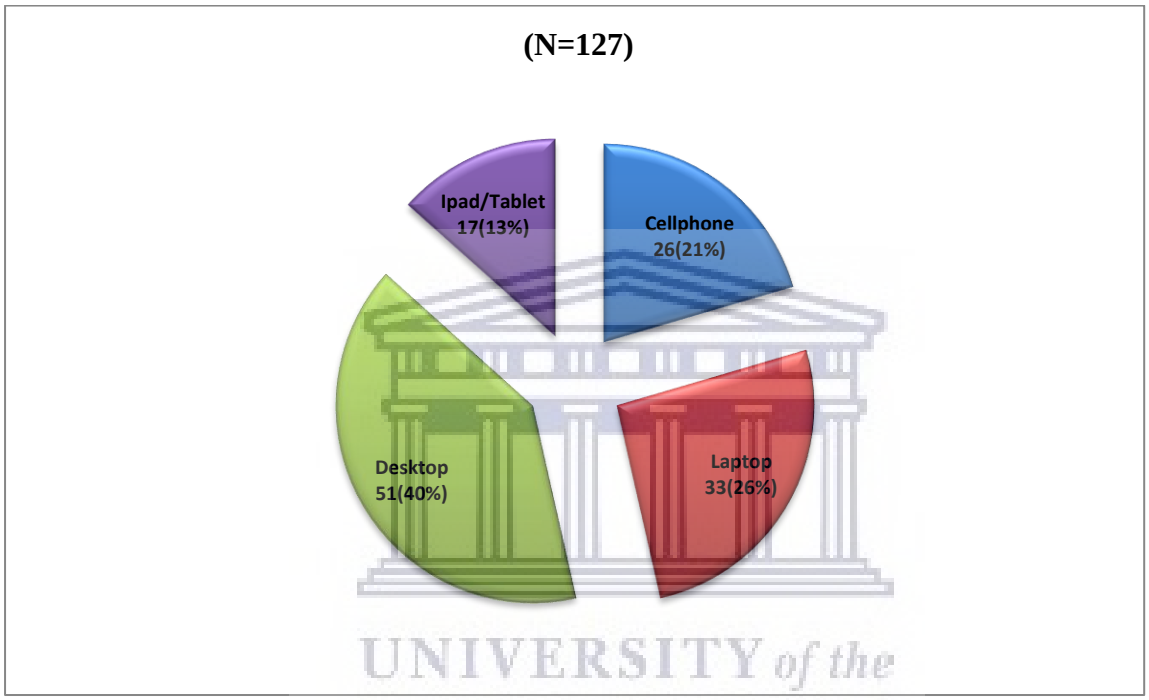





*Figure 5.8 ICT tools used*

A cross-tabulation of name of organisation and name of ICT used revealed some interesting trends in the data, although there was no statistically significant relationship between the two variables. The first interesting trend to note in the data in Table 5.6 is that the desktop is the most used tool in all the organisations. The data also revealed that the usage of the rest of the tools is uniform across all the organisations.

**Table 5.6 Name of Organisation * ICT Tools Used Cross-tabulation**

| | | ICT Tools Used | | | | |
|---|---|---|---|---|---|---|
| | | Cellphone | Laptop | Desktop | Ipad/Tablet | Total |
| Name of Organisation | NAC | 9 | 18 | 12 | 7 | 46 |
| | ZNNP | 12 | 6 | 17 | 4 | 39 |
| | ZICHRE | 5 | 1 | 15 | 4 | 25 |
| | Restless Development | 1 | 4 | 5 | 1 | 11 |
| | HI04 | 1 | 3 | 2 | 0 | 6 |
| Total | | 26 | 33 | 51 | 17 | 127 |

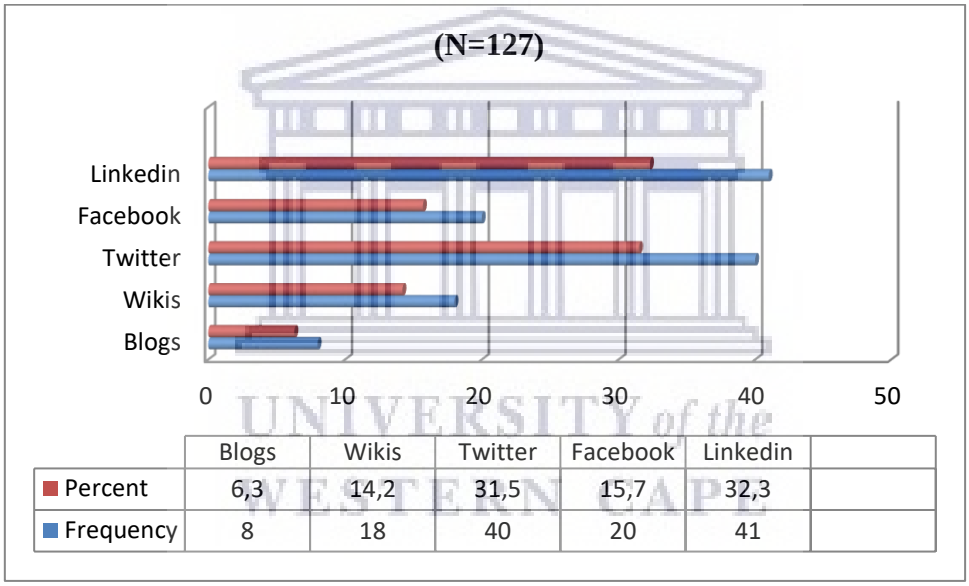
A test of significance of the relationship between gender and ICTs was done using Pearson Chi-Square test. A p-value of 0.000, implies that there is a strong relationship between the two variables. Table 5.7 shows that more males seventeen (13.4%) use cell phones to access HIV and AIDS information on the internet than females nine (7.1%). More females 25 (19.7%) used laptops than males [eight (6.3%)]. More males used desktops [36 (28.4%)] and tablets [fourteen (11%)] than females.



**Table 5.7 Gender of Respondents * ICT Tools Used Cross-tabulation**

| | | ICT Tools Used | | | | |
|---|---|---|---|---|---|---|
| | | Cell phone | Laptop | Desktop | iPad/Tablet | Total |
| Gender of Respondents | Male | 17 | 8 | 36 | 14 | 75 |
| | Female | 9 | 25 | 15 | 3 | 52 |
| Total | | 26 | 33 | 51 | 17 | 127 |
| **Chi-Square Tests** | | | | | | |
| | Value | df | Asymptotic Significance (2-sided) | | | |
| Pearson Chi-Square | 23.592[a] | 3 | .000 | | | |
| N of Valid Cases | 127 | | | | | |

Literature presented in Chapter 2 revealed that social media tools have proven to be effective in the fight against HIV and AIDS. Therefore, data was gathered on the use of social media in accessing and sharing HIV and AIDS information. This preliminary data was gathered to enable the participants to explicitly identify and evaluate the social media tools. Figure 5.9 shows that the majority of participants use LinkedIn (32%), and Twitter (31.5%) to access and share HIV and AIDS information. Facebook had 15.7% and the least used were blogs (6.3%) and wikis (14.2%). The participants did not highlight other social media tools such as Tumblr, Pinterest, and Reddit.




| | Blogs | Wikis | Twitter | Facebook | Linkedin | |
|---|---|---|---|---|---|---|
| Percent | 6,3 | 14,2 | 31,5 | 15,7 | 32,3 | |
| Frequency | 8 | 18 | 40 | 20 | 41 | |

*Figure 5.9 Social media used*

A test of significance of the relationship between organisation and social media usage using Pearson Chi-Square test revealed no relationship between the two. There was however a statistically significant relationship between gender and social media usage. The data presented in Table 5.8 shows a p-value of 0.000, which implies that the gender of the respondents strongly influenced their choice of social media. The trends in the data in Table 5.7 show that more

females preferred Wikis and Facebook than males. Conversely, Twitter, LinkedIn, and Blogs were more popular with men.

**Table 5.8 Gender of Respondents * Social Media Used Cross-tabulation**

| | | Social Media Used | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Blogs | Wikis | Twitter | Facebook | LinkedIn | |
| Gender of Respondents | Male | 7 | 7 | 29 | 3 | 29 | 75 |
| | Female | 1 | 11 | 11 | 17 | 12 | 52 |
| Total | | 8 | 18 | 40 | 20 | 41 | 127 |
| **Chi-Square Tests** | | | | | | | |
| | | Value | df | Asymptotic Significance (2-sided) | | | |
| Pearson Chi-Square | | 27.060[a] | 4 | .000 | | | |
| N of Valid Cases | | 127 | | | | | |

As part of the evaluation process, respondents were asked to rate their current ICTs in their organisation using a four point Likert scale. The study used a questionnaire and a rubric to evaluate the ICTs. Rubric data is presented separately. The general ICT attributes were: Ease of use; Ease of learning; Response Time, Availability; Access to Technical Support; and Security of System. There attributes were informed by the HOT-fit model which was chosen as the evaluation framework for the ICT systems. Descriptive, univariate analysis data was presented in this section.

Ease of use also known as usability can be described as the capacity of a system to provide a condition for its users to perform the tasks safely, effectively, and efficiently while enjoying the experience. Participant in the research were asked to rate their ICTs in terms is their ease

of use. The data presented in Figure 5.10 shows that the majority of the respondents 51 (40.2%) rated their ICT as good; with 47 (37%) indicating that they are average; fifteen (11.8%) thought they were excellent while only fourteen (11%) noted that they were poor.

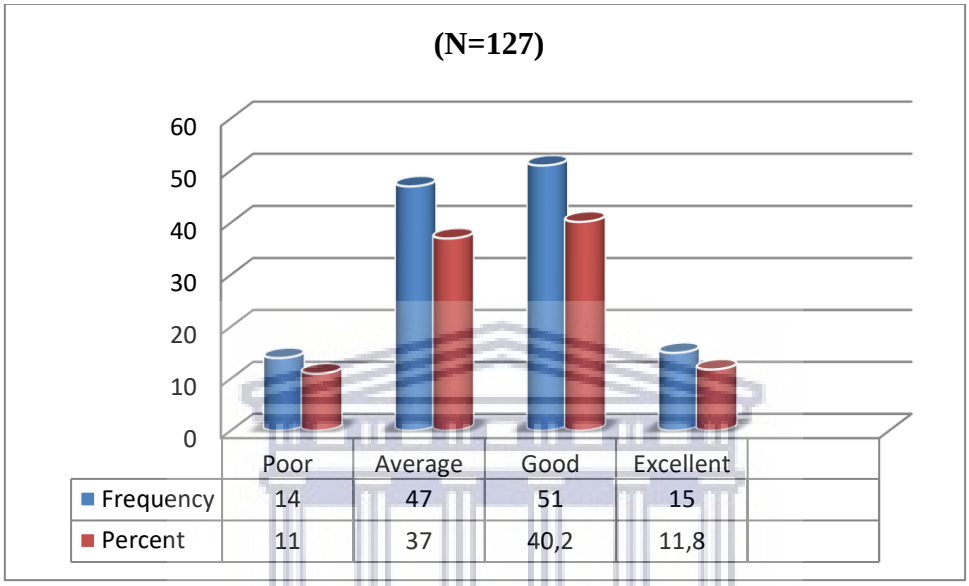



*Figure 5.10 Ease of use*



Ease of learning basically refers to how fast a user who has never used s system or ICT tool before can accomplish basic tasks. Ease of learning was considered important in evaluating the ICT systems and tools used in HIV and AIDS organisations. The data in Figure 5.11 shows that in terms of ease of learning, a significant majority of the respondents 66 (52%) viewed their system as good; 40 (31.5%) viewed them as average; fourteen (11%) thought they were poor and only seven (5.5%) said they were excellent.

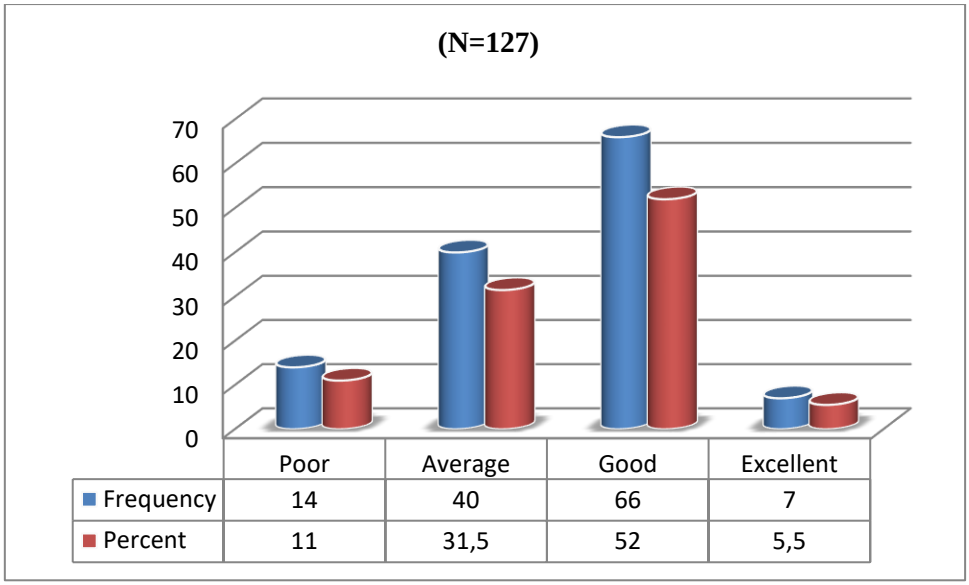



*Figure 5.11 Ease of learning*

Typically, system response time refers to the time between when the user initiates an action, and when the computer starts to display the result. With rapid advances in hardware speed and data communication bandwidth, one might not expect to have to deal with issues such as response time and system performance. But these issues remain a very real concern today. Lengthy system response times may cause lower satisfaction and poor productivity among users in the health sector.



Response time is therefore an important factor when designing information access platforms for HIV and AIDS organisations. In terms of response time, Figure 5.12 shows that the majority 61 (48%) of the respondents indicated that their ICTs are good; 44 (34.6%) indicated that they are average; fifteen (11.8%) felt they are excellent, while seven (5.5%) selected the poor option.

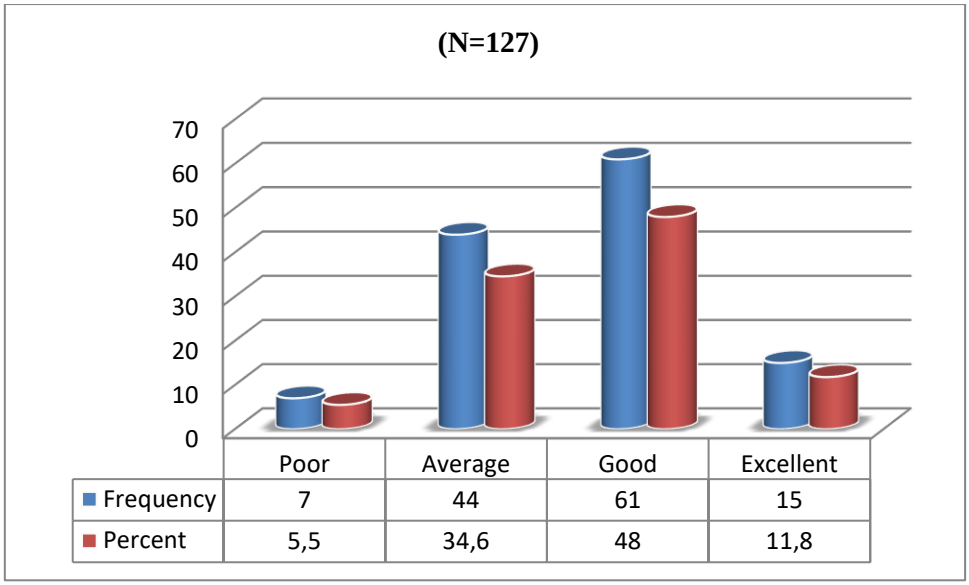



*Figure 5.12 Response time*

System availability was an important evaluation metric for the study. In the context of this study, availability refers to the time that the ICT infrastructure remains operational under normal circumstances in order to serve its intended purpose. The system users (healthcare professionals and IT personnel) were asked to rate their ICTs in terms of system their availability. It was interesting to note that unlike the data on ease of use, ease of learning and response time, the data that was gathered on availability was somewhat different. Figure 5.13 shows that in terms of ICT availability, the majority 61(48%) of the respondents indicated that their ICTs are average; 43 (33.9%) indicated that they are good; fifteen (11.8%) felt they are poor, while eight (6.3%) indicated that they are excellent.

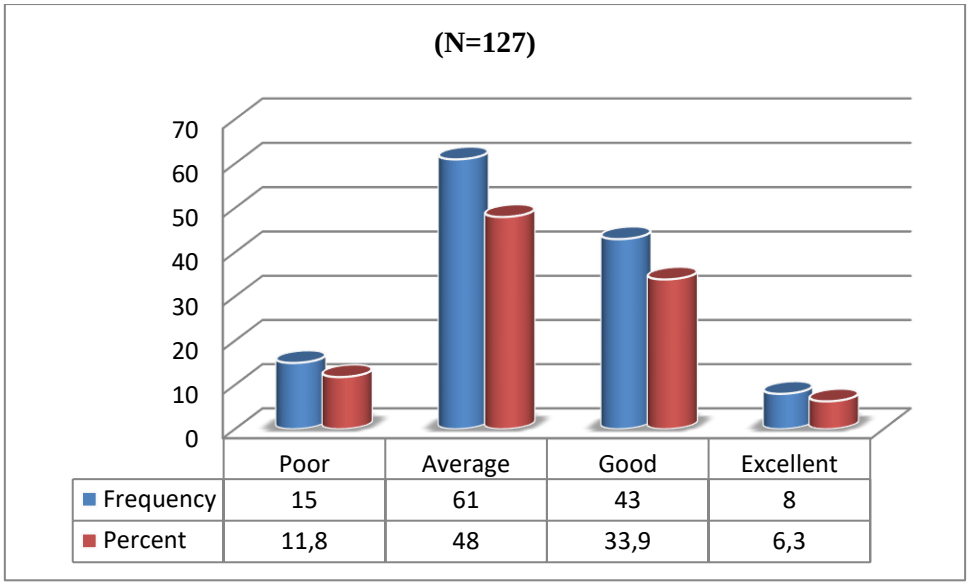



*Figure 5.13 Availability*

An evaluation of user access to technical support was essential in the overall evaluation process. The study measured the quality of the support that system users receive from the IS department and IT support personnel. The rationale is that there is need for continuous access to support not only during the system project implementation but also throughout the operational phase of the system. The data in Figure 5.14 shows that a significant majority 72 (56.7%) of the respondents thought that system support was poor; 40 (31.5) felt that the support was average; eight (6.3%) thought support is good while seven (5.5%) thought system support is excellent.

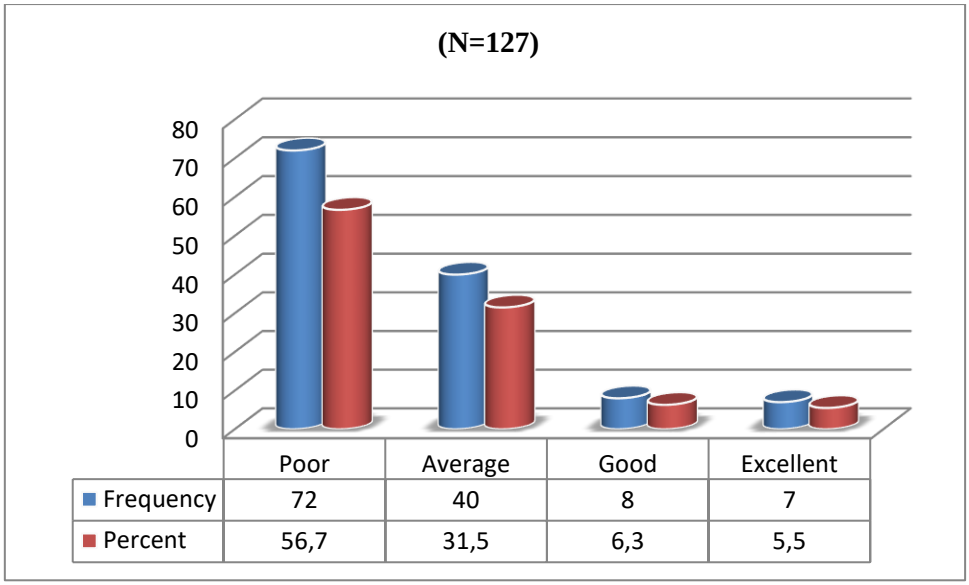



*Figure 5.14 Access to technical support*

System security was considered an important attribute in evaluating the ICT systems used in the HIV and AIDS organisations. The objective of system security is the protection of sensitive HIV and AIDS information and ICT property from theft, corruption and other types of damage, while allowing the information and property to remain accessible and productive. Data presented in Figure 5.15 shows that system security is generally considered average by the majority 73 (57.5%). It was of concern to note that a significant number of respondents 40 (31.5%) felt that security is poor, while fourteen (11%) felt the security was good. None of the questionnaire responses indicated that security was excellent.

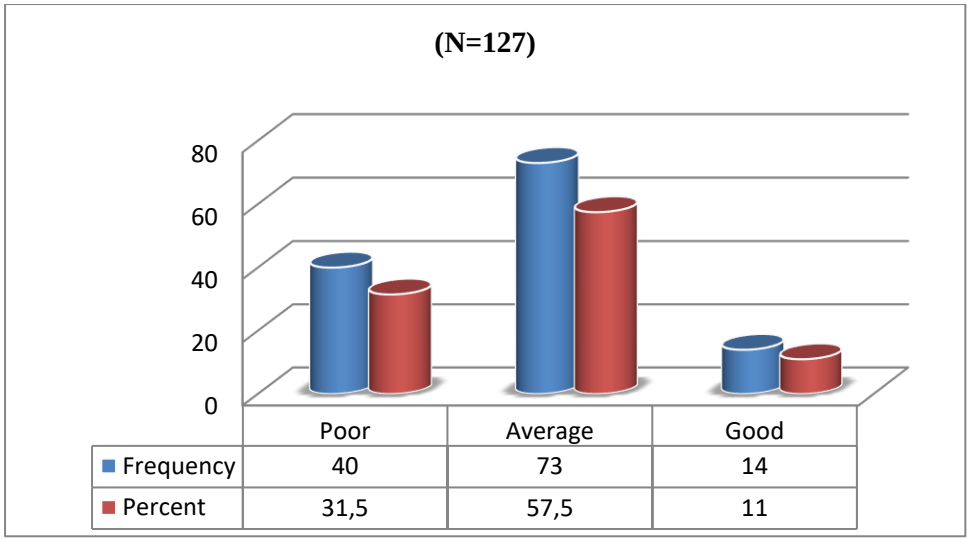



*Figure 5.15 System security*



**5.6.1.1 Bivariate analysis of system evaluation metrics and organisation**

Kruskal-Wallis H test was used to determine if there were statistically significant differences between two or more groups of an independent variable (name of organisation) on an ordinal dependent variable (ICT system evaluation metric). The ordinal variables used a Likert scale with a range from poor to excellent. The metrics were grouped together in Table 5.9. The data from the Kruskal-Wallis Test shows a p- value of more than 0.05. This means that there is no statistically significant relationship between name of organisation and the system evaluation metrics.

**Table 5.9 Kruskal-Wallis Test on Organisation and ICT System evaluation metrics**

| | Ease of Use | Ease of Learning | Response Time | Availability | Access to Technical Support | Security of System |
|---|---|---|---|---|---|---|
| Chi-Square | .710 | .305 | 3.304 | 1.189 | .856 | .123 |
| Df | 4 | 4 | 4 | 4 | 4 | 4 |
| Asymp. Sig. | .950 | .989 | .508 | .880 | .931 | .998 |
| a. Kruskal Wallis Test | | | | | | |
| b. Grouping Variable: Name of Organisation | | | | | | |

The healthcare professionals were asked to make an overall rating of the ICTs used in their organisations. This was done to determine how the healthcare professionals judge their ICTs from a general perspective. The data presented in Figure 5.16 shows that overall, the majority 70 (55%) believe that their ICTs are average; 26 (20.5%) think they are good; sixteen (12.6%) feel they are poor; and fifteen (11.8%) view them as excellent.



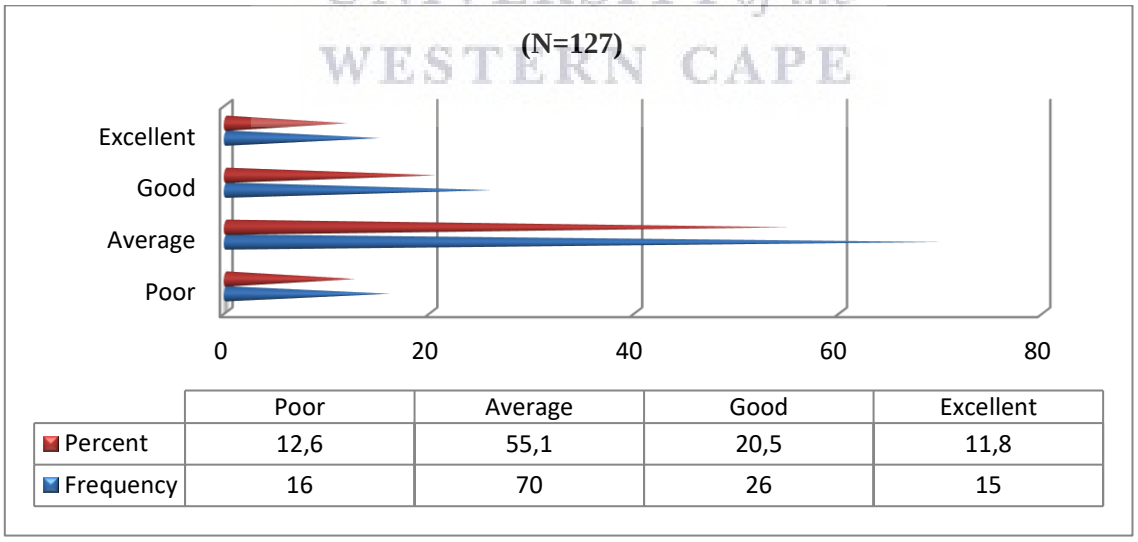



*Figure 5.16 Overall rating of ICTs*

A Kruskal-Wallis H test revealed that there is no statistically significant the relationship between organisation name and overall rating of the ICT. A cross-tabulation of gender and overall ICT rating revealed a positive relationship. The p-value of 0.000 in Table 5.10 reveals that there is a statistically significant relationship between gender and rating of the ICTs with the system. The data shows that more females [38 (30%)] than males [nine (7.1%)] view the ICTs as average and poor; while more males [22 (17.3%)] than females [fourteen (11%)] rate the ICTs as good and excellent

**Table 5.10 Gender of Respondents * Overall ICT Rating Cross-tabulation**

| | | Overall ICT Rating | | | | Total |
|---|---|---|---|---|---|---|
| | | Poor | Average | Good | Excellent | |
| Gender of Respondents | Male | 7 | 32 | 22 | 14 | 75 |
| | Female | 9 | 38 | 4 | 1 | 52 |
| Total | | 16 | 70 | 26 | 15 | 127 |
| **Chi-Square Tests** | | | | | | |
| | Value | df | Asymptotic Significance (2-sided) | | | |
| Pearson Chi-Square | 21.016[a] | 3 | .000 | | | |
| N of Valid Cases | 127 | | | | | |

### 5.6.2 Human issues

This section presents data on the human aspects of the ICT systems used in HIV and AIDS organisations. The section presents data on four system variables that were derived from the HOT-fit model on human issues, namely; frequency of use, training level, user satisfaction and acceptance of the system. The first variable to be evaluated on human issues was system use. Figure 5.17 shows that a significant majority 100 (78.1%) of healthcare professionals usually use the ICTs, 20 (15.6%) sometimes use the systems, and seven (5.5%) rarely use the systems.

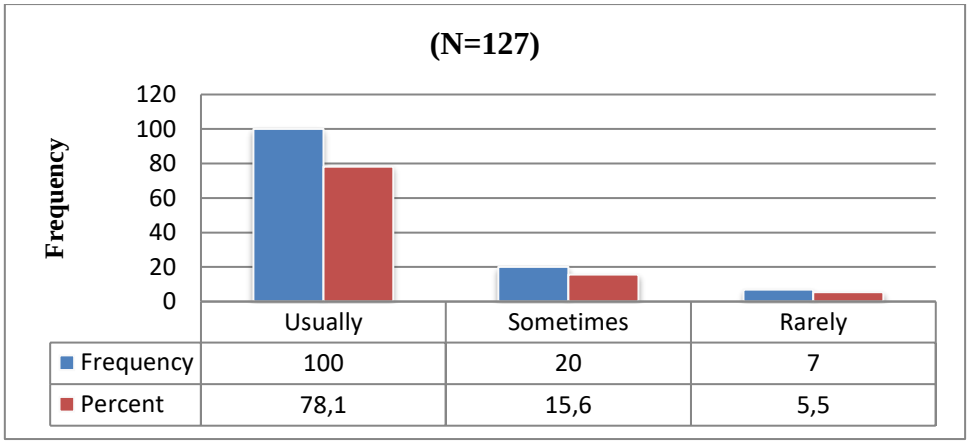



*Figure 5.17 System use*

The second variable to be evaluated on human issues was training levels. Figure 5.18 shows that the majority 66 (51.6%) of the healthcare professionals rate their training on ICTs as average; 49 (38.3%) thought they were good; seven (5.5%) rated their training as excellent and only five (3.9%) rated the training as poor. There was no relationship between training levels and the two independent variables of the study.



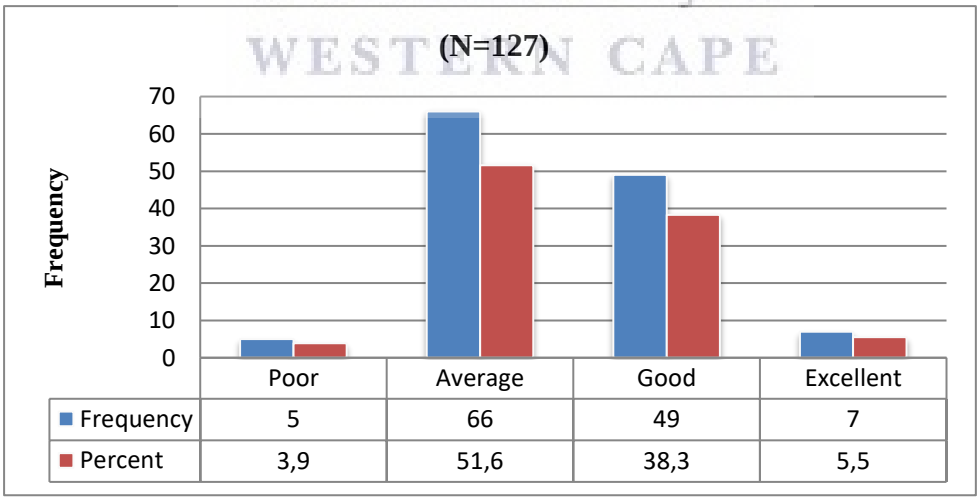



*Figure 5.18 Training levels*

The third variable on human issues was user satisfaction. Figure 5.19 reveals that the majority of healthcare workers 57 (44.5%) were satisfied with the current ICTs; 41 (32%) were neutral, twelve (9.4%) were very satisfied. It was interesting to note that nine (7%) were unsatisfied and eight (6.3%) were very unsatisfied.

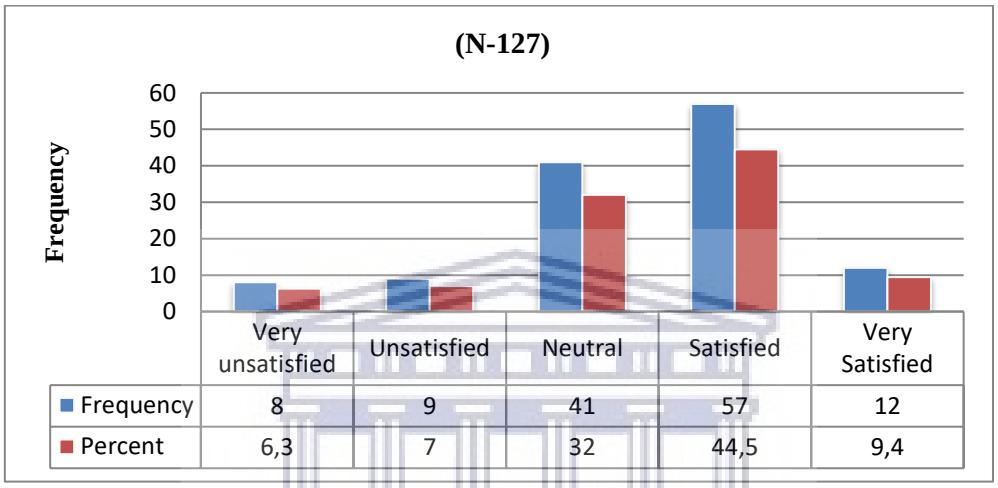



*Figure 5.19 User satisfaction*



A Pearson Chi-Square test revealed no statistically significant relationship between user satisfaction and name of organisation. However, there was a strong relationship between user satisfaction and gender. A p-value of 0.000 implies that there is a strong relationship between the two variables. Table 5.11 shows that more females are either unsatisfied (9) or very unsatisfied (7) by the systems as compared to men with 0 and 1 frequencies respectively. More men (45) were satisfied by the ICTs than females (12).

**Table 5.11 Gender of Respondents * System Satisfaction Cross-tabulation**

| | | System Satisfaction (N=127) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very Satisfied | Total |
| Gender | Male | 1 | 0 | 26 | 45 | 3 | 75 |
| | Female | 7 | 9 | 15 | 12 | 9 | 52 |
| Total | | 8 | 9 | 41 | 57 | 12 | 127 |

**Chi-Square Tests**

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 35.557[a] | 4 | .000 |
| N of Valid Cases | 127 | | |

The last variable on human issues was system acceptance. When the healthcare professionals were asked whether they would either accept or reject the current ICT systems, the majority 91 (72%) indicated that they would accept them while 36 (28%) indicated that they would reject the current systems. The results are presented in Figure 5.20. There was no significant relationship between system acceptance and either gender or name of organisation.

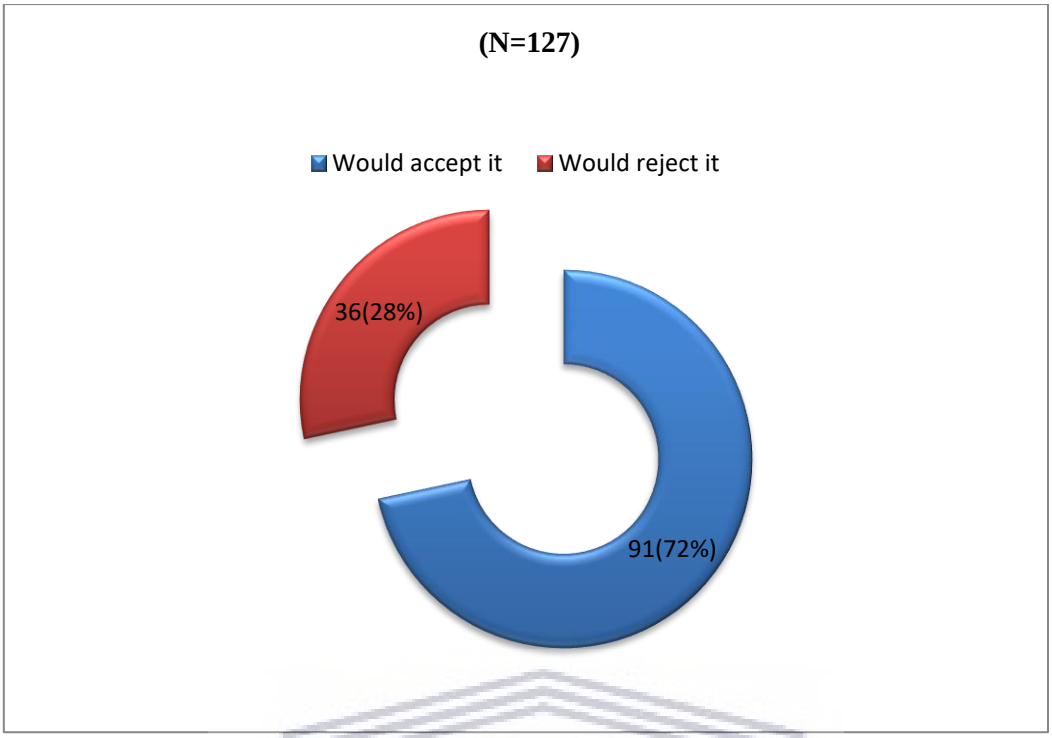



*Figure 5.20 System acceptance*



### 5.6.3 Organisational issues

This section presents data on the evaluation of organisational issues. The organisational issues that were evaluated are: structure culture, politics, communication, funding and policies. Various tests of significance revealed no relationship between these dependant variables and the independent variables of the study. The evaluation results of these organisational features are presented in Figure 5.21. An evaluation of the organisational structure revealed that the majority of healthcare professionals 54 (52.2%) viewed them as good; 39 (30.5%) rated them as average; nineteen (14.8%) rated them poor while fifteen (11.7%) thought they are excellent. This shows that organisational structures are generally rated as good.

The results on organisational culture were different from those of organisational structure. The majority of healthcare workers 72 (56.3%) felt that they were average; 31 (24.2%) thought they

were good; nineteen (14.8%) rated them poor; while only five (3.9%) thought they were excellent. The results show that generally, most healthcare professionals feel that the culture in their organisations is average for ICT projects.

The results of organisational politics were somewhat similar to those of organisational culture. Most respondents 73 (57%) thought organisational politics was average; 34 (26.6%) rated it good; fifteen (11.7%) thought it was poor; while 5(3.9%) felt it was excellent. Generally, the majority felt that the politics in their organisation is average in terms of its influence of the adoption and use if ICTs. On the issue of communication, the majority 70 (54.7%) of healthcare professionals rated the communication systems as average; 29 (22.7%) rated them as good; 23 (18%) felt they were poor; and five (3.9%) had the view that they were excellent. Overall, the communication systems in HIV and AIDS organisations were rated as average by the healthcare professionals



An evaluation of funding was done to determine the nature of funding that is given to ICT projects. The majority of healthcare professionals 57 (44.5%) felt that funding was poor; 41 (32%) thought it was average; 22 (17.2%) felt it was good; while only seven (5.5%) rated it excellent. Similarly; most healthcare professionals 71(55.5%) thought the ICT related policies were poor, 34 (26.6%) thought the policies are average; fifteen (11.7%) felt they were good; and only seven (5.5%) rated the policies as excellent.

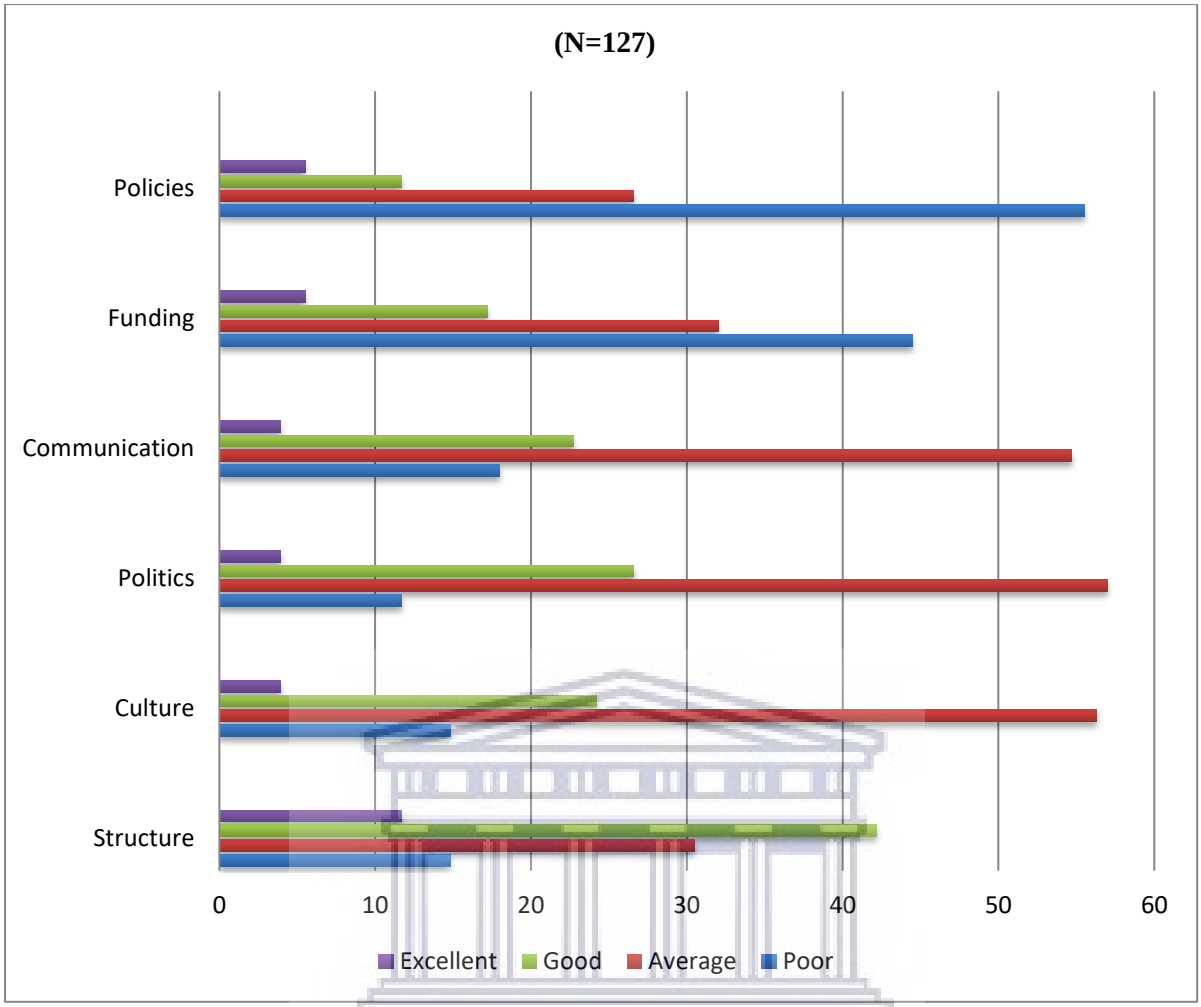



*Figure 5.21 Organisational issues*



## 5.7 Appropriate ICTs

The third and last objective of the study was to establish and recommend appropriate ICTs for accessing HIV and AIDS information by healthcare professionals in Zimbabwe. This section presents questionnaire data on the recommendations that were made by healthcare professionals on the ICTs that should be implemented.

### 5.7.1 Appropriate ICTs that can facilitate access to HIV and AIDS information

This section presents data on the first research question under the third and final objective of the study. The section presents data on the technologies that were deemed appropriate by the ICT users in developing the information access and sharing platform. The Social Construction of Technology (SCOT) theory acted as the analytical lens for the development of the platform. The SCOT theory argues that human action shapes technology and that that users are important participants in the projects and that system designers and suppliers regard users as important contributors in the development process.

The SCOT approach has positively contributed to understanding technological development by providing a consistent methodology for studying technology design and it reveals the various social forces that influence and shape the life-course of a technology. It offers clear guidelines for performing case studies of technological innovation (Prell, 2009). The theory has been widely applied in different settings in understanding how social actors adopt and develop technology in their own contexts (Van Baalen, Van Fenema & Loebbecke, 2016).



#### 5.7.1.1 Effectiveness of ICT sources

The study gathered data on the effectiveness of ICT sources from the perspective of healthcare professionals. The sources that were highlighted were; internet and web-based sources; Print materials (Text books); Electronic Journals; and Medical databases. The data presented in Figure 5.22 shows that the majority 73 (57.5%) of healthcare professionals perceive that web sources are effective; 25 (19.7%) feel they are slightly effective; fifteen (11.8%) think they are above average; while seven (5.5%) said they are not effective.

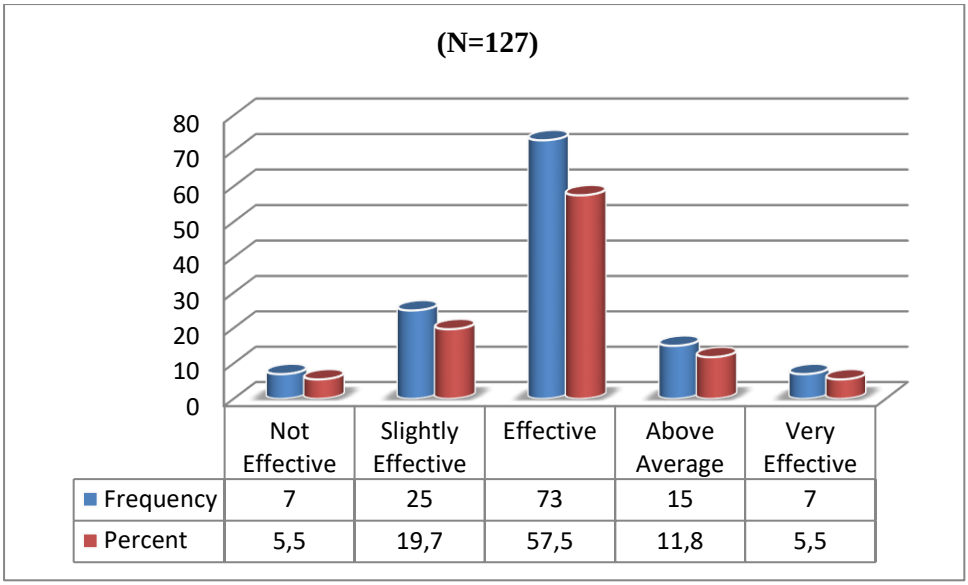



*Figure 5.22 Internet and web sources*

Print textbooks have been a major source of health information among healthcare professionals in Zimbabwe. Healthcare professionals were asked about the effectiveness of print textbooks as a source of HIV and AIDS information. The data presented in Figure 5.23 shows that the majority 46 (36.2%) of healthcare professionals perceive that print textbooks are effective; 43 (33.9%) feel they are slightly effective; 23 (18.1%) think they are above average; eight (6.3%) felt they are very effective and seven (5.5%) think they are not effective.

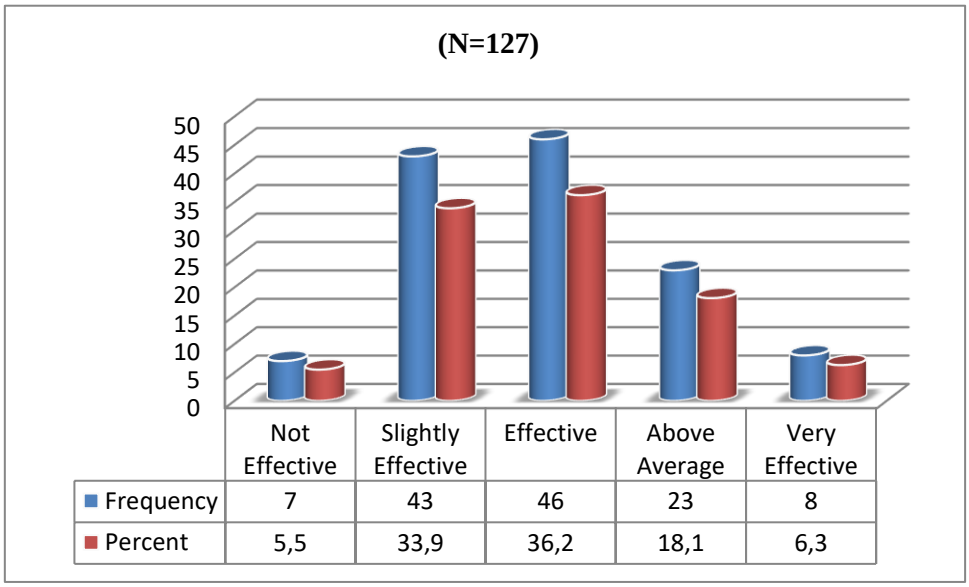
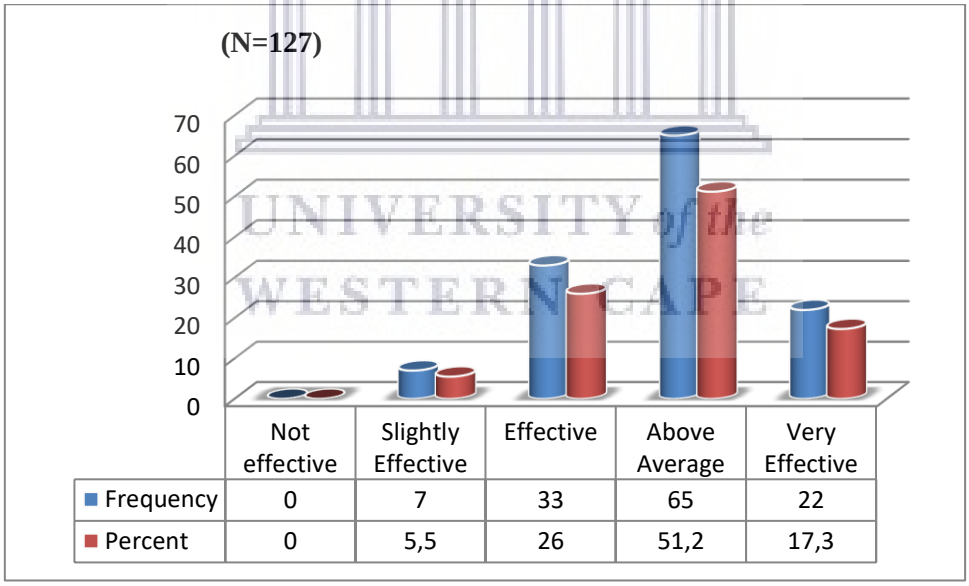


*Figure 5.23 Print textbooks*

Electronic journals have also been widely used as a reliable source of health information by healthcare professionals in Zimbabwe. Healthcare professionals who participated in the study were asked about the effectiveness of electronic journals as a source of HIV and AIDS information. Electronic journals fared fairly better than print textbooks and internet and web sources. The data presented in Figure 5.24 shows that the majority 65 (51.2%) of healthcare professionals perceive that electronic journals are above average; 33 (26%) feel they are effective; 22 (17.3%) think they are very effective; seven (5.5%) felt they are slightly effective. None of the respondents indicated that they are not effective.




| | Not effective | Slightly Effective | Effective | Above Average | Very Effective |
|---|---|---|---|---|---|
| Frequency | 0 | 7 | 33 | 65 | 22 |
| Percent | 0 | 5,5 | 26 | 51,2 | 17,3 |

*Figure 5.24 Electronic Journals*

Medical databases were highly regarded by the healthcare professionals as effective sources of HIV and AIDS information. Figure 5.25 shows that a large majority 79 (62.2%) of healthcare professionals believe that medical databases are a very effective source of HIV and AIDS

information; 27 (21.3%) perceive that they are above average, and 21 (16.5%) feel they are effective. It was interesting to note that none of the respondents viewed medical databases as slightly effective or not effective which were the lowest rankings.

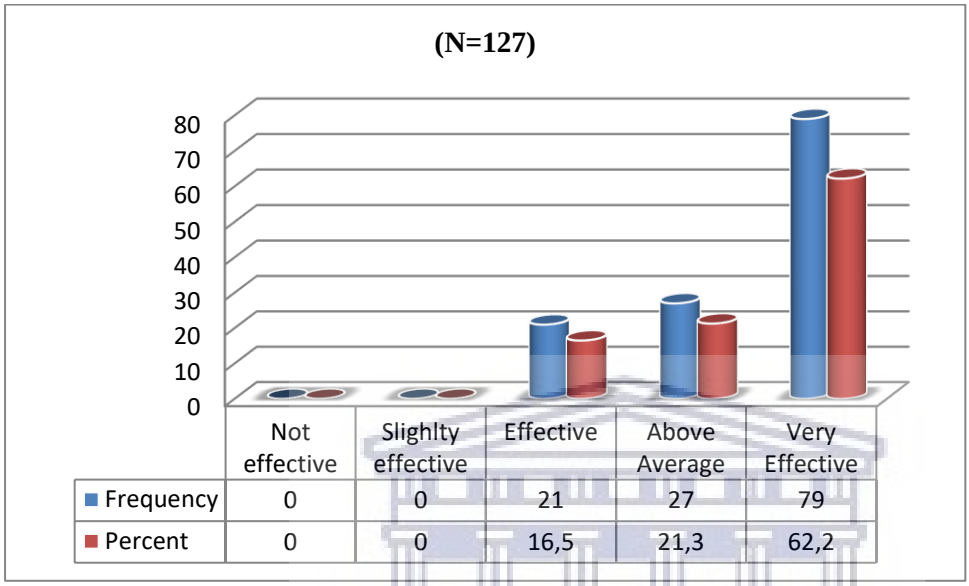



*Figure 5.25Medical databases*

Mean rating scores indicate that on average participants view medical databases as the most effective source of HIV and AIDS information (M = 4.46; SD = 0.764) Electronic journals occupied the second place (M = 3.80; SD = 0.787); followed by internet and web sources (M = 2.92; SD = 0.869). Print sources had the least scores (M = 2.86; SD = 0.990) (See Table 5.12).

**Table 5.12 Mean scores for effectiveness of ICT sources**

| | | Internet & Web Sources | Print & Textbooks | Electronic Journals | Medical Databases |
|---|---|---|---|---|---|
| N | Valid | 127 | 127 | 127 | 127 |
| | Missing | 0 | 0 | 0 | 0 |
| Mean | | 2.92 | 2.86 | 3.80 | 4.46 |

| | | | | |
|---|---|---|---|---|
| Std. Deviation | .869 | .990 | .787 | .764 |

Inferential analysis of data on ICT sources using the Kruskal-Wallis H test revealed that there is no statistically significant the relationship between organisation name and ICT sources. This means that there were no significant variations on the choice of ICT sources across HIV and AIDS organisations. However, there was a relationship between gender of respondents and perception of ICT sources. Table 5.13 show that the strongest relationship was on gender and internet and web sources (p=0.001); followed by electronic journals (p=0.005), and print textbooks (p=0.009). Of interest to note is that gender did not influence choice of medical databases. The data revealed that more males (mean rank = 71.92) than females (mean rank =52.58) prefer internet and web sources. The same applies to print textbooks where there are more males (mean rank = 70.73) than females (mean rank = 54.29) and electronic journals where males had a mean rank of 70.95 while females had a rank of 53.97.



**Table 5.13 Kruskal-Wallis Test on gender and ICT sources**

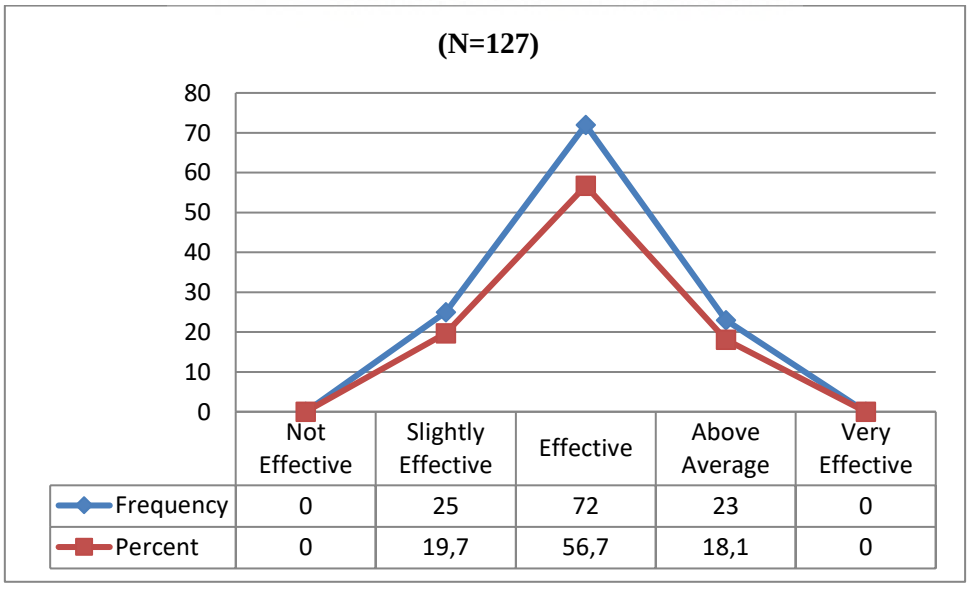
| | Internet & Web Sources | Print & Textbooks | Electronic Journals | Medical Databases |
|---|---|---|---|---|
| df | 1 | 1 | 1 | 1 |
| Asymp. Sig. | .001 | .009 | .005 | .910 |
| a. Kruskal Wallis Test | | | | |
| b. Grouping Variable: Gender of Respondents | | | | |
| **Ranks** | | | | |
| | | Gender of Respondents | N | Mean Rank |
| Internet & Web Sources | | Male | 75 | 71.92 |
| | | Female | 52 | 52.58 |
| Print & Textbooks | | Male | 75 | 70.73 |
| | | Female | 52 | 54.29 |
| Electronic Journals | | Male | 75 | 70.95 |
| | | Female | 52 | 53.97 |
| Medical Databases | | Male | 75 | 63.73 |
| | | Female | 52 | 64.38 |

### 5.7.1.2 Effectiveness of ICT gadgets

The study sought to establish the effectiveness of the ICT gadgets preferred by the health and IT workers in HIV and AIDS for accessing and sharing of information related to their work. They were asked to rate specific ICTs (Cell phone, Laptop, Desktop, IPad/Tablet, and Personal Digital Assistants (PDAs) in terms of their effectiveness. The objective of gathering this data was to rank the ICTs in terms of their effectiveness during the development of the information access and sharing platform.

The healthcare professionals were asked to indicate the degree of effectiveness of a gadget from a continuum of 'not effective' through to 'very effective'. The ordinal data gathered on the cell phone was skewed at the centre, showing that the cell phone was viewed as effective by the majority of the workers 72 (56.7%); 25 (19.7%) indicated that it is slightly effective and 23(18.1%) thought it is above average (see Figure 5.26). None of the healthcare professionals felt that the cell phone is either very effective or not effective.






| | Not Effective | Slightly Effective | Effective | Above Average | Very Effective |
|---|---|---|---|---|---|
| Frequency | 0 | 25 | 72 | 23 | 0 |
| Percent | 0 | 19,7 | 56,7 | 18,1 | 0 |

*Figure 5.26 Cell phone*

Figure 5.27 shows that there was somewhat a normal distribution of data on the responses that related to the effectiveness of the laptop; with most respondents 44 (34.6%) indicating that it is effective. Thirty-three (26%) felt the laptop is above average; nineteen (15%) perceive it is slightly effective; sixteen (12.6%) thought it is not effective, while fifteen (11.8%) felt it is very effective.

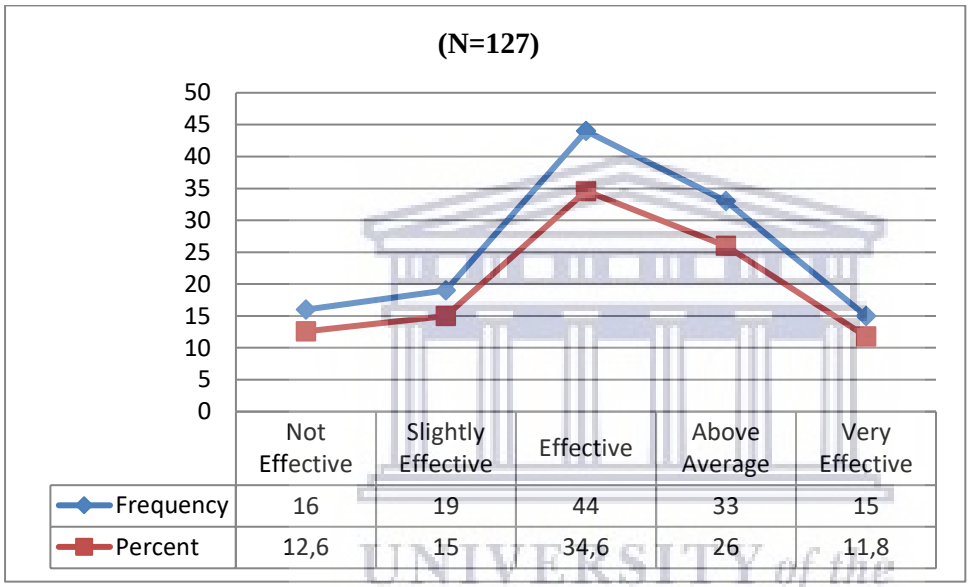
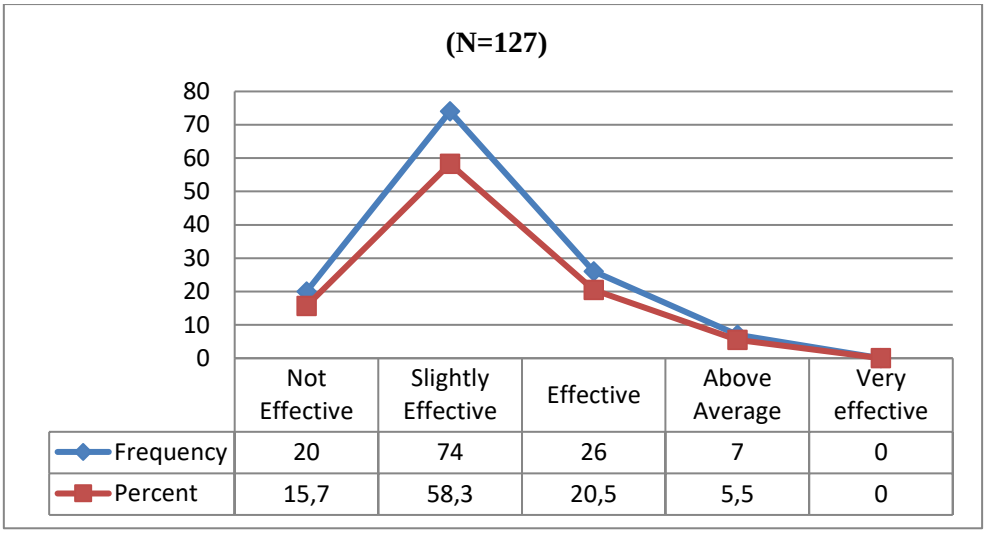



*Figure 5.27 Laptop*



The data, as illustrated in Figure 5.28 is skewed around slightly effective. This shows that the majority of healthcare professionals 74 (58.3%) viewed the desktop as less effective than the ll phone and laptop in accessing and sharing information. Twenty-six (20.5%) of the healthcare professionals thought it is effective while a significant number 20 (15%) thought it is not effective. Only seven (5.5%) of the respondents viewed it as above average, while none of them considered it as very effective.

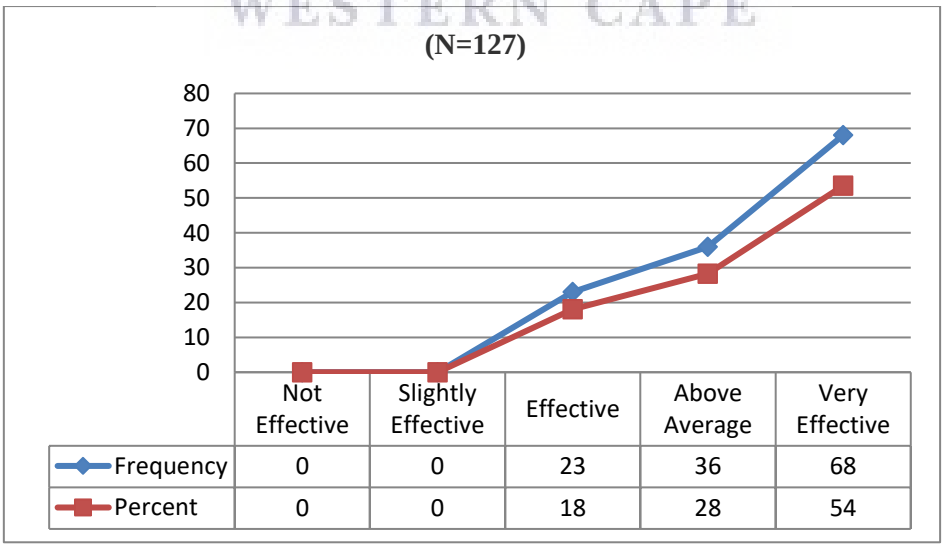



| | Not Effective | Slightly Effective | Effective | Above Average | Very effective |
|---|---|---|---|---|---|
| Frequency | 20 | 74 | 26 | 7 | 0 |
| Percent | 15,7 | 58,3 | 20,5 | 5,5 | 0 |

*Figure 5.28 Desktop*

The data presented in Figure 5.29 shows that the iPad and tablet are regarded highly by the healthcare professionals in terms of their effectiveness in information access and sharing. It was interesting to note that a significant majority 68(54%) considered the gadgets as very effective. Thirty-six (28%) of the healthcare professionals viewed them to be above average; 23 (18%) thought they are effective. None of the healthcare professionals perceived the gadgets as slightly effective or not effective.

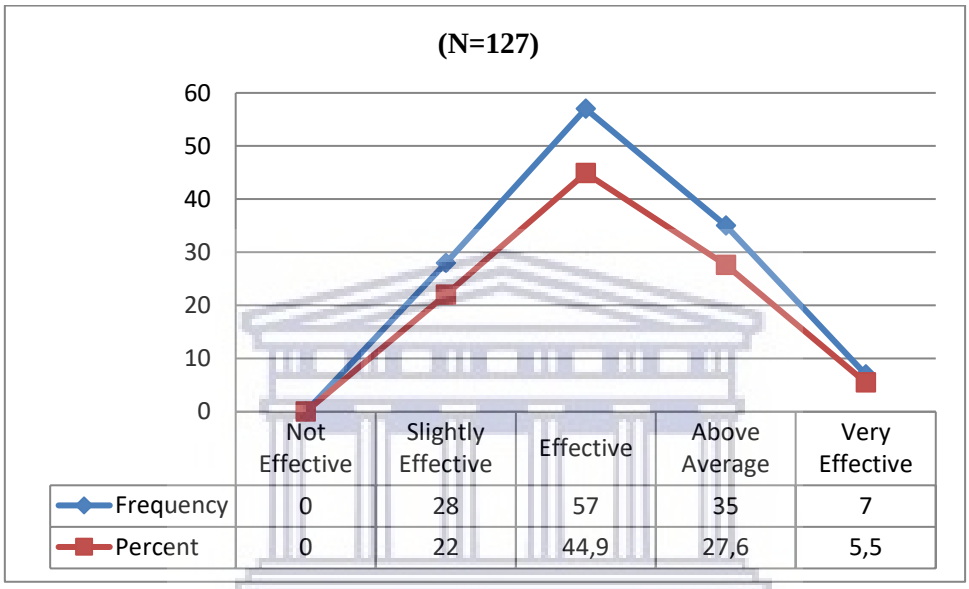





| | Not Effective | Slightly Effective | Effective | Above Average | Very Effective |
|---|---|---|---|---|---|
| Frequency | 0 | 0 | 23 | 36 | 68 |
| Percent | 0 | 0 | 18 | 28 | 54 |

*Figure 5.29 iPad/Tablet*

On PDAs there was a normal distribution of the data, with most of the responses 57(44.9%) indicating that it is effective. Thirty-five (27.6%) felt the laptop is above average; 28 (22%) perceive it is slightly effective; seven (5.5%) thought it is very effective, while none felt it is not effective (see Figure 5.30).




| | Not Effective | Slightly Effective | Effective | Above Average | Very Effective |
|---|---|---|---|---|---|
| Frequency | 0 | 28 | 57 | 35 | 7 |
| Percent | 0 | 22 | 44,9 | 27,6 | 5,5 |

*Figure 5.30 PDA*



The data presented in Table 5.14 shows that that on average participants view iPads or tablets as the most effective (M = 4.35; SD = 0.772) ICT gadgets for information access and sharing. PDAs occupy the second place (M = 3.17; SD = 0.833); followed by laptops (M = 3.09; SD = 1.178). Desktops were the least effective (M = 2.16; SD = 0.750).

**Table 5.14 Mean scores on effectiveness of ICT gadgets**

| | | Cellphone | Laptop | Desktop | iPad/Tablet | PDAs |
|---|---|---|---|---|---|---|
| N | Valid | 120 | 127 | 127 | 127 | 127 |
| | Missing | 7 | 0 | 0 | 0 | 0 |
| Mean | | 2.98 | 3.09 | 2.16 | 4.35 | 3.17 |
| Std. Deviation | | .635 | 1.178 | .750 | .772 | .833 |

Inferential analysis of data on ICT sources using the Kruskal-Wallis H test revealed that there is no statistically significant the relationship between organisation name and ICT sources. However, there was a significant correlation between gender of respondents and choice of ICT gadgets. Data presented in Table 5.15 shows that there was a significant relationship between gender and choice of cell phones.

A p-value of 0.000 on cell phone and a mean rank of 73.32 on males and a mean rank of 43 on females indicate that males prefer the cell phone for information and sharing than females. The opposite was true when it came to the choice of laptops, desktops and iPads or tablets. A p-value of 0.000 was obtained on these gadgets, indicating a very strong relationship. Females had higher mean rankings (79.89; 74.32; and 76.93) than males (52.98; 56.85; 55.03) respectively on the choice of laptops, desktops and iPads or tablets in their respective order. This entails that females preferred laptops, desktops and iPads or tablets more than males. A p-value of 0.459 shows that there is no statistically significant relationship between the gender of respondents and choice of PDAs.

**Table 5.15 Kruskal-Wallis Test on gender and ICT gadgets**

| | Cellphone | Laptop | Desktop | iPad/Tablet | PDAs |
|---|---|---|---|---|---|
| Chi-Square | 27.738 | 17.582 | 8.763 | 13.293 | .548 |
| df | 1 | 1 | 1 | 1 | 1 |
| Asymp. Sig. | .000 | .000 | .003 | .000 | .459 |
| a. Kruskal Wallis Test | | | | | |
| b. Grouping Variable: Gender of Respondents | | | | | |
| **Ranks** | | | | | |
| | Gender of Respondents | | N | Mean Rank | |
| Cellphone | Male | | 68 | 73.32 | |
| | Female | | 52 | 43.74 | |
| Laptop | Male | | 75 | 52.98 | |
| | Female | | 52 | 79.89 | |
| Desktop | Male | | 75 | 56.85 | |
| | Female | | 52 | 74.32 | |
| iPad/Tablet | Male | | 75 | 55.03 | |
| | Female | | 52 | 76.93 | |
| PDAs | Male | | 75 | 65.89 | |
| | Female | | 52 | 61.28 | |



### 5.7.1.3 Effectiveness of information formats

Health information can be accessed or shared using a variety of formats. These formats include video and or audio, print and electronic text. These formats vary in terms of their effectiveness in different contexts. The study gathered data on the effectiveness of the information formats from the perspective of healthcare professionals and IT personnel.

Questionnaire participants (healthcare professionals) were asked to indicate on a 5–point Likert scale (1 = Not Effective, 2 = Slightly effective; 3 = Effective; 4 = Above Average; 5 = Very Effective). Table 5.16 presents the results. Most of the participants (44.1%) viewed audio as slightly effective, and 38% said it is not effective. Fewer participants (11.8%) said it was effective and only 6.3% said it was very effective. None of the participants said that audio was very effective.

Video formats were the most recommended by the participants, with most of them (49.6%) saying they are very effective, and 26.8% saying that videos are above average. Fewer participants (5.5%) said that video is not effective. There was a significant variation on the data for print. The data showed that 40.2% think print is effective and 37% said it is slightly effective. Fewer participants (5.5%) said that print is very effective. On the electronic formats, most of the participants (40.2%) said they are above average; and 29.9% said they are very effective. Only 6.3% of the participants said that electronic formats are not effective.



**Table 5.16 Effectiveness of information formats (N=127)**

| **Effectiveness** | **Audio** | **Video** | **Print** | **Electronic** |
|---|---|---|---|---|
| Not Effective | 37.8 | 5.5 | 5.5 | 6.3 |
| Slightly effective | 44.1 | 5.5 | 37.0 | 0 |
| Effective | 11.8 | 12.6 | 40.2 | 23.6 |
| Above Average | 6.3 | 26.8 | 11.8 | 40.2 |
| Very Effective | 0 | 49.6 | 5.5 | 29.9 |
| **Mean (M)** | 1.87 | 4.09 | 2.75 | 3.87 |
| **Standard deviation (SD)** | .858 | 1.158 | .934 | 1.046 |

Mean rating scores indicate that on average participants view video as the most effective (M = 4.09; SD = 1.158). Electronic formats occupy the second place (M = 3.87; SD = 1.046); followed by print (M = 2.75; SD = 0.934). Audio was the least preferred (M = 1.87; SD = 0.858). A significance test using Kruskal-Wallis H test revealed that there is no statistically significant the relationship between organisation name and gender (independent variables) and perceived effectiveness of information formats.

#### 5.7.1.4 Other recommended ICTs

When asked about other ICTs that they would recommend for accessing HIV and AIDS information the majority of healthcare professionals cited (40%) Social media platforms, such as Twitter, thirty percent (20%) cited Chat-based education programs, eighteen percent (18%) cited Web-based treatment educational systems, and (12%) online search information platforms.



### 5.7.2 Establishment of the information access platform

This section presents questionnaire data on the third research question of the study: How can an effective platform for accessing health information in Zimbabwe be established? The data that was collected related to the system development principles and methodologies, recommended design strategies and software, network architecture, organisational issues to be addressed, training needs, and implementation strategies.

#### 5.7.2.1 System development methods

The data that is presented in this section relates to system development methodologies that should be used and the software that is most applicable in developing the information access

platform. The system development method or strategy that was chosen by most participants was outsourcing 60 (47.2%), followed by insourcing 33 (26%). The life cycle approach was chosen by eleven (8.7%) of the participants. The least chosen methods were the Rapid Application Development seven (5.5%) and End-user programming eight (6.3) (see Figure 5.31). A significance test using Pearson Chi-Square Test revealed that there is no significant correlation between name of organisation and system development method.

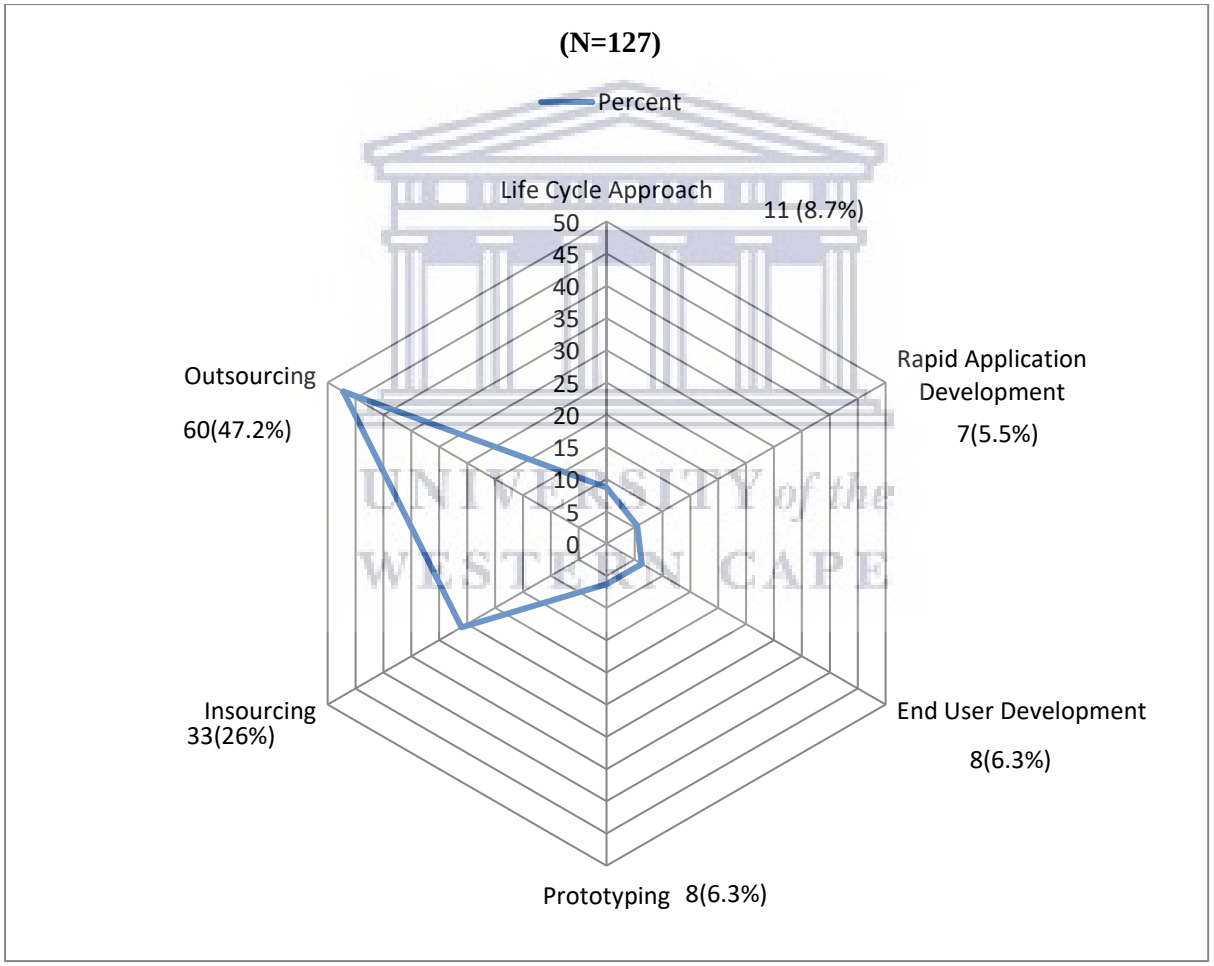
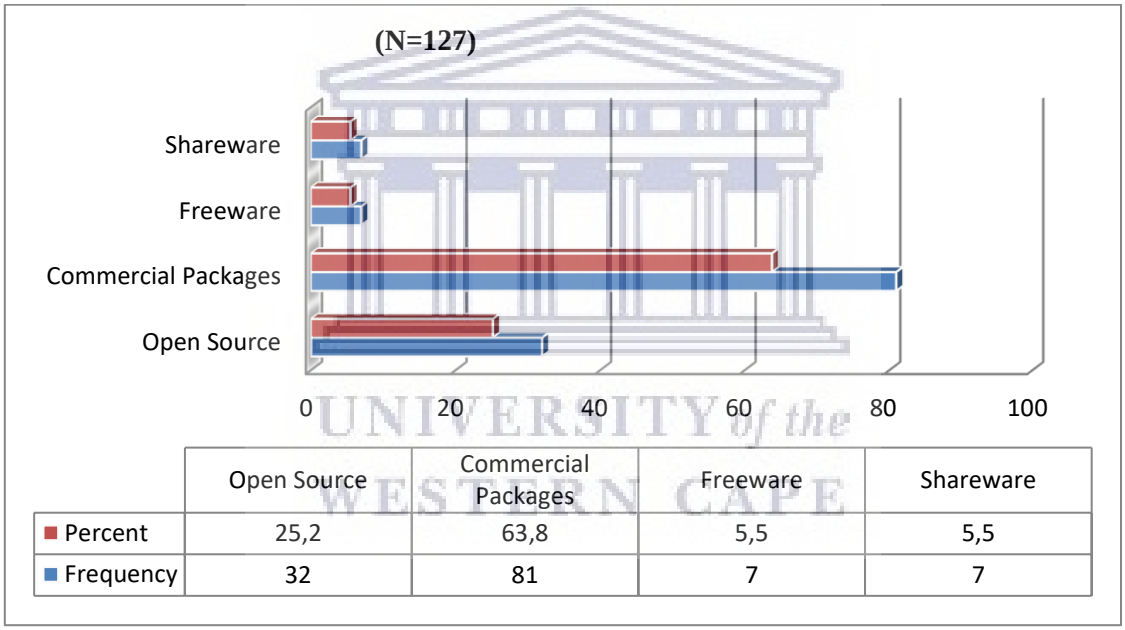



*Figure 5.31 System development methods*

### 5.7.2.2 Software type

There are several approaches that can be used in acquiring software in organisations. During the system development process, managers have an option of choosing from commercial software, open source software, freeware or shareware. When healthcare professionals were presented with the options, the majority 81(63.8%) chose commercial packages, followed by open source 32 (25%). Freeware and shareware were the least chosen with seven (5.5%) responses. Figure 5.32 presents the results.




| | Open Source | Commercial Packages | Freeware | Shareware |
|---|---|---|---|---|
| Percent | 25,2 | 63,8 | 5,5 | 5,5 |
| Frequency | 32 | 81 | 7 | 7 |

*Figure 5.32 Software recommended*

### 5.7.2.3 System design principles

The development of effective information systems should be informed by certain system design principles, depending on the context. The study collected data from healthcare professionals on perceived principles that would lead to an effective information access platform. The majority 53 (41.7%) cited user centred design, 50 (29.3%) cited management support; 41

(32.2%) cited scalability and integration with other information systems; 33(30%); cited affordability 28 (22%) cited effective security features; 21 (16.5%) cited clear policies and standards.

### 5.7.3 Benefits of the information access platform

The last research question of the study was: How will such a platform enhance Zimbabwean HIV and AIDS health services? This section therefore presents data on the benefits of the information system in enhancing HIV and AIDS services. The healthcare professionals responded to a 5-Point Likert scale on possible benefits of the information access platform. Table 5.17 presents the data. The data shows that 62.2% (mean = 1.43) strongly agreed that it improves storage and backup of information, 60.6% strongly agreed that in improves access to information; 48.8% strongly agreed that it facilitates knowledge sharing while 44.9% strongly agreed that it improves collaboration. A majority of the respondents generally agreed with the prescribed benefits while a small percentage remained neutral (see Table 5.16). It was interesting to note that a sizeable number of respondents (26%) disagreed to the statement that security of information is improved, and 17.3% disagreed that accuracy and reliability of information is improved.

**Table 5.17 Benefits of the information access platform**

| Benefits | Strongly agree | Agree | Neutral | Disagree | Strongly disagree | Mean | SD |
|---|---|---|---|---|---|---|---|
| Ease of access to information | 60.6% | 28.3% | 11% | - | - | 1.50 | .689 |
| Knowledge sharing | 48.8% | 34.6% | 11.0% | 5.5% | - | 1.73 | .868 |
| Collaboration | 44.9% | 42.5% | 6.3% | 6.3% | - | 1.74 | .838 |
| Storage and backup | 62.2% | 32.3% | 5.5% | - | - | 1.43 | .599 |
| Peer review | 12.6% | 49.6% | 32.3% | 5.5% | - | 2.31 | .761 |
| Accuracy and reliability of information | 14.2% | 47.2% | 21.3% | 17.3% | - | 2.42 | .938 |
| Security of information | - | 25.2% | 48.8% | 26.0% | - | 3.01 | .718 |

**SECTION 2 - WEBSITE ANALYSIS**

This section presents the data gleaned from the website evaluation rubric.



### 5.8 Website evaluation rubric data

The study used a rubric to evaluate websites in HIV and AIDS organisations. The rubric was designed to obtain scores from the respondents on seven aspects of the websites, namely: Authority, Purpose, Content, Currency, Design, Navigation and Interactivity. The data on evaluation is presented in Figure 5.33.

#### 5.8.1 Authority

The authority of a website is determined by the author credentials and its domain that is the person or organisation responsible for creating this website. If anyone can post content on a website, then the website's authority is compromised. Participants were asked to rate their

websites and authority was one of the yardsticks for evaluation. The data presented in Figure 5.15 shows that a significant majority 98 (77.2%) of respondents rate their websites as fair in terms of authority; fifteen (11.8%) rate them as poor while few fourteen (11%) rate them as good. None of the respondents rated their websites as excellent.

### 5.8.2 Purpose

The purpose of a website was also used to evaluate websites. The 'about' link of every website should inform the user that the purpose of the information in the website is either to inform, teach, sell, entertain or persuade? The purpose should be clear to the users. When asked to evaluate the purpose of their websites, most healthcare professionals 67 (52.8%) indicated that they were fair; 42 (33.1%) indicated they were good; 15 (11.8%) indicated they were poor; while only three (2.4%) indicated they were excellent.

### 5.8.3 Content

It was important to evaluate the level of information coverage the HIV and AIDS websites contain. The research participants were therefore asked to evaluate the content in their websites. The data revealed that the majority 100 (78.7%) viewed the content as good; 21 (16.5%) saw it as excellent and six (4.7%) as fair. None of the respondents thought the content was poor.

### 5.8.4 Currency

The accuracy of a website is often influenced by how recently it was created or how frequent it is updated. For HIV and AIDS topics science, it is especially important to have current information. On currency, 64 (50.3%) viewed their website as good, 59 (46.4%) thought they are fair while four (3.1%) viewed them as poor.

### 5.8.5 Design

The design of a website is a very important element to consider when judging overall quality. Good websites have a design that is visually appealing, readable, easy to navigate, and reinforces the purpose of the site while giving it a unified look and feel. Design issues of the HIV and AIDS websites were therefore evaluated. The majority 101 (79.5%) of participants viewed the design as good; 23 (18.1%) viewed them as excellent designs, three (2.4%) thought they were fair, while none of them viewed the designs as poor.

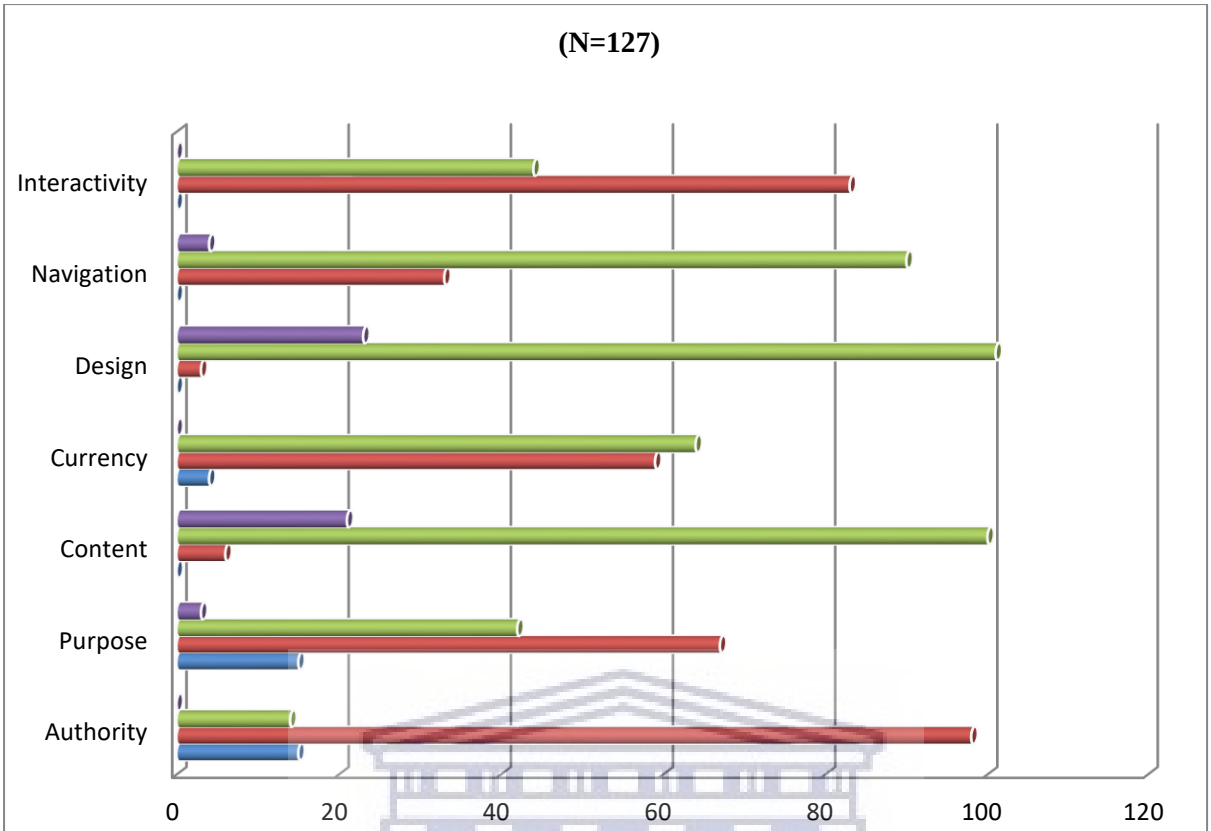
### 5.8.6 Navigation

Navigation exists to help users to quickly and easily find content and it helps to take the users where they intended to go. Users were asked to evaluate the navigation of their websites, including links and search facilities. The majority 90 (70.9%) of healthcare professionals viewed navigation of the websites as good; 33 (26%) said they were fair, and four (3.1%) viewed them as poor.



### 5.8.7 Interactivity

Interactivity was used as a measure of the quality of the websites. Participants were asked to judge the use new technologies on the websites and the multimedia that make a website more interactive. It was interesting to note in the data presented in Figure 5.17 that a majority 83 (65.4%) viewed interactivity as fair, and 44 (34.6%) rated interactivity as good. None of the respondents rated interactivity as excellent or poor.




| | Authority | Purpose | Content | Currency | Design | Navigation | Interactivity |
|---|---|---|---|---|---|---|---|
| Excellent | 0 | 3 | 21 | 0 | 23 | 4 | 0 |
| Good | 14 | 42 | 100 | 64 | 101 | 90 | 44 |
| Fair | 98 | 67 | 6 | 59 | 3 | 33 | 83 |
| Poor | 15 | 15 | 0 | 4 | 0 | 0 | 0 |



*Figure 5.33 Website evaluation metrics*

Kruskal-Wallis H test was used to determine if there were statistically significant differences between two or more groups of an independent variable (name of organisation) on an ordinal dependent variable (ICT system evaluation metric). The ordinal variables used a Likert scale with a range from poor to excellent. The metrics were grouped together in Table 5.18. The data from the Kruskal-Wallis Test ($p \geq 0.05$) shows that there is no statistically significant relationship between name of organisation and the website evaluation metrics. This means that

the various HIV and AIDS organisations had near uniform results in terms of the nature and quality of their websites.

**Table 5.18 Kruskal-Wallis Test on Organisation and website evaluation metrics**

| | Authority | Purpose | Content | Currency | Design | Navigation | Interactivity |
|---|---|---|---|---|---|---|---|
| Chi-Square | 4.784 | 2.582 | 2.170 | 2.429 | 2.344 | 2.912 | 2.038 |
| df | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Asymp. Sig. | .310 | .630 | .704 | .657 | .673 | .573 | .729 |
| a. Kruskal Wallis Test | | | | | | | |
| b. Grouping Variable: Name of Organisation | | | | | | | |



**SECTION 3 – INTERVIEWS**

This section presents data from the interviews with IT professionals. The data is arranged according to the interview questions as reflected in the interview schedule. Data is presented on information needs; evaluation of ICTs, recommended ICTs and establishing the information access platform.

### 5.9 Information needs of healthcare workers

The IT professionals were asked to state what the information needs of the healthcare workers are. Table 5.19 reflects that healthcare workers use a variety of information sources. There were slight variations in the use of information sources across the HIV and AIDS organisations. The most commonly used sources of health information were textbooks, the internet, electronic journals, medical databases, handbooks, mass media and social media. The use of the source

depended on the nature of the information need and availability of information resources. The ICT gadgets widely used by the healthcare professionals were the desktop computers, laptops, tablets, cell phones, and television. Social media applications used were Facebook, WhatsApp, YouTube, Twitter, LinkedIn, Instagram, Zoom and blogs. The respondents highlighted that electronic resources, video and textbooks were widely use, although dome textbooks were becoming out-dated.

**Table 5.19 Information needs of healthcare workers**

| Theme | Responses N=5 |
|---|---|
| **Information sources** | *- Preferred sources include textbooks, internet, journals and medical databases such as Medline and PubMed central.*<br>*- Handbooks such the Essential Drug list of Zimbabwe (EDLIZ), Peer-reviewed medical journals; the internet and social media.*<br>*- Textbooks, the internet, government publications, social media, and news sites on the internet. Other sources of health information include the mass media and publications such as bulletins by private organisations.*<br>*- The internet and search engines such as Google for general information, for more complex information they use targeted site types such as medical sites and electronic journals. The library has been used for textbooks and computers to access the internet.*<br>*- Sources include medical textbooks, Internet, health databases and social media.* |
| **ICT gadgets** | *- The most common ones are regular phone, mobile phone, computers, laptops, tablets, and television.*<br>*- iPads and smartphones, laptops and desktop for managing patient databases.*<br>*- They use a variety of tools to access information; common gadgets are cellphones, laptops and desktop computers.*<br>*-The most common is the desktop. Other tools include laptops and even tablets and smartphones.*<br>*- Preferred gadgets include laptops and mobile phones.* |
| **Social media** | *- The most common social media tools are Facebook, WhatsApp, Twitter, Instagram, Zoom and LinkedIn.*<br>*- WhatsApp is the most common, together with Facebook and Youtube.*<br>*- Most individuals use WhatsApp, YouTube, and LinkedIn.*<br>*- Facebook and WhatsApp are common in Zimbabwe.*<br>*- Facebook, LinkedIn WhatsApp and some health blogs.* |
| **Access channels** | *- They use electronic text, sometimes video feeds*<br>*- Electronic text, print materials and videos.*<br>*- Print and e-resources are often used, videos are also used sparingly due to network challenges.*<br>*- E-resources are the most common and textbooks too.*<br>*-These days its e-resources, most textbooks are now out-dated.* |

### 5.10 Evaluation of current ICTs

The IT professionals were asked to state the extent to which the current ICT were meeting the information needs of the healthcare workers. Table 5.20 shows that most of the organisations are not meeting the needs of healthcare workers to a lesser extent in terms of ICT gadgets. The reasons were out-dated technology and software. One respondent indicated that the organisation is keeping pace with technology and meeting the ICT needs to a large extent.

Three out of the five respondents indicated that the information sources are meeting the needs of the healthcare workers. The challenges that were cited were subscription costs, out-dated materials, and lack of support from the organisation. Two respondents cited that the information sources are meeting the needs of healthcare professionals because of the availability of well well-resourced libraries. Similar results were obtained for assess channels. The majority felt that they are meeting the needs of healthcare workers to a lesser extent due to lack of technological infrastructure. One respondent felt that the organisation is trying to keep pace with technological developments and the access formats are in line with the needs of the healthcare workers.

**Table 5.20 Evaluation of current ICTs**

| Theme | Responses N=5 |
|---|---|
| **ICT gadgets** | *- We are struggling to acquire latest gadgets for the workers.*<br>*- To a lesser extent because the technology is now out-dated*<br>*- To a larger extent because the organisation has invested in a variety of these tools including tablets.*<br>*- To a lesser extent because the gadgets are few and the software is not up to date.*<br>*-To a lesser extent because we still rely on old technology.* |
| **Information sources** | *- To a lesser extent because of subscription costs.*<br>*- To a larger extent because we provide a variety of sources in different formats.*<br>*- To a lesser extent because print materials are becoming out-dated.*<br>*- To a lesser extent because of lack of commitment in investing in reliable sources.*<br>*- To a larger extent because we have a good library with a variety of sources.* |
| **Access channels** | *- To a lesser extent because of lack of infrastructure to support other formats*<br>*- We are in the middle because we offer a variety of e-resources, including video materials.*<br>*- On average because there is a variety of options including audio-visual materials.*<br>*- We are almost there, except for more interactive media and virtual reality.*<br>*-To a lesser extent because we are still very far in keeping up with technological developments.* |



The respondents were asked to evaluate the current ICTs in terms of their frequency of use; ease of use; ease of learning; response time; access to technical support; and security. All the respondents indicated that the current ICTs were good in terms of frequency of use; ease of use; ease of learning; response time; and access to technical support. All of them however felt that security of the systems needs to be improved due to incessant threats.

## 5.11 Recommended ICTs

This section presents interview data on the ICT recommendations proposed by IT professionals. Table 5.21 shows that the interviewees recommended a variety of mobile technologies that include laptops, smartphones, iPads, tablets, and laptops. Mobile

technologies were recommended because of their convenient use by healthcare workers and their affordability. Authoritative sources were recommended including library materials, peer reviewed journals, textbooks and medical databases. Internet based resources and social media applications were also recommended. A combination of different information access formats were also recommended with electronic text materials and video being chosen by the majority as the most effective. The respondents recommended different kinds of mainly open access software for managing the database management system. They also recommended the Service Oriented Network Architecture, multi-cloud, and the actor-oriented networks.

**Table 5.21 Recommended ICTs**

| Theme | Responses N=5 |
|---|---|
| **ICT gadgets** | *- Mobile technologies such as laptops and mobile phones are effective. They are widely used by the workers, they are affordable and they allow mobility when one is doing their work.*<br>*- I recommend the use of latest technology including iPads, smartphones and tablets.*<br>*- In recommend the use of latest mobile devices.*<br>*- Mobile devices are increasingly becoming popular among health professionals.*<br>*-A variety of tools depending on the nature of information to be accessed.* |
| **Information sources** | *- Authoritative sources such as medical databases and e-journals*<br>*- Library materials which are more accurate.*<br>*- Internet based sources and social media are effective in today's world.*<br>*- Peer reviewed journals, databases and other forms of reliable information.*<br>*- Medical databases, textbooks, journals and the internet in general.* |
| **Access channels** | *- A combination of video, audio and electronic text.*<br>*- Video and electronic materials.*<br>*- E-resources are more effective.*<br>*- A format depends on the need at hand. All formats are still effective today.*<br>*-I recommend electronic materials and videos.* |
| **Software** | *- Open source packages are more flexible and cheaper.*<br>*-Epi Info and Health Mapper.*<br>*- The Epidemic Projection Package (EPP).*<br>*- The Resource and Management Patient System (RPMS).*<br>*- The District Health Information Software (DHIS).* |
| **Network architecture** | *- Service Oriented Network Architecture.*<br>*- Multi-cloud network.*<br>*- The actor-oriented network*<br>*- Client-server architecture*<br>*- Cloud based network* |

### 5.12 Establishment of the information access platform

This section presents interview data on the establishment of the information access platform. Data on the various human, organisational and technological aspects involved in establishing the system were presented Table 5.21. The data reveal that a web-based platform is the most ideal and open source content management software was recommended; specific examples were Drupal, Joomla, Dscape and Alfresco. Outsourcing was recommended together with agile system development life cycle (SDLC). Outsourcing was recommended due to lack of IT expertise and staff in the organisations. The pilot implementation approach was recommended, with the option of using the phased approach.

The participants raised a number of training needs of the users or the system to be effective. Training needs were on the following ICT related skills: Advanced computer skills; Data capture; Information organisation; Coding; Research skills; Content creation and synthesis; Information retrieval; Information evaluation; Information storage; Communication and networking; Data analysis; Information security; Information visualisation, Ethical use of information. They also raised the following organisational issues that relate to the ICT policy: organisational support; visionary leadership; cohesive culture; performance management; ICT governance; quality control; inter-professional teams and cooperation between health and social care organisations; staff incentives and training.

**Table 5.22 Establishment of the information access platform**

| Theme | Responses N=5 |
|---|---|
| **Software type** | *- Any web based content management software will do, depending on the need.*<br>*- Drupal of Joomla.*<br>*- Open source software like DSpace and Alfresco.*<br>*- The list is endless but I recommend open source software.*<br>*-A variety of content management tools are available depending on the budget.* |
| **Development method** | *- Outsourcing and agile SDLC.*<br>*- In-house development using agile SDLC.*<br>*- Due to lack of IT personnel, outsourcing will do.*<br>*- Outsourcing is more realistic due to lack of technological expertise.*<br>*- Outsourcing if more effective.* |
| **Implementation strategy** | *- Phased implementation after system testing.*<br>*- Pilot or phased approaches are safe.*<br>*- A pilot approach will be more effective for this kind of project.*<br>*- The nature of the project calls for the pilot approach.*<br>*- Phased and pilot approaches are the only applicable models.* |
| **User training** | *- Advanced computer skills and Coding.*<br>*- Data capture; Information organisation; Research skills.*<br>*- Content creation and synthesis; Information retrieval; Information evaluation; Information storage.*<br>*- Communication and networking; Data analysis; Information security.*<br>*- Computer skills, Information visualisation, Ethical use of information.* |
| **Policy issues** | *- Organisational support; visionary leadership; cohesive culture.*<br>*- Performance management; ICT governance; quality control.*<br>*-Professional teams and cooperation between health and social care organisations.*<br>*- Incentives and training.*<br>*- Quality control and information security.* |

### 5.13 Benefits of the system

This section presents data on the benefits of the information access platform in the area of HIV and AIDS services. It also presents data on the possible challenges in introducing the system and solutions to the challenges. The data in Table 5.22 shows that the system would eliminate duplication of effort; improve accessibility and management of information; enhance patient care, improve performance management and reporting and reduce medical errors. Challenges of implementing the platform were lack of IT expertise, lack of management support and commitment, lack of financial resources, lack of policies and standards and staff resistance to change. Solutions that were highlighted were training of users and IT personnel use of open source applications, stakeholder engagement and lobbying, policy formulation, and donor funding and fundraising activities.

**Table 5.23 Benefits of the system**

| Theme | Responses N=5 |
|---|---|
| **Benefits** | - *Less duplication of effort among key stakeholders*<br>- *Improved information access, storage, analysis, and dissemination*<br>- *Enhanced performance analysis and reporting; patient accessibility; and reduced operational costs.*<br>-*Reduced expenses associated with paper medical records and reduced medical errors.*<br>- *Increased patient information accessibility and improved patient care.* |
| **Challenges** | - *Lack of IT expertise.*<br>- *Lack of management support and commitment.*<br>- *Lack of financial resources.*<br>- *Lack of policies and standards.*<br>- *Staff resistance to change.* |
| **Solutions** | - *Training of users and IT personnel.*<br>- *Open source applications.*<br>- *Stakeholder engagement and lobbying*<br>- *Policy formulation.*<br>- *Donor funding and fundraising activities.* |

## 5.14 Summary

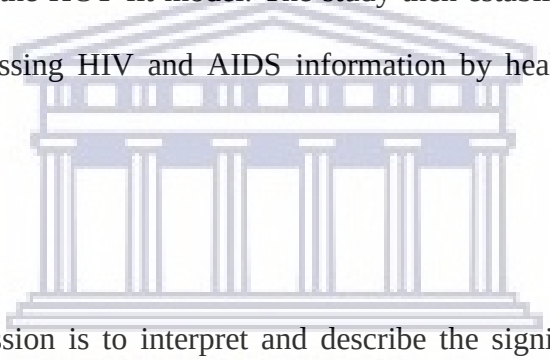
This chapter presented the findings of the study. The data was arranged according to the research instruments. The first section presented data gleaned from the questionnaire. The second section presented interview data. The third section presented data from the website evaluation rubric. The datasets collected from both workers and IT experts using a questionnaire, interviews and a website evaluation rubric were presented both qualitatively and quantitatively. The next chapter discusses and interprets the findings presented in this chapter by providing explanations of the findings in relation to literature and the theoretical framework.

# CHAPTER 6

# DISCUSSION AND INTERPRETATION

## 6.1 Introduction

This chapter discusses the research findings. The study aimed at developing a needs-based ICT platform for accessing HIV and AIDS information among healthcare professionals. Therefore, the first objective of the study was to assess the information needs of healthcare professionals. The second objective assisted the researcher in evaluating current ICTs used in the HIV and AIDS organisations using the HOT-fit model. The study then established and recommended appropriate ICTs for accessing HIV and AIDS information by healthcare professionals in Zimbabwe.



The purpose of the discussion is to interpret and describe the significance of the research findings and to explain the new knowledge or insights that emerged from the study. The chapter ties together the results of the study from the interviews and the questionnaire with literature, existing theory and research. The chapter also seeks to provide meaning and context to the data that was presented in the previous chapter. The meanings on the qualitative data may be derived from lessons learnt, comparison of information with the literature review or personal experiences. In quantitative data the meanings may be drawn from the descriptive statistics and the inferences generated by the significance tests. The interpretation and discussion of the main research findings in this chapter is according to the research questions generated to guide the study in addressing its objectives. The chapter is arranged according to both the predefined and emerging codes. The theoretical framework assisted in arranging the codes.

## 6.2 Importance of the discussion

The discussion section is often considered the most important part of a PhD study. Bitchener and Basturkmen (2006) highlight the major points that make the discussion important. In the context of this study the discussion allowed the researcher to:

i. Most effectively demonstrate the ability to think critically about an issue, to develop creative solutions to problems based upon a logical synthesis of the findings, and to formulate a deeper, more profound understanding of the research problem under investigation;

ii. Present the underlying meaning of the research, note possible implications in other areas of study, and explore possible improvements that can be made in order to further develop the concerns of the research;

iii. Highlight the importance of the study and how it can contribute to understanding the research problem within the field of study;

iv. State how the findings from the study revealed and helped fill gaps in the literature that had not been previously exposed or adequately described.



## 6.3 Information needs of healthcare professionals

The first key objective of the study was to describe the information needs of the healthcare professionals. Conceptualisation of information needs was done in Chapter 2 to refer to the identification by healthcare professionals of what they consider would be useful to improve access to information, enhance their knowledge and improve their practice. The information needs were grouped into sub-facets. Prior to the study the researcher had identified some codes that relate to information needs that are: health topics, health sources, media and channels. From the emerging data, the codes were later expanded to include social media tools and ICT

gadgets which are health topics, sources, ICT gadgets, social media, and access channels needed by the workers to access health information. This section therefore is organised according to these sub-facets of a health information need which were operationalized for this study.

As discussed in the literature review chapter, determination of information needs of healthcare professionals is a precursor to devising an effective information access platform. The design of the information access platform should be informed by the information needs of healthcare professionals. One of the keys to the success of information systems is user centred design and therefore there is a need for active user involvement in the design of the information access platform. The information needs or "wants" included (1) recognition by health care providers of their own knowledge deficits and (2) identification by healthcare professionals of what they consider would be useful to improve their practice. This section therefore discusses these needs or wants from the perspective of healthcare professionals.



### 6.3.1 Health topics

Information needs of public health workforce had become more urgent and mandatory due to the emergency of new infectious diseases like severe acute respiratory syndrome (SARS), Asian bird flu, HIV/AIDS, malaria and tuberculosis (LaPelle et al., 2006). The results from the study support this assertion by revealing that the majority of healthcare professionals (45,7%) need information on HIV and AIDS treatment options. Literature has acknowledged that one of the main reasons medical doctors tend to use online sources is to provide improved treatment to their patients (Bennett et al., 2006). Stressing on the danger of lack of information on

treatment options, Dubow and Chetley (2011, p. 12) warned that "…this situation has the potential to cause miss-diagnosis, wrong treatment, increase multi drug resistance, severe injury and unexpected patients death".

The results of this study are consistent with a study that was carried out by Andualem, Kebede, and Kumie (2013) which showed that TB-HIV drug administration and new findings were mentioned areas for seeking health information resources. The results showed that (62%) of the participants used the internet for drug and patient care information. The result of this study also confirm previous findings by Girma, Alenko and Agenanew (2020) which revealed a significant knowledge gap on treatment options of COVID-19 among healthcare professionals in Ethiopia.

This study revealed that other health topics that are needed by healthcare professionals include information on policy issues 33 (26%), HIV and AIDS services 23 (18.1%) symptoms 8 (6.3%), causes of HIV and AIDS 5 (3.9%). These results support earlier findings by Andualem, Kebede and Kumi (2013) which showed that healthcare workers also need information on policy issues that support their daily activities, and information to update their existing knowledge on symptoms and recent developments on HIV and AIDS. The results of this study were also in line with a web based survey by Girma, Alenko and Agenanew (2020) which revealed a significant knowledge gap among healthcare professionals on knowledge of COVID-19 clinical symptoms and perceived understanding of government implementation strategy. The American Nursing Association (2019) also stresses the need for adequate knowledge and information dissemination on policies on HIV related to ethics and values.

Data from this study showed that healthcare professionals also need information on chronic illnesses related to HIV and AIDS; African traditional methods of health promotion; co-morbidities and clinical outcomes among Africans and prevention measures. In Africa, traditional medicines and natural health products are often used as primary HIV treatment and as therapy for HIV-related symptoms including dermatological disorders, nausea, depression, insomnia, and weakness (Babb et al., 2004).

UNAIDS (2000) asserts that the World Health Assembly adopted a series of resolutions to encourage training and research in the area of traditional medicine. Several specific measures governing the practice of traditional medicine were incorporated into the national health legislations, including that of Zimbabwe, to allow the promotion of traditional medicine and collaboration with traditional healers (Sibanda, Naidoo & Nlooto, 2016). The World Health Organisation (WHO) reported that 80% of the emerging world's population relies on traditional medicine for therapy (Mahomoodally, 2013). These trends, measures and resolutions could be the driving forces why some healthcare professionals in the study indicated that they needed information on African traditional HIV cure methods.



### 6.3.2 Sources of health information

The results of this study showed that the majority of healthcare professionals (51.2%) perceived electronic medical databases as the most effective source of health information for healthcare professionals The choice of medical databases by participants in this study confirms the results from a study by Andualem, Kebede and Kumi (2013) in Ethiopia which showed that formal health information resources (HIRs) were preferred by 98.8% of health professionals (HPs) than informal HIRs. This shows that scientific journals and medical databases comprise the

most popular and frequently used online information sources by professionals to supplement their expertise and to keep themselves up to date (Kritz et al., 2013). The Centres for Disease Control and Prevention (2020) also confirmed that health care providers trust and use research published in credible, peer-reviewed scientific journals. Trust and familiarity with an online source and overall credibility of the source have been reported as important judgement motivators for utilising information found (Kostagiolas et al., 2013). The internet was regarded by 18% of respondents to be the most effective source. Low internet usage by healthcare professionals was also reported by a study that was done by Norbet and Lwoga (2013) in Tanzania.

However, data gathered from the interviews shows that the choice of the source depends on several factors. One interviewee stressed that the factors include the depth of information required, availability of time, and type of content needed. This entails that sometimes health professionals tend to use non authoritative sources. This supports an assertion by Mikalef Kourouthanassis and Pateli, (2017) that usability of non-authoritative sources renders credibility as less important in situations where information has to be found quickly, extending beyond traditional views of user friendliness of the user interface. Non-authoritative sources, such as Wikipedia for instance, tend to provide easier access to single topics, whereas authoritative sources such as PubMed contain in-depth studies in the form of research papers. Therefore, the usage of an authoritative or non-authoritative source is contingent upon the time frame in which information is needed, the degree to which doctors are inclined to overlook cognitive authority, as well the depth of knowledge required (Mikalef, Kourouthanassis & Pateli, 2017). Additionally, a study by Kritz et al. (2013) noted that physicians tend to search information on non-authoritative sources due to restricted accessibility of authoritative

information sources. From the above, discussion it can be advanced that non-authoritative sources can be equally beneficial in fulfilling certain information needs in certain situations.

The factors that include convenience, ease of use, accessibility, cost, time, and nature of information needed are probably the reasons why the internet was the second preference an information source, after medical databases. Despite the shortcomings of the internet, this tool is increasingly being used by healthcare professionals to access health information. According to a report published in September 2013 by Kantar Media Healthcare research team examining the online behaviour of 3000 physicians across 21 specialties, more than half of surveyed doctors use the internet before a meeting with their patients (Alvarez, 2013). This signifies a major shift in the search behaviour of doctors for health related information, which conventionally was skewed towards offline information resources, such as hospital libraries and workplace peers (Clarke et al., 2013). Although the internet has a lot of credible information, however, the danger is that some health professionals and patients do not possess the information literacy skills to evaluate the sources (Higgins et al., 2011).



The results of this study showed that healthcare professionals preferred electronic journals over textbooks. Similar results were also drawn from a study by Burton, Howard and Beveridge (2005) who carried out a survey of 37 East African surgeons and found that they prefer electronic journals to textbooks. “Western” journals were indicated as being the most useful by most of the respondents in their clinical (76%), teaching (73%), and research (68%) activities. By contrast, a multicentre survey that was carried out by Page et al. (2000) in China, Egypt, Kenya, India, and Thailand showed that textbooks remain the most commonly used source of information about the management of common medical conditions; journals were less popular

and computer searching was uncommon. One credible explanation on these differences is that earlier in the 2000s, most healthcare professionals were either not familiar or were sceptical on the efficacy of electronic reading materials. Moreover, there were still challenges on the accessibility of electronic journals stemming from low bandwidth, and lack of ICT infrastructure.

Qualitative data from the study shows that healthcare professionals also get information from other sources that include professional and non-professional social networks, health support organisations, peers and the mass media. This entails that healthcare professionals have diverse information needs that are met by different information sources in different contexts and settings.

The results showed a strong relationship gender and choice of health topics with females preferring the internet and electronic journals than males. Research (Renahy & Chauvin, 2006; Lorence & Park, 2007; Renahy, Parizot & Chauvin, 2010), that have specifically examined gender as a variable in health information seeking behaviour also clearly demonstrates that women are more active seekers of health-related information on the internet than men. Rice (2006) analysed seven major US nationally representative data sets from the Pew Internet and American Life Project and found that one of the strongest and most consistent predictors of frequent health information seeking on the internet was being female. A study by Bidmon and Terlutter (2015) also showed that women use the internet more often for health-related information searches than men.

### 6.3.3 ICT gadgets

The most preferred ICT gadgets in this study were the iPads or tablets followed by laptops. Mobile devices have become commonplace in health care settings, leading to rapid growth in the development of medical software applications (apps) for these platforms (Ventola, 2014b) and to a new phenomenon in the health care called mHealth. This finding supports the results of a study by Wallace, Clark and White (2012) where over 85% of healthcare professionals reported using a mobile-computing device. The main uses described for mobile devices related to information management, communication and time management. Advantages identified were portability, flexibility, access to multimedia and the ability to look up information quickly. Ventola (2014b) also asserted that introduction of mobile computing devices (personal digital assistants [PDAs], followed by smartphones and tablet computers) has greatly impacted many fields, including medicine. Healthcare professionals now use smartphones or tablet computers for functions they used to need a pager, cell phone, and PDA to accomplish.



Desktop computers were the least preferred by healthcare professionals and ICT professionals. Stressing the advantages of smartphones and tablets over desktop computers, Boulos et al. (2011) stated that smartphones and tablets combine both computing and communication features in a single device that can be held in a hand or stored in a pocket, allowing easy access and use at the point of care. In addition to voice and text, new mobile device models offer more advanced features, such as web searching, global positioning systems, high-quality cameras, and sound recorders. They also stressed that powerful processers and operating systems, large memories, and high-resolution screens, mobile devices have essentially made mobile devices to become handheld computers.

It is important to note that although the desktops were the least preferred ICT in this study; this does not take away their importance in managing information in healthcare settings. Desktop computers continue to be widely used by healthcare professionals. One interviewee in this study stated that for communication purposes, an IPad is used, but for managing patient databases, a desktop computer is used. This supports the 2012 Manhattan Research-physician channel adoption study which revealed that doctors' ownership and use of mobile devices is pervasive, with 87% using a smartphone or tablet device in their workplace, compared to 99% who use a computer (Chase, 2013).

Other tools that were highlighted in the questionnaires are digital stethoscopes, Google Glass, bidirectional video feeds, smart cameras, smart TVs, robotics and Wacom Intuos. Supporting the use of emerging technologies in the healthcare settings, Scherman (2019) stated that another way technology is driving the healthcare system forward is in its ability to increase patient engagement through the use of devices and wearable technology which can provide insight to help create hyper-targeted, personalized health and wellness plans.



### 6.3.4 Social media applications

The results of this study revealed that in terms of preference, WhatsApp was the most preferred social media tool, followed by Twitter, LinkedIn and Skype. The least preferred social media tools were blogs, RSS feeds, wikis and podcasts respectively. This is in support of a claim by Masoni and Guelfi (2020) who stated that WhatsApp is a popular messaging application frequently used by physicians and healthcare organisations to improve the continuity of care and facilitate effective health services provision, especially in acute settings. In March 2020, the World Health Organisation launched the WHO Health Alert on WhatsApp to improve

awareness and access to COVID-19 information. Similarly, a study by De Benedictis et al. (2019) showed that a growing number of healthcare professionals have adopted WhatsApp in their daily work in order to share information with peers and patients.

Similar results were drawn from a study by Gomes and Coustasse (2015) whose findings showed that that the utilization of Twitter by hospitals has the capacity to generate opportunities for cost savings, increase communication for both patients and employees, and expand patient outreach. Interviewees in this study stated that other most common social media tools that are being used by healthcare professionals include Facebook, Zoom, Instagram and LinkedIn. In support of this the Patient Empowerment Network (2019) stated that social media is one of the most popular channels used by healthcare providers to communicate with their patients and promote health. They cited that 99% of hospitals in the U.S. have an active Facebook page and the use of other social networking platforms like Twitter and Instagram in healthcare is also on the rise.



The data revealed that healthcare professionals use social media tools for a variety of reasons. The first reason was communication. One respondent added that social media is used to "communicate with fellow colleagues and to participate in online communities, listen to experts, and network and communicate with colleagues regarding patient issues". Another respondent cited that social media tools such as Twitter, Facebook, and YouTube are being used for education purposed by healthcare professionals. Other uses that were cited were communicating with the community and patients; enhancing organisational visibility; marketing products and services; establishing a venue for acquiring news about activities, promotions, and fund-raising; providing a channel for patient resources and education; and

providing customer service and support. Similarly, a study by Hazzam and Lahrech (2018) concluded that the use of online platforms facilitates the exchange of medical information among peers and enhances the share of experiences that support healthcare professional's learning and development, foster a higher level of communication among practitioners and might improve daily productivity. In support of these different uses, O'Brien, Tan and Yuan (2016) stated that social networking for healthcare is used by many of the different participants in the healthcare system and the motivations for using social networking differ depending on the participant.

Of interest to note is that, while social media applications would be considered as non-authoritative under the traditional view; notwithstanding, there seems to be a tendency of medical doctors to use them. Empirical evidence supports this view, with outcomes verifying the fact that non-authoritative information sources are used to an equal and even greater extent than authoritative information sources to complement knowledge deficiencies. Hughes et al. (2009) found that the use of non-authoritative sources was three times greater than authoritative sources. Madathil et al. (2015) noted that although YouTube has been criticised of containing ambiguous content that contradicts reference medical standards, it remains a highly preferred health information platform.

Previous studies suggest that healthcare professionals appreciate the increased convenience, accessibility and ease of use of these sources compared with authoritative ones (Metzger & Flanagin, 2011; Moorhead et al., 2013; Hughes et al., 2010). Social media and Wikis provide information free of charge; while at the same time facilitate information presentation in media

rich forms such as multimedia and interactive content. Interactivity is one of the factors that was influenced the choice of information sources in this current study.

It is clear from this studies that social media applications constitute viable options for healthcare professionals to expand their knowledge about medical developments, new or existing practices and therapies, and novel research opportunities. In particular, social media represent a good starting point in search strategies as they contain high-level information in a structured format. At the same time, they include advanced search capability which makes finding information less time-consuming and cost effective. Nevertheless, as these sources are not regulated in terms of their information quality, healthcare professionals are likely to be reluctant to trust them as their primary source of information for satisfying their contextual information needs.



The results of this study revealed that that gender influences the choice of social media tools. It was interesting to note that males preferred Twitter, Skype, LinkedIn and Wikis and females preferred WhatsApp and RSS feeds. Similarly, a study by Idemudia et al. (2017) revealed a relationship between gender and use of social media applications. The results of their analysis showed that females have stronger and significant perception of ease of use, compatibility, relative advantage, and risk when using social media compared to males. The results also showed that males have a stronger perception of satisfaction and information quality when using social media compared to females.

### 6.3.5 Access channels

The most preferred information access channels were video and electronic text followed by audio and traditional print respectively. This supports the view by Madathil et al. (2015) who noted that YouTube remains a highly preferred health information platform because of its accessibility, free usage, ease of use and interactivity. This study revealed that interactivity has become one of the key features in today's media. In support of the use of videos, Munawar (2020) explained that videos are a persuasive medium that can easily grab people's attention, raise awareness and convince patients to be more vigilant against diseases. Animated videos help healthcare professionals explain the different complex aspects of a disease in a simplified manner. Videos help in simplifying complex medical concepts and increase retention as compared to conventional textbook learning.

The data in this study showed that while most professionals would naturally choose electronic media which is more interactive, print formats have been widely used in Zimbabwe by healthcare professionals due to challenges emanating from poor ICT infrastructure low bandwidth and cost of electronic journals. The results are similar to a study by Norbet and Lwoga (2013) in Tanzania which revealed that in order to fulfil their information needs, physicians preferred to seek information from formal sources, which included printed textbooks, electronic resources and printed journals. The study also revealed that there was low use of the internet for prescribing various drugs and diagnosis due to poor ICT infrastructure, lack of access to a computer, frequent power cuts and lack of time.

Similarly, a study by Laki (2016) revealed that commonest source of health information for health providers were textbooks, (34.1%), followed by colleagues (28.8%), mobile telephones (21.1%) and internet (14.5%). A later study by Demergazzi et al., (2020) however, indicated

that online resources were preferentially used by clinicians (48/50, 96%) compared with offline sources (24/50, 47%). A multichannel approach, in which both online and offline sources were consulted to meet the same need, was adopted in 33% (65/198) of information-seeking events. Neurologists more likely retrieved information from online relative to offline channels (F=1.7; P=.01). One possible explanation of this disparity is the different settings whereby Italy, a developed nation is likely to have better ICT infrastructure for healthcare professionals than Tanzania and Zimbabwe. Another plausible explanation is the period in which the different studies were carried out. It is possible to assume that the 2020 study was carried out when there was a proliferation of ICTs in healthcare settings.

### 6.4 Evaluation of current ICTs

This section discusses the results on the evaluation that was done on current ICTs in the selected health organisations. The evaluation process was the second objective of the study. It was done to identify the strengths and weaknesses in the current systems. The ultimate objective of this formative evaluation was to gather useful feedback that informed the development of the information access platform. The evaluation was informed by the HOT-fit model which looks at an information system from a human, organisational and technological perspective, together with net benefits derived from the system. The human aspect looks at system use and user satisfaction; the organisation aspect looks at structure and environment (politics. culture, funding, communication and policies); the technology component consists of system quality, information quality and service quality (Bandiyono & Naufal, 2020). Therefore, this section is organised according to the system components respective order.

### 6.4.1 Human aspects

There are several dimensions in the human element of information systems. This study was guided by the HOT-fit Model in choosing the variables. This section discusses and interprets the findings on the evaluation of the four system variables on human issues, namely; frequency of use, training level, user satisfaction and acceptance of the system.

*i) Frequency of use*

The first variable to be evaluated on human issues was system use. The study revealed that the majority 100 (78.1%) of healthcare professionals usually use the ICTs, 20 (15.6%) sometimes use the systems, and seven (5.5%) rarely use the systems. Data from the interviews also confirmed that healthcare professionals frequently use ICTs. None of the healthcare professionals or IT professionals stated that they never use the ICTs. There was no statistically significant relationship between system use and the two independent variables of the study (gender and name of organisation).



The results on system usage deviate from a study by Vest and Jasperson (2012) which looked at how health professionals were using a health information exchange system of the Integrated Care Collaboration of Central Texas. The Texas study showed that overall, most users engaged with the system in a minimal fashion. In terms of user characteristics, minimal usage was highest among physicians and the highest percentage of clinical information usage was among nurses. Contrary to the current study, the Texas study showed that usage also differed by organisation with repetitive searching most common in settings with scheduled encounters and uncommon in the faster-paced emergency department. Lastly, usage also varied by timing of

the patient encounter. A possible explanation on the difference is that this study looked generically at ICT systems within the organisations whilst the Texas study looked at a specific system. It is possible to assume that the specific system was complicated for the users or there was user resistance or lack of training in the use of the system. Other possible reasons for minimal system use include poor design and implementation, poor organisational culture and politics and organisational inertia.

*ii) Training level*

The second variable to be evaluated on human issues was training levels. The results of this study shows that the majority 66 (51.6%) of the healthcare professionals rate their training on ICTs as average; 49 (38.3%) thought they were good; a few seven (5.5%) rated their training as excellent and only five (3.9%) rated their training as poor. There was no relationship between training levels and the two independent variables of the study. On the contrary, a cross-sectional study by Dery et al. (2016) among students in five Schools of the College of Health Sciences at the University of Ghana concluded that computer knowledge was high (almost 99%) among health sciences students. About 83% owned computers and self-rated computer knowledge was 87%. The difference in the self-rating could be due to demographic factors. The Ghana study looked at college students who can be considered to be more technologically savvy and there is a possibility that they could have been exposed to an information literacy programme by the university. A study by Harerimana and Mtshali (2019) among nursing students at a selected university in South Africa also corroborates this by revealing that the majority of the respondents (74.7%) were skilled in using ICT skills and online resources with a progressive increase in skills with the level of the study, with upper levels being more skilled than the lower levels.

However, a study by Baridam and Govender (2019) which specifically looked at training levels of practising healthcare professionals in the Niger Delta region revealed that there was significant agreement that staff needed assistance in using the HIS ($t(234) = 12.413$, $p < .0005$). This result suggests that the respondents need assistance in the use of this system. A possible explanation is that the system may have been handed down without the necessary documentation or training to empower the users. The implication was that the greater percentage of staff within the hospitals in the Niger Delta needed to be trained to be computer literate, to be able to use computers in their operations. A study by Anwar and Shamim (2011) showed that only government sector agrees that ICT training is a barrier for adaption of new health technology. The reason behind it is that government employees have security about their jobs and they are not doing regular training while personnel in private sector have to update their skills and knowledge regularly.

Studies by Anwar and Shamim (2011) as well as Ngwakongnwi, Atanga and Quan (2014) showed that unavailability of trained staff was a barrier in the adoption of health information technology in Africa. A study by Asangansi, et al. (2013) concluded that unawareness of technology applications or processes were the most frequent individual barriers to adopt health information technologies. The results of the current study have similar implications on the training needs of healthcare workers in Zimbabwe and their implications on the success of health technology projects. A study by Khalifa (2013) stressed that human barriers, those related to the healthcare professionals are the major barrier in the way of successful implementation of health information technologies in Pakistan.

*iii) User satisfaction*

The third variable on human issues was user satisfaction. This study revealed that the majority of healthcare workers 57 (44.5%) were satisfied with the current ICTs; 41 (32%) were neutral, while twelve (9.4%) were very satisfied. It was interesting to note that respectively 7% and 6.3% were unsatisfied and very unsatisfied. Overall the satisfaction with the ICT systems was average considering that 54% of the respondents did not confirm that they were satisfied with the systems. Similarly, a study by Khajouei and Abbasi (2017) in Iran at all teaching hospitals of Kerman University of Medical Sciences revealed that nurses' satisfaction with both systems was at a medium level. The majority of nurses were relatively satisfied with the information quality and user interface quality of these systems. Similarly, a study by Omune and Kandiri (2018) in Kenya found that nearly all categories of end-users were satisfied with overall functionalities of the system, with some users also expressing dissatisfaction with their systems in cases where user involvement was restricted during the design and implementation.



This study showed that there was no statistically significant relationship between user satisfaction and name of organisation. This is in line with a study by Khajouei and Abbasi (2017) which showed no significant relationship between overall satisfaction and employment status, organisational type and work experience. However, the difference between the current study and that of Khajouei and Abbasi (2017) was on the relationship between overall satisfaction and gender. This study revealed a strong relationship between user satisfaction and gender, with more females unsatisfied by the systems as compared to men; conversely men were satisfied by the ICTs as compared to females. The study by Khajouei and Abbasi (2017) revealed no relationship between overall satisfaction and gender. The reason of these differences could be due to the sampling approaches used by these studies. The Iranian study

specifically looked at nurses, and there is a possibility that is a female dominated profession and the target population was dominated by females. The current study looked at healthcare workers in general.

*v) System acceptance*

The last variable on human issues was system acceptance. The majority 91 (72%) of healthcare workers in this study indicated that they would accept them while 36 (28%) indicated that they would reject the current systems. There was no significant relationship between system acceptance and either gender or name of organisation. The results refute earlier findings by Mohamed and Osama (2015) who conducted a study at King Faisal Specialist Hospital and Research Centre, Saudi Arabia and found that the performance of the HIS was slow overall and that this unexpected slowness was not acceptable because it increased the time spent by patients inside hospital. The disparity might be a result of the fact that the system at King Faisal Specialist Hospital and Research Centre, Saudi Arabia was already facing implementation hurdles and there were challenges of resistance, acceptance and satisfaction of the HIS by the end users.



### 6.4.2 Organisational issues

Organisational issues were the second element in the HOT-fit Model to be evaluated. There are several dimensions of the organisational component, namely; organisational structure, culture, politics, communication, funding and policies (Maryati & Yusof, 2018; Agustini et al., 2020). This section discusses and interprets the results on these organisational issues in HIV and AIDS organisations.

*i) Organisational structure*

The first organisational feature to be evaluated was the organisational structure. The HOT-fit Model prescribes that there should be an alignment or 'fit' between the information system and the organisational structure because the two influence each other. An evaluation of the organisational structure revealed that the majority of healthcare professionals 54 (52.2%) viewed them as good; 39 (30.5%) rated them as average; nineteen (14.8%) rated them poor while fifteen (11.7%) thought they are excellent. This shows that organisational structures are generally rated as good. All the IT professionals who were interviewed also felt that the organisational structures were generally good. These results are in line with the HOT-fit theoretical framework which suggests a co-relationship between improved organisational structure and an increase in efficiency and effectiveness of health organisations. A study by Fiorio, Gorli, and Verzillo (2018) also showed that traditional organisational models were less effective than Patient-Centred hospital models. In particular, the increase in efficiency of the patient-centred models emerged from the reduction of the average length of stay, and in re-hospitalization rates.



The results of this study contradict with a study that was conducted by Kawonga, Blaauw and Fonn (2016) in South Africa. They found that the health system was characterized as Mintzberg's machine bureaucracy, with centralized and highly formalized with structures, management styles and practices that promote programme managers as lead role players in the monitoring of HIV interventions within districts, undermining policy objectives of district managers assuming this leadership role. The study concluded that the structure of organisations in the South African health sector limits the success of administrative integration reforms. Similarly, a study by Seitio-Kgokgwe et al. (2014) demonstrated that the organisational

structure of the Botswana public hospital system is hierarchical and highly centralized leaving hospital managers with limited control of key resources necessary for delivery of health services such as the budget, equipment and human resources. The differences in the effectiveness of the organisational structures could be due the differences in the study population. This study looked at non-governmental institutions which are characterised by less formal structures while the studies by Kawonga, Blaauw and Fonn (2016) and Seitio-Kgokgwe et al. (2014) looked at government institutions which are characterised by formal structures.

*ii) Organisation culture*

Organisational culture was the second feature to be evaluated. Organisation culture influences communication approaches for successfully implementing IT in hospitals. Strong organisation cultures support greater sharing of information (group culture) and development of new approaches (developmental culture) which tend to facilitate communication by addressing empathy and communication channels and therefore facilitate IT adoption and implementation (Lepore et al., 2018). The majority of healthcare workers felt that they were average. However, three out of the five IT professionals who were interviewed felt that the organisational culture was good while two felt the culture is average and needs to be improved. This implies that unlike organisational structure; organisational culture in the HIV and AIDS organisations is not conducive enough to support information systems. This supports the results of a study by Kawonga, Blaauw and Fonn (2016) who found that South Africa's health system exhibits features of organisational culture that may undermine organisational change and administrative integration.

*iii) Organisational politics*

Organisational politics can be defined as the informal process by which personal friendships, loyalties, and enmities are used in an attempt to gain an advantage in influencing project decisions. The concept has also been defined in a narrower term to connote the negative use of influence in an organisation to achieve selfish personal interests at the expense of organisational goals (Romi, 2010). However, organisational politics should not be avoided, system development managers should make conscious efforts to participate in organisational politics and successfully leverage their influence to achieve project objectives.

The results on the evaluation of organisational politics were similar to those of organisational culture. Generally, the majority of the respondents felt that politics in their organisation is average in terms of its influence of the adoption and use if ICTs. This indifference draws to the assertion made by Fehse, Krabbendam and Boer (2002) that rather than risking conflict, people tend to accept standing power structures, even if these structures are built on bases that do not hold for the particular project environment. This acceptance leads to passive forms of political behaviour (conflict avoidance, scapegoating), or to active behaviour (manipulation, forming alliances) supporting the most powerful group's interests. These interests do not necessarily concur with the official IS implementation project goals (Fehse Krabbendam & Boer, 2002). This study therefore advances the view that passive forms of political behaviour may delay IS implementation outcomes and active political behaviour is an essential but not necessarily sufficient condition for the successful achievement of IS implementation project goals in HIV and AIDS organisations.

The results of this current study contradict previous results on the issue of organisational politics in different ways. A questionnaire study from Pakistan revealed that some employees failed to comply with health management information system (HMIS) reporting as they knew that no action could be taken against them due to their corrupt association with politicians (Kumar et al., 2012). Similarly, in a qualitative study from Pakistan, participants raised concerns about the corruption of HMIS staff and management citing the misuse of HMIS office resources, such as typing of unofficial letters, the appropriation of computers by senior management and data manipulation to hide the causes of epidemic diseases (Qazi & Ali, 2009). These differences may be attributed to different cultures in the various organisational settings. As revealed in this study, the organisational culture in the HIV and AIDS organisations was moderate, meaning that it does not actively cultivate corruption and misuse of resources.

*iv) Communication systems*

On the issue of communication, the majority of healthcare professionals as well as the IT professionals rated the communication systems as average. A study by Dawber et al. (2017) showed that there were excellent communication systems and collaborative team players at the state of Queensland Health system. The result of this was increased collaboration between people in specific teams, and respect and trust across the different allied health professions and between medical and nursing professions.

On the contrary, a study by Sakyi, Koku and Adzei (2011) in Ghana targeting public health institutions and district stakeholders indicated that the usual forms of government communication, such as circulars, letters, memos and reports, were not being used effectively

to share information on management decisions which limited their knowledge of the decentralisation policies. Likewise, a study by Jeppsson, Östergren and Hagström (2013) in Uganda, showed that the use of circulars and written communication, as opposed to face-to-face communication, were seen as the cause of poor communication between the Ministry of Health and the district health system. This resulted in poor support for the restructuring process required for the decentralisation policies at the district level. This sharp contrast may be due to the different health settings and administrative systems. Public health systems tend to be more bureaucratic and the communication systems are therefore not effective. This current study focused on private and quasi government institutions.

*v) Funding*

An evaluation of funding was done to determine the nature of funding that is given to ICT projects in the select HIV and AIDS organisations. The results revealed that funding was generally poor in all the organisations. Funding is a critical element in the success of health information systems. Without regular funding, health information systems become less and less effective ultimately become obsolete. Gwandure and Mayekiso (2013) also bemoaned diminishing donor funding of HIV and AIDS organisations in Sub-Saharan Africa. Factors associated with reduced funding identified in this study were the global financial crisis, governance issues, the shift in research interests, and the politics of medical research and patenting. Moucheraud et al. (2017) studied the potential sustainability of electronic health information system (EHIS) investments in Malawi, Zambia and Zimbabwe, originally supported by the United States President's Emergency Plan for AIDS Relief and concluded that technical resource constraints; affecting system usage, maintenance, upgrades and repairs may limit EHIS sustainability.

The issue of lack of funding for ICT projects found in this study reiterate findings from previous studies, especially in developing countries. Anwar and Shamim (2011) studied the barriers in adopting technology in developing countries and found out that funding was the major stumbling block in the establishment and sustenance of health information systems. A study conducted by Khalifa (2013) stressed that other than human barriers, financial barriers related to money and funding are major barriers and challenges in the way of successful implementation of health information systems. Generally, financial constraints were identified as the main barrier to health information system implementation and adoption in low to medium income countries (Adjorlolo & Ellingsen, 2013; Ghia et al., 2013; Hernandez-Avila et al., 2013). Management costs (Lewis et al., 2012) and high air time costs (mobile minutes) (LeMay & Bocock 2012) were additional cost-related barriers post implementation of health information technologies in the developing world.



The issue of lack of funding for ICT projects in HIV and AIDS organisations in Zimbabwe can be attributed to withdrawal of donor funding as a results of economic sanctions imposed on Zimbabwe. Nearly all respondents acknowledged concerns about financing. Most HIV and AIDS organisations rely (to a differing extent) on contributions from external sources (international donors and the government). The systems of these organisations will not exist without substantial external financing. However, Moucheraud et al. (2017) caution that while external financing presents opportunities, this reliance was seen to carry risks. Donor-sponsorship comes with deliverables and some respondents voiced concerns that donors use their influence on the content and deployment of the ICT systems to meet their own priorities and deadlines. Therefore, HIV and AIDS organisations need to come up with creative ways of generating funds without risking their autonomy.

*vi) Policy issues*

Policy issues were evaluated as part of broader organisational issues. The majority of participants of this study indicated that ICT related policies were poor. This supports the results from a systematic review done by Akhlaq et al. (2016) which revealed that lack of clear policy direction was a significant factor hampering the effectiveness of health information exchange systems. A study conducted by Khalifa (2013) also cited the negative impact of legal and regulatory barriers (Laws and Policies) on the successful implementation of health information systems. Similarly, Baridam and Govender (2019) concluded that a lopsided ICT policy in terms of ICT usage with an uncoordinated implementation strategy within the healthcare sector is responsible for the slow pace of growth in healthcare delivery. Baridam and Govender (2019) specifically pointed out that lack of ICT infrastructure recycling policy in the healthcare was affecting the effectiveness of the current health information systems.



The results of this study imply that there is lack of effective policies to guide the development and implementation of health information technology in HIV and AIDS organisations in Zimbabwe. Development of ICT related policies will therefore aid in the establishment of effective ICT systems in the organisations. Authors from Ethiopia, Mexico, Nigeria, and Senegal, concluded that political and administrative will, which leads to reformed and flexible policies, may help to facilitate the implementation and adoption of health information systems in their countries (Shiferaw & Zolfo, 2012; Asangansi et al., 2013; Hernandez-Avila et al., 2013).

### 6.4.3 Technological aspects

As explained earlier in section 6.4, the HOT-fit Model evaluates information systems from a human, organisational and technological perspective. It was therefore essential to evaluate technological aspects of the current ICTs in HIV and AIDS organisations. The technology dimensions that were evaluated were: Ease of use; Ease of learning; Response time; Availability; Access to technical support; and Security. The study also evaluated the websites in terms of seven variables: Authority; Purpose; Content; Currency; Design; Navigation and Interactivity.

The study started by establishing the ICT gadgets that are commonly used by the healthcare workers. The results of this study indicated that the majority of participants use desktops followed by laptops and cell phones; tablets were the least used. This confirms results of a study by De Rosis and Seghieri (2015) which revealed that the percentage scales of General Practitioners that reported computer use in their practice range from 70 to 100 %. There is a close resemblance between the results of this study and those of a study by Siwicki (2017) in Australia which also found that 94.6% of the healthcare professionals still use desktop computers; 79.8% use tablets; 42.6% use smartphones; and 37.2% use laptops to access the information needed to provide and coordinate care. The only difference is that in this study, the cell phones were the least used, while the study by Siwicki (2017) showed that the laptops were least used. Similarly, a study by Chase (2013) found that 98% of healthcare professionals use their desktop or laptop to search, 56% use their mobile, while 63% use their tablet.

The results of this study imply that healthcare professionals in Zimbabwe are more reluctant to use their personal smartphones for work related tasks than healthcare professionals in Australia.

This implies that more healthcare professionals in the developed world are using mobile technologies in healthcare settings than in developing nations. The reasons for low usage of tablets and smartphones in Zimbabwe could be lack of availability of the technology, lack of compatibility between mobile phone applications and current health systems, and lack of data bundles. Low usage may also be attributed to lack of ICT literacy and lack of appreciation of the potential value of smartphones in healthcare delivery.

This study revealed that in terms of technology usage, more males use desktops and tablets to access HIV and AIDS information on the internet than females. Females use cell phones and laptops more than males. A study by Andone et al. (2016) also found that females use smartphones for longer periods at work than men. On the other hand, a study by Hilao and Wichadee (2017) demonstrated that male and female students did not differ in their usage or attitudes towards mobile phone usage for learning. These differences may be attributed to age differences in participants between these two studies and the different uses of the technologies.



This study argues that social media provide healthcare professionals in HIV and AIDS organisations with tools to share information, to debate health care policy and practice issues, to promote health behaviours, to engage with the public, and to educate and interact with patients, caregivers, students, and colleagues. Therefore, the study specifically assessed the actual use of social media applications by healthcare professionals at the workplace. The participants indicated that they use a variety of social media applications that include LinkedIn (32%), Twitter (31.5%), Facebook (15.7%), wikis (14.2%) and blogs (6.3%) for work related purposes. This compares to a survey of more than 4,000 physicians conducted by the social media site QuantiaMD which found that 65% of healthcare professionals use social media sites

for professional reasons (Househ, 2013; Fogelson, Rubin & Ault, 2013). Nearly a third of physicians have reported participating in social networks (George, Rovniak & Kraschnewski, 2013).

Similarly, a study by Ventola (2014a) revealed that physicians are increasingly using social networking sites, blogs, microblogs, wikis, and media sharing sites to access and share health information. The study also cited that healthcare professionals have now developed and are using customised social media sites such as Sermo, Doximity, Medical Directors Forum, QuantiaMD, Student Doctor Network, ASHP Connect, PharmQD. The fact that healthcare professionals in this current study did not mention the use of customised networks could be attributed to either lack of knowledge of these sites, restrictions in joining them or lack of relevance to their own needs. This implies the need for home made and customised social media applications for HIV and AIDS organisations in Zimbabwe.



It is interesting to note that there is a gap between social media preference and actual usage. As discussed earlier in section 6.3.4, WhatsApp was the most preferred social media tool, followed by Twitter, LinkedIn and Skype. The least preferred social media tools were blogs, RSS feeds, wikis and podcasts respectively. When it comes to actual usage, LinkedIn and Twitter were the most frequently used. This gap shows a misalignment between the information needs of healthcare workers and the social media applications that are available at their workplace. There is need to design WhatsApp based applications due to its popularity with healthcare workers. It is also important to note that the ranking of the preferences was done to determine the extent to which healthcare professionals prefer certain social media applications and this does not necessarily disqualify those which are least preferred. For example, some

healthcare professionals and ICT professionals felt that YouTube is widely used by healthcare professionals to access health information. Therefore, when designing the needs-based information access platform, developers should ensure that they incorporate the actual needs of healthcare workers.

The results of this study showed that gender of the respondents strongly influenced their choice of social media. The data revealed that more females preferred Wikis and Facebook than males and males preferred Twitter, LinkedIn, and Blogs. A study by Chen (2020) and Tankovska (2021) also showed that men used Twitter and LinkedIn more than women. This shows that gender sensitivity is an important factor that has to be considered in the development of the information access platform.

#### 6.4.3.1 Ease of use

After assessing ICT usage patterns of the healthcare professionals, the study evaluated the technology in terms of predefined variables drawn from the HOT-Fit model. Ease of use also known as usability refers to the capacity of a system to provide a condition for its users to perform the tasks safely, effectively, and efficiently while enjoying the experience. The study revealed that most healthcare professionals (52%) felt that the ICTs were good in terms of ease of use and rated their ICT as good; with 47 (37%) indicating that they are average; fifteen (11.8%) thought they were excellent while only fourteen (11%) noted that they were poor. All the interviewees perceived their system as good in terms of ease of use. This entails that generally the systems are easy to use from the perspective of the users. The results slightly differ from a study by Khajouei and Abbasi (2017) in Iran which found that nurses' satisfaction with ease of use of the health system were at a medium level. The slight difference stems from the fact that user centred evaluations are subjective. Moreover, there is a plethora of health

information systems which are designed differently in terms of their functions and complexity. Therefore, it is not uncommon that these systems function differently. User training may also influence user views on ease of use.

#### 6.4.3.2 Ease of learning

Ease of learning refers to how fast a user who has never used s system or ICT tool before can accomplish basic tasks. For end users, health systems must be able to present outputs in designed layouts and graphical formats that make it easy to read and interpret. The study found that in terms of ease of learning, a significant majority of the healthcare professionals 66 (52%) and all the ICT professionals viewed their system as good; 40 (31.5%) viewed them as average. This means that the system is considered easy to learn by a significant number of healthcare workers. On the contrary, a study by Nkanata et al. (2018) in Kenya at selected hospitals found that the healthcare workers needed assistance in learning the system, implying that the system was not easy to use. Similarly, a study by Omune and Kandiri (2018) found that the hospital information systems were complex to learn. These different perceptions probably stem from the different levels of complexity of the systems or the computer literacy levels of the participants.



#### 6.4.3.3 Response time

System response time refers to the time between when the user initiates an action, and when the computer starts to display the result. The study found that the majority of healthcare workers 61 (48%) and all the interviewees view their systems are good in terms of response time. This means that the systems in the selected HIV and AIDS organisations have a good response time. This finding contradicts a study by Kuo et al. (2018) which found that response time is an

important predictor of physician satisfaction, and most respondents were not satisfied with the response time of the system. The difference in the findings can be attributed to the differences in organisational culture. In an organisation where there is a culture of Total Quality Management, customer satisfaction is an essential objective. For example a study by Rubins et al. (2019) reported a case in which a web-based service caused significant increase in the time to generate decision support, in turn leading to marked delays in electronic health record system responsiveness, which could have led to patient safety events. However, it can be noted that most health organisations in Zimbabwe have not implemented quality standards in terms of customer care. It is very common to see long queues and delays in serving customers in most healthcare institutions in Zimbabwe.



**6.4.3.4 Availability**

Availability refers to the time that the ICT infrastructure remains operational under normal circumstances in order to serve its intended purpose. The system users (healthcare professionals and IT personnel) indicated that their ICTs are average on availability. This finding is different from the previous variables which were viewed as good. This shows that lesser healthcare workers view system availability as good. This concern is somewhat similarly to the results from a study by Nkanata et al. (2018) where number of respondents in both hospitals strongly agreed the system is slow and keeps going on and off implying users keep experiencing problems from time to time in terms of system availability.

System availability is a critical factor in the health sector because it can make a difference between life and death. Apenteng et al. (2018) conducted a study that aimed to assess the impact of power outages on in-healthcare facility mortality in Ghana, a country that has experienced

worsening energy crises in the last few decades. Their findings revealed a positive association between the frequency of power outages and in-facility mortality, with the risk for mortality estimated to increase by 43% for each day the power was out for over two hours.

#### 6.4.3.5 Access to technical support

The study evaluated the quality of the support that system users receive from the IS department and IT support personnel. The study found that a significant majority 72 (56.7%) of the healthcare workers thought that system support was poor. However, interviewees had different sentiments. Four of the five interviewed ICT personnel believed access to technical support was good, while one of them said it is excellent. A comparison of these results shows that healthcare professionals and IT professionals have different perceptions on the quality of IT services provided by the IT department. Since this study adopted a user centred approach on evaluation, it is therefore safe say that the 'customer is always right' and assume that the IT professionals were unaware that the system users are not satisfied with their services due to lack of feedback mechanisms.



#### 6.4.3.6 Security

Security is the protection of sensitive HIV and AIDS information and ICT property from theft, corruption and other types of damage, while allowing the information and property to remain accessible and productive. This study found that system security is generally considered average by the majority, but it was of concern to note that a significant number of respondents 40 (31.5%) rated the security as poor. The ICT managers also agreed that lack of security is an incessant threat to information systems and that there is always a need for constant improvement on security. This is in line with a study by Aqsa and Ricardo (2018) who

identified a number of security threats to health information systems that include hackers, security breaches, power breakdown, inside threat (staff), stealing of data, misuse of passwords and accidental misuse of data.

The results of this study revealed that security of information is an issue of concern among healthcare professionals. On the same note, Nkanata et al. (2018) noted that in spite of many attempts in providing security in health information system in Kenya, data security breaches in health care organisations have continued to increase and number of threats in this area has increased dramatically. Studies show that between 2006 and 2007 in hospitals alone, more than 1.5 million names were exposed to data breaches (Healthcare Information and Management Systems Society, 2008). In addition, the results of 2010 healthcare information and management systems society security survey suggests that the reports of more than 110 healthcare organisations have shown the loss of sensitive protected health information. Personal identifying information affected over 5,306,000 individuals since January 2008 and damages from patient information lost top $6 billion per year in 2010 (Sedlack & Tejay 2011). The report showed they were received as theft (stolen laptops, computers, or media), loss or negligence by employees or third parties, malicious insiders, system hacks, web exposure, and virus attacks (Healthcare Information and Management Systems Society, 2008).



### 6.4.4 Net benefits

Net benefits form part of the last evaluation yardstick of the HOT-fit evaluation model. This variable is also in line with the last research questions of the study which focused on possible benefits of the information access platform on Zimbabwe's HIV and AIDS health services. Net benefits relate to the impact of information management or the contribution of the

implementation of information systems felt by individuals, organisations, industries, and countries. The benefits can be viewed from an individual, behavioural, organisational or financial perspective. Net benefits can be accessed using direct benefits, job effects, efficiency and effectiveness, reducing error rates, controlling expenses and costs. The more positive of user satisfaction outcome then the implementation of information system is more successful (Agustini et al., 2020).

The results of this study showed that a majority of healthcare workers strongly agreed that an information access platform will improve storage and backup of information, access to information knowledge sharing, and collaboration among HIV and ADIS professionals. The respondents generally agreed that the information access platform will improve storage and backup of information, and peer review. However, a sizeable number of respondents disagreed to the statement that security, accuracy and reliability of information is improved. Net benefits related to health services were numerous, including, remote patient monitoring, improved patients record keeping, improved accessibility to patients' details, improved data analysis, increase the timeliness and accuracy of patient care, improved cost control, increased service capacity, reduction of personnel costs and inventory levels, and improved quality of patient care.



On a similar note, Ohio University (2020) summarised the benefits into five broad areas namely; Increased Patient Safety; Efficient Care Coordination; Enhanced Performance Analysis; Increased Patient Information Accessibility; and Reduced Operational Costs. Madison (2014) also stressed that health information systems can improve cost control, increase the timeliness and accuracy of patient care and administration information, increase service capacity, reduce personnel costs and inventory levels, and improve the quality of patient

care. From a behavioural perspective, Kumar (2011) noted that behavioural or communication benefits include improved quality patient care; easy, accurate, and quick information retrieval; rapid information sharing; quick decision making; reduced medical errors due to electronic alerts; increased storage of data and records electronically; and improved information screening and reporting. Similarly in a study by Khalifa (2017), ten perceived benefits were validated and ranked. These are; 1) Improved information access, 2) Increased healthcare professional productivity, 3) Improved efficiency and accuracy of coding and billing, 4) Improved quality of healthcare, 5) Improved clinical management (diagnosis and treatment), 6) Reduced expenses associated with paper medical records, 7) Reduced medical errors, 8) Improved patient safety, 9) Improved patient outcomes and 10) Improved patient satisfaction. From a financial perspective, Wang, Wang and McLeod (2018) found that hospitals' health information technology investments involving intermediate business processes are associated with positive financial performance and productivity following the implementation of the Health Information Technology.



On a similar note, the findings by Atinga et al. (2020) revealed statistically significant positive relationship between e-health usage and job satisfaction. Thus, a unit increase in e-health usage with other factors being constant, will lead to 46% increase in job satisfaction. The strength of the relationship was moderate. The finding suggests that healthcare workers who used digital systems to communicate, register and consult patients experienced job satisfaction. Also, respondents who felt e-health enhances healthcare delivery were more likely to show job satisfaction. These findings correspond to related studies such as Maillet, Mathieu and Sicotte (2015) who found an increase in job satisfaction and positive emotions among healthcare professionals after the adoption of e-health. Similarly, Williams et al. (2019) revealed that physicians with higher perceived efficiency to use e-health reported higher job satisfaction.

### 6.4.5 Website evaluation

The study used a website evaluation rubric to specifically evaluate HIV and AIDS organisational websites. The websites were evaluated in terms of their authority, purpose, content, currency, design, navigation and interactivity. The results revealed that the websites were regarded as fair in terms of their authority, purpose and interactivity. Similar results have been found in other studies, wherein the authority of information available on different medical conditions on the internet has been found to be of low quality. A study by Raj et al. (2016) found that quality of health information websites on parameters of accessibility, reliability, and readability was average. Similarly, a study by Livas, Delli and Ren (2013) found that usability and reliability of the information on the websites were low. This implies that further improvement is required especially in areas like transparency of sites, authorship by experts, update frequency, and citing of relevant sources.



Interactivity in consumer health websites is a main resource for health communication (Rubinelli et al., 2013). In producing these websites, health organisations invest significant resources to provide health information in the traditional one-way (professional-to-consumer) model of communication: health information is created by groups of experts in the field as a resource to educate the community (Neuhauser & Kreps, 2003). These educational endeavours are important. They foster the growth of health literacy that is at the core of self-management of health conditions.

However, one-way communication as a channel for influencing health behaviour has limitations (Neuhauser & Kreps, 2010). Interactivity seems to be the communication attribute with the greatest power to promote self-management, as communicating effectively about

health requires active control by the user, two-way (reciprocal) communication and synchronicity. However, less research on interactivity on consumer health websites is available (Kreps & Neuhauser, 2010). Stout, Villegas and Kim (2001) did a content analysis of 30 websites and found that the majority of health websites had interactive tools.

The content, currency and design and navigation were rated as good by the majority of the healthcare professionals. The results were inconsistent with other previous studies on content and navigation. A study by Alhuwail, AlMeraj and Boujarwah (2018) suggests that the majority of hospitals in Kuwait needed improvement in terms of their design and content. Their study also found that every hospital had missing navigation methods to help users in finding content and location on the websites such as "missing titles and anchor texts" (over 100 errors). In terms of the content Alhuwail, AlMeraj and Boujarwah (2018) found that in all the evaluated websites, some of the health and medical information was not attributed to an author. Moreover, there some sections of the website contained information from non-medically qualified individuals or organisations.



### 6.4.6 Overall rating of ICTs

The current study showed that the majority of healthcare professionals believe their ICTs were good. This evaluation was done to determine the overall impact of the ICTs on healthcare delivery. The results of the study imply that overall, the ICTs have a positive impact on the HIV and AIDS organisations. The results were inconsistent with other previous studies. Majeed and Khan (2019) analysed the relationship between ICT and population health and found that there is a positive and significant impact of ICT on population health. Similarly, a study by Lin et al. (2016) showed that most nurses had positive attitude to the information system, but some

believed that the information system has had less effect on some nursing activities Gund et al. (2012) also revealed that attitudes towards healthcare ICT were found positive as 74% were positive concerning healthcare ICT today, 96% were positive regarding the future of healthcare ICT, and 54% had high confidence in healthcare ICT.

### 6.5 Establishing and recommending appropriate ICTs

The third and last objective of the study was to establish and recommend appropriate ICTs for accessing HIV and AIDS information by healthcare professionals in Zimbabwe. The three major research questions that were asked were: What are the appropriate ICTs that can facilitate access to HIV and AIDS information by healthcare professionals? How can an effective platform for accessing health information in Zimbabwe be established? How will such a platform enhance Zimbabwean HIV and AIDS health services? The last research question relates to the benefits of the information access platform and the results of this research question have been discussed under section 6.4.4. This section will therefore discuss the findings on the recommended ICTs, and on the establishment of the platform.



The recommended ICTs were organised into sources, IT gadgets, and access formats. The proposed information access platform is a needs based platform. Therefore, data from section 6.3 will assist in recommending appropriate ICTs as per the preferences of the healthcare workers. Social Construction of Technology (SCOT) theory was used to draw recommendations from both the healthcare professionals and IT professionals.

### 6.5.1 Recommended information sources

This section discusses the study recommendations on information sources. The study found that healthcare professionals consult a variety of information sources, namely medical databases, electronic journals, internet and web sources, print textbooks, government publications, and social media sources. Mean rating scores indicate that on average participants view medical databases as the most effective source of HIV and AIDS information (M = 4.46; SD = 0.764); followed by electronic journals, (M = 3.80; SD = 0.787); and internet and web sources (M = 2.92; SD = 0.869). Print sources had the least scores (M = 2.86; SD = 0.990). As discussed in section 6.3.2 the choice of sources is influenced by factors that include trustworthiness, convenience, ease of use, accessibility, cost, time, and nature of information needed. This study therefore recommends all these information sources due to their effectiveness in different contexts of the users.

These findings are in line with previous studies. A study by Lialiou and Mantas (2016) showed that physicians and nurses rely heavily on online medical databases for their information needs. A study by Aquil and Sulaiman (2017) also found that medical students frequently used medical databases as compared to electronic journals. Databerry (2021) concurs that healthcare databases are an important part of running the entire health operation that include labs, finances, patient identification, tracking, billing, payments, among others. Healthcare systems generate data that requires delicate handling and sometimes a patient's life depends on this information, and it is therefore important for healthcare providers to be able to access it in the shortest time possible. Medical databases provide accurate and critical data in a timely fashion. Databerry (2021) cited numerous advantages of medical databases that include efficiency, exchange of information, monitoring and improving the value of healthcare, assessing the quality of healthcare, and tracking healthcare usage.

The emergence of geographic databases and other forms of cloud based database management systems has resulted in huge amounts of health related data. Therefore, there is an increase in the use of medical databases to make real-time, short term and long term decisions from this Big Data. Healthcare professionals are benefiting from this incredibly large amount of data. A study by Pastorino et al. (2019) showed that the use of Big Data in healthcare is already offering solutions for the improvement of patient care and the generation of value in healthcare organisations.

In the current study, electronic journals were ranked as the second most effective source of information by healthcare professionals. This supports previous research which also demonstrated the effectiveness of electronic journals. A study by Singh and Singh (2012) demonstrated that electronic journals were effective in meeting the research needs of the medical professionals. Similar results were found by Bansode (2013) who found that the use of electronic journals improved the productivity of faculty and helped in citation analysis. Most of the faculty staff admitted that their quantity of paper publication increased due to the use of electronic journals only and overall, journals met their information requirements were fully satisfied with the electronic journals. Similarly, a study by Akussah, Asante and Adu-Sarkodee (2015) indicated a significant positive relationship between the impact of electronic journals and their usage among the users.

This study revealed that the internet is ranked as the third most effective source of health information by the healthcare workers. Previous studies have stressed the increasing importance if the internet as a source of health information. A study Zigdon, Zigdon and Moran (2020) showed that healthcare workers viewed the internet as effective source of health

information. Ajuwon (2006) also carried out a study in Nigeria and discovered that the internet was widely used by health professionals. Similarly, Adebayo, Michael and Akole (2017) found that the internet was the mostly widely used source by medical students as compared to other sources. However, Gund et al. (2012) cited that the internet has challenges that relate to the authority, accuracy and reliability of the information, and irregular power supply.

This study confirmed that print sources remain popular with medical professionals. The study also revealed that some healthcare professionals viewed print textbooks as more effective that electronic journals and the internet. Despite the fact that electronic materials are gaining momentum in terms of their effectiveness and use, print resources remain effective in the field of health. This study revealed that print medical textbooks are still effective because of their reliability and authenticity. A study by March, Vaikosen and Akporoghene (2020) showed that textbooks are widely consulted by healthcare professionals. Commenting on the effectiveness of textbooks, Tez and Yıldız (2017) believe that medical textbooks are considered by many to be the definitive sources of medical information. These textbooks are published and updated periodically with the goal of providing readers with the most current information. They contain detailed analyses of medical topics by experts of the particular fields covered in the book. These books often are the main source of information for medical students and residents, and these readers usually believe the information found there is indisputable. A study by Jeffery et al. (2012) also documents that medical textbooks have some ways to go in keeping pace with high quality, clinically relevant new evidence. This new evidence has the capacity to impact their clinical recommendations, and potentially the quality of patient care.

The results of this study showed that healthcare workers rated the conventional sources of health information (medical databases, electronic journals, the internet and print textbooks) as the most effective sources of information. The reasons stem from their reliability and accuracy. It is important to note that some healthcare professionals mentioned specific internet based sources such as PubMed, MEDLINE and HINARI. This confirms findings by March, Vaikosen and Akporoghene (2020) whose study revealed that health sources such as PubMed, MEDLINE and HINARI are effective in meeting the research needs of healthcare professionals.

Most healthcare professionals in this study singled out social media as an effective source of current health information. This study showed that WhatsApp, YouTube, LinkedIn, Twitter, Skype and Facebook are increasingly becoming useful in the dissemination and access of health information. The major advantages of social media include their low cost of usage, easy accessibility and interactivity. This supports results from a study by Zigdon, Zigdon and Moran (2020) which showed that most nurses preferred medical information that is easy to access and not evidence-based, such as that on social media, for their day to day work.



### 6.5.2 Recommended ICT gadgets

The data presented in Table 5.13 shows that that on average participants view iPads or Tablets as the most effective ICT gadgets for information access and sharing (M = 4.35; SD = 0.772). PDAs occupy the second place (M = 3.17; SD = 0.833); followed by laptops (M = 3.09; SD = 1.178); followed by smartphones (M = 2.98; SD = .635). Desktops were the least effective (M = 2.16; SD = 0.750).

As discussed earlier on in section 6.3.3, the most preferred ICT gadgets in this study were mobile devices. This section also confirms that the iPads are considered as the most effective information access ICT tool. Advantages of iPads identified were portability, flexibility, access to multimedia and the ability to look up information quickly (Ventola, 2014b). The effectiveness of smartphones PDAs and laptops were numerous, including convenience, cost, flexibility, multimedia capability, processing power, large memory, high quality cameras and their ability to be used at the point of care. This study therefore recommends the use of these ICTs in developing the information access platform. Other ICTs that were recommended include digital stethoscopes, Google Glass, bidirectional video feeds, smart cameras, smart TVs, robotics and Wacom Intuos.

### 6.5.3 Recommended Information access formats

Mean rating scores indicate that on average participants view video as the most effective (M = 4.09; SD = 1.158). Electronic formats occupy the second place (M = 3.87; SD = 1.046); followed by print (M = 2.75; SD = 0.934). Audio was the least preferred (M = 1.87; SD = 0.858). As shown in section 6.3.5, the most preferred information access channels were video and electronic text followed by audio and traditional print respectively. It is interesting to note that in terms of preference, print was the least preferred while in terms of effectiveness, audio was viewed as least effective. This implies that sometimes users prefer access formats due to some factors irrespective of their effectiveness. This study therefore recommends the formats in terms of their effectiveness as perceived by the healthcare professionals and not according to general preference. As discussed earlier in section 6.3.3, user preferences are influenced by several factors that include convenience. For example, a user might prefer to use social media just because it is convenient for them while social media sources are less effective because the danger of inaccurate and unreliable information.

However, the choice of electronic formats over print sources was further clarified by this study. The healthcare workers cited that electronic resources are more effective than print formats. This confirms results from previous studies. Maggio et al. (2019) found that the use of electronic knowledge resources is associated with a positive impact on clinician behaviours and patient effects. They found statistically significant associations between the use of electronic knowledge resources and improved clinician behaviours and patient effects. When compared with other resources, the use of electronic knowledge resources was associated with increased success in answering clinical questions, with variable impact on speed.

### 6.5.4 Establishment of the platform

This section discusses study recommendations on system development methodologies and strategies. It specifically discusses system development methods, network architecture, software types, design principles, human and organisational issues and implementation strategies. It is important to note that system development strategy or option refers to the broader approach used by an organisation to develop the system and the two major approaches are either outsourcing of insourcing. System development methodologies include the traditional SDLC, prototyping, end user development and application software packages.



#### 6.5.4.1 System development methods

The system development strategy that was chosen by most participants was outsourcing 60 (47.2%), followed by insourcing 33 (26%). The life cycle approach was chosen by eleven (8.7%) of the participants. The least chosen methods were the Rapid Application Development seven (5.5%); Prototyping eight (6.3%) and End-user programming eight (6.3%).

The results of this study support previous findings. Findings by Mobasheri et al. (2014) indicate that factors such as cost decrease, improvement of production process and productivity, quality increase, promotion of customer's satisfaction were included among the advantages of outsourcing. On the same note, Davis (2015) stresses that the overwhelming conclusion was that immediate access to a fully-trained staff and its technology, in combination with a positive return-on-investment, are driving forces behind the turn toward IT outsourcing, especially as the demand on healthcare organisations grow in complexity. A study by Davis (2015) showed that 84% of respondents using the services stated they are satisfied with rendered services and their expectations have been exceeded.

A study by Malovec, Borycki and Kushniruk (2015) further suggest that outsourcing development and implementation may offer more benefits and fewer challenges than outsourcing operations and maintenance. The research also finds that there can be benefits of outsourcing, such as gaining access to expertise and improving service levels. Park (2014) further stresses that innovative health organisations are more likely to outsource their work-process-related IS functions. However, outsourcing has negative implications on data security. Moreover, the development of a local solution needs to be done by specialists with intimate knowledge of the organisations' internal and external environment.

This study showed that insourcing ranked second in terms of recommended system development methodologies. In support of insourcing, Kahouei et al. (2016) noted that a third of the total sample had reservations about the skills of outside providers to securely manage hospital data, and did not consider that outsourcing health information management services would be positive for the organisation, their working environment or for staff and patient

satisfaction. This implies that insourcing is a good alternative in developing health information systems in cases where there are challenges related to trust and user resistance.

Most healthcare professionals in this study did not recommend the use of the traditional System Development Life Cycle (SDLC) approach. On the same note Gutiérrez-Ibarluzea, Chiumente, and Dauben (2017) listed challenges of the SDLC that include extended development time, costs associated with analyst and user time, changing user requirements, and unclear user needs. One of ICT professionals in this study recommended the use of the SDLC because of its maturity in designing health information systems. However, another IT professional recommended a refined version of the SDLC called the agile SDLC. In support of the agile method Lalband and Kavitha (2019) stress that while traditional SDLC is still the better choice on large scale projects, agile SDLC is better suited for small and medium projects. Therefore, this study also recommends agile SDLC for actual system development in HIV and AIDS organisations.



**6.5.4.2 Network architecture**

The participants of this study recommended three network architectures, namely the Service Oriented Network Architecture (SONA), the cloud network, and the actor-oriented network. The results confirm earlier recommendations on network architecture adopted in the health sector. Scutaru et al. (2009) supported the use of SONA in hospital settings. The architecture is designed taken into consideration some important characteristics; scalability, integration with other existing hospital networks, remote and secure resource access, user friendliness, and complete data security. However, this architecture is best suited to hospitals which have

multiple operations. HIV and AIDS organisations have a less rigid structure and therefore using SONA might not reap the desired effects.

The results of this study are in conformity with a study by Britto et al. (2018) who advocated the use of the actor-oriented network architecture. The actor-oriented network architecture aligns participants around a common goal of improving health outcomes, transparency of outcome measures and a flexible and adaptive collaborative learning system. Team collaboration is promoted by using standardised processes, protocols and policies, including communication policies, data sharing, privacy protection and regulatory compliance. In this architecture, participants observe their own results and learn from the experience of others. A common repository (a 'commons') is used to share resources that are created by participants. Standardised technology approaches reduce the burden of data entry, facilitate care and result in data useful for research and learning. This architecture fits well on HIV and AIDS organisations which are driven by a common goal. This architecture will improve the sharing of data and information across the organisations while improving interoperability and collaboration.



Cloud computing was also suggested by the IT professionals. This study revealed that multi-cloud is more appropriate because it allows healthcare providers to separate applications with different security requirements. The Cloud Standards Customer Council (2017) supports the use of this architecture and they stated that this architecture allows connecting and securing healthcare systems and applications end to end from the data centre to the point of care, across many clouds as simply as if they were in one cloud. Any workload can be launched on any cloud across a multivendor environment. The architecture can manage resources as a single,

cohesive infrastructure with consistent security and operations across all places of the network. This makes it suitable for HIV and ADIS organisations. It is worthwhile to note that the cloud architecture can be used in conjunction with the actor-oriented architecture. The actor oriented architecture can be used as the generic model while the cloud architecture can be used for technical aspects relating to data storage and management.

#### 6.5.4.3 Software type

The majority 81 (63.8%) of healthcare workers chose commercial packages, followed by open source 32 (25%). Freeware and shareware were the least chosen with seven (5.5%) responses. IT professionals chose specific applications that include Epi Info and Health Mapper, the Epidemic Projection Package (EPP), the Resource and Management Patient System (RPMS), and the District Health Information Software. However, the prescribed software is limited to specific applications which might not be ideal for developing an information access platform. For example, the WHO developed Health Mapper is a Geographic Information System-based system for disease surveillance and monitoring; Epi Info is designed for statistical analysis. EPP is basically an HIV estimation and projection package; and RPMS is tailor made for hospitals. It is important to note that although most healthcare professionals chose commercial packages, the majority of IT professionals chose open source software. It is therefore important to respect the suggestions of IT professionals because of their knowledge and experience in ICT related aspects. These findings therefore imply that there is a need for a customised open source information access system for information access. As discussed in section 6.5.4.1, the system development process should be outsourced.

The findings of this study support the findings of De la Torre Díez, Martínez-Pérez and Lopez-Coronado (2013) who observed that countries with few resources tend to implement open-source software systems and developed countries lean towards commercial health systems. On the same note, Aminpour, Sadoughi and Ahamdi (2014) also discovered that open source health systems have been widely used by resource limited regions in all continents, especially in Sub-Saharan Africa and South America. They further ague that open source software would create opportunities to improve national healthcare level especially in developing countries with minimal financial resources and that they overcome the problems of high-costs and inflexibility associated with the proprietary health information systems.



#### 6.5.4.4 System design principles

The design of the information access platform should be informed by certain system design principles. An analysis of the data showed that the principles can be grouped into broader categories namely; management approval and support; user centred design; systems approach, robust system design, scalability, integration and interoperability; user training and empowerment; planned implementation; clear policy and standards; and security. The findings confirm the system development principles listed in literature (Information-technology Promotion Agency, 2012; Font, 2021; Online Notes Nepal, 2021). The results of this study show that user centred design received more support than other design principles. Therefore, system designers should take into account the unique needs of the system users during system design.

#### 6.5.4.5 Organisational issues

Establishing an information access platform does not mean a mere technical arrangement of technology. It also involves aligning the technology to the behavioural and social aspects in organisational settings. The HOT-fit model emphasised the need for alignment or 'fit' between the technology and the organisational features. The study revealed a number of organisational issued that need to be addressed during the design of the information access platform. These were also grouped into broad categories, namely; organisational support; visionary leadership; cohesive culture; performance management; ICT governance; quality control; inter-professional teams and cooperation between health and social care organisations; staff incentives and training. The same organisational issues were also addressed in previous studies (Maryati & Yusof, 2018; Agustini et al., 2020; Bandiyono & Naufal, 2020).

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#### 6.5.4.6 Training needs

User training is part of organisational issues but it was singled out because of its importance in the success of ICT projects. User training is essential before the implementation of any ICT related project. A study by Khalifa (2013) showed that unavailability of trained staff was a barrier in the adoption of health information technology in Africa. The results of this study are consistent with those of previous studies. This study showed that healthcare professionals need training on the following set of ICT related skills: Advanced computer skills; Data capture; Information organisation; Coding; Research skills; Content creation and synthesis; Information retrieval; Information evaluation; Information storage; Communication and networking; Data analysis; Information security; Information visualisation, Ethical use of information. These skills were also highlighted in previous studies (Anwar & Shamim, 2011; Asangansi et al., 2013; Ngwakongnwi, Atanga and Quan, 2014).

#### 6.5.4.7 Implementation of the platform

The findings of the study revealed a number of issues that should be addressed during the implementation of the information access platform. These were organised into the following areas: Build the right team; develop communication channels; engage all stakeholders; provide the necessary financial and technological resources; train your staff; and continue to conversation. This is in line with the implementation strategies by Mandaza-Mapesa (2016) who gave a detailed analysis of health information technology implementation strategies. The choice of the pilot conversion is in line with the recommendations by Bansle and Havn (2010) and Mandaza-Mapesa (2016).



### 6.6. A framework of the proposed information access platform

The framework is based on the research from this study. It draws from aspects gleaned from this study in its entirety including findings and discussion thereof in the context of the literature and theory. The framework is informed by the information needs of healthcare workers and suggestions by IT professionals. Shaping the framework for developing the information access platform is based on the findings interpreted and discussed in this chapter.

#### 6.6.1 Rationale for the proposed information access platform

There is lack of a common platform for accessing and sharing HIV and AIDS information by healthcare professionals in Zimbabwe. There are a number of players in the fight against HIV and AIDS in Zimbabwe. These organisations share common goals and interests. They also generate huge amounts of data and information which is useful for decision making and policy formulation. However, the major challenge is that they tend to operate in isolation, and they do not have formal means to share valuable data and information. This often leads to duplication

of effort and lack of coordination amongst these key stakeholders. This study is trying to bridge this gap by proposing an ICT based information access platform that will be useful for sharing of information resources among HIV and AIDS organisations.

### 6.6.2 The concept of the information access platform and its components

This section presents the concept of the information access platform and its components. The components were informed by the theoretical framework, study objectives, research questions, and the discussion literature. Creativity was also essential in the organisation of the components using the systematic approach adopted for this study.

#### 6.6.2.1 HIV and AIDS Topics

The findings of the study revealed that healthcare workers need information on a variety of health topics that relate to the management of HIV and AIDS. Table 6.1 presents the health topics needed by the healthcare workers according the order of their importance or level of demand.

**Table 6.1 Health topics according to level of demand.**

| Health topics | Demand |
|---|---|
| Treatment options | High |
| policy issues | High |
| HIV and AIDS services | High |
| Causes of HIV and AIDS | Moderate |
| Symptoms of HIV and AIDS | Moderate |
| Chronic illnesses related to HIV and AIDS | Moderate |
| Antiretroviral treatment use | Low |
| African traditional methods | Low |
| Co-morbidities and clinical outcomes | Low |
| Prevention measures | Low |



**6.6.2.2 Information sources**

The study findings revealed that the respondents preferred and recommended a variety of information sources. Table 6.2 presents the recommended information sources according to their level of effectiveness in accessing HIV and AIDS related information. The researcher devised a colour code to present the effectiveness of the information sources, with a darker shade of colour representing more effectiveness.

**Table 6.2 Recommended sources according to effectiveness**

| Sources | Effectiveness level | |
|---|---|---|
| Medical databases | Very effective | |
| Electronic journals | Above average | |
| Internet and web sources | Effective | |
| Print textbooks | Effective | |
| Social media | Slightly effective | |
| Mass media | Slightly effective | |

Very effective Above average Effective Slightly effective

Not effective



**6.6.2.3 ICT gadgets**

The study findings revealed that the respondents preferred and recommended a variety of ICT gadgets. Table 6.3 presents the recommended ICT gadgets according to their level of effectiveness in accessing information.

**Table 6.3 Recommended ICTs according to effectiveness**

| Sources | Effectiveness level | |
|---|---|---|
| iPads & Tablets | Very effective | |
| PDAs | Effective | |
| laptops | Effective | |
| smartphones | Effective | |
| Desktops | Slightly effective | |

Very effective Above average Effective Slightly effective

Not effective



**6.6.2.4 Access formats**

This study revealed that all access formats are effective to some extent, depending on the information need at hand and according to other factors such as time, literacy, depth of information needed, and convenience. Figure 6.1 presents the recommended formats according to their effectiveness. A deeper colour and broader icon on the pyramid represents more effectiveness.

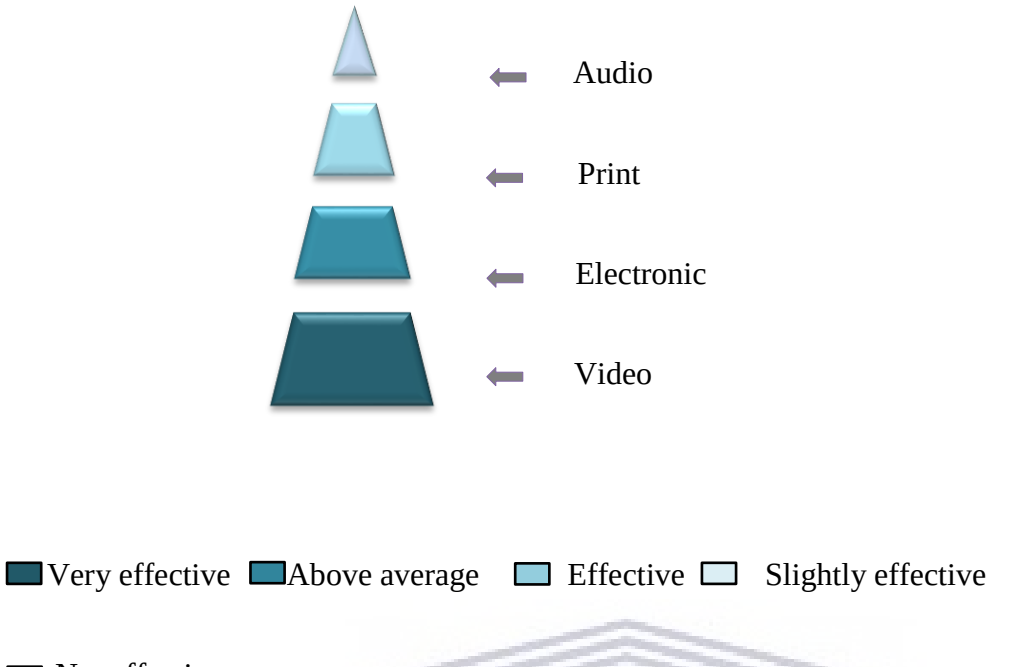



*Figure 6.1 Recommended formats according to effectiveness.*



**6.6.2.5 Establishment methods and activities**

The study revealed that establishment of the information access platform involves a number of activities, methodologies and approaches. This section presents these approaches that were recommended by the research participants. The recommended development strategy was outsourcing, with an option of insourcing of sections of the system where privacy of data is an issue. Outsourcing describes an arrangement, in which the organisations will hire an external software development agency to effectively carry out critical tasks of a software development project, which could be done in-house instead. Most HIV and AIDS organisations in Zimbabwe do not have strong ICT departments to carry out complex IT development projects. Therefore, development of the information access platforms should be outsourced, while other simple tasks will be done in-house.

The proposed development methodology was the Agile SDLC. Agile SDLC model is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. The method breaks the software product into small incremental builds. These components are provided in stages and every stage involves cross functional teams working simultaneously on various areas like, planning, requirements analysis, design, testing, and review. Figure 6.2 illustrates the proposed iterative activities that should be used for system development in HIV and AIDS organisations. This is a suitable model because it believes that every project needs to be handled differently and the existing methods need to be tailored to best suit the project requirements.



*Figure 6.2 Agile SDLC (Product Tribe, 2021)*

The Service Oriented Network Architecture (SONA), the actor-oriented network and the multi-cloud network were recommended for the network architecture. SONA is a generic architectural framework that illustrates how to build integrated systems and guides the development of organisational networks. Using the SONA framework, HIV and AIDS organisations can improve flexibility and increase efficiency by optimizing applications, business processes, and resources to enable IT to have a greater effect on business. This study therefore recommends SONA as the backbone of the network architecture. The SONA framework, shown in Figure 6.3 shows how integrated HIV and AIDS systems can allow a dynamic, flexible architecture and provide for operational efficiency through standardization and virtualization.

In the diagram, the networked infrastructure layer is where all the IT resources are interconnected across a converged network foundation including servers, storage, and clients. The layer includes the network devices and links to connect servers, storage, and clients in different places in the network. The interactive services layer enables efficient allocation of resources to applications and business processes delivered through the networked infrastructure, it virtualises services (or unties them from specific pieces of hardware) to allow them to be provided over a dispersed or centralized network environment. The applications layer contains the business applications and collaborative applications that take advantage of efficiencies from the interactive services. The layer carries the responsibility for providing the applications that users rely on (Cisco Systems, 2021).

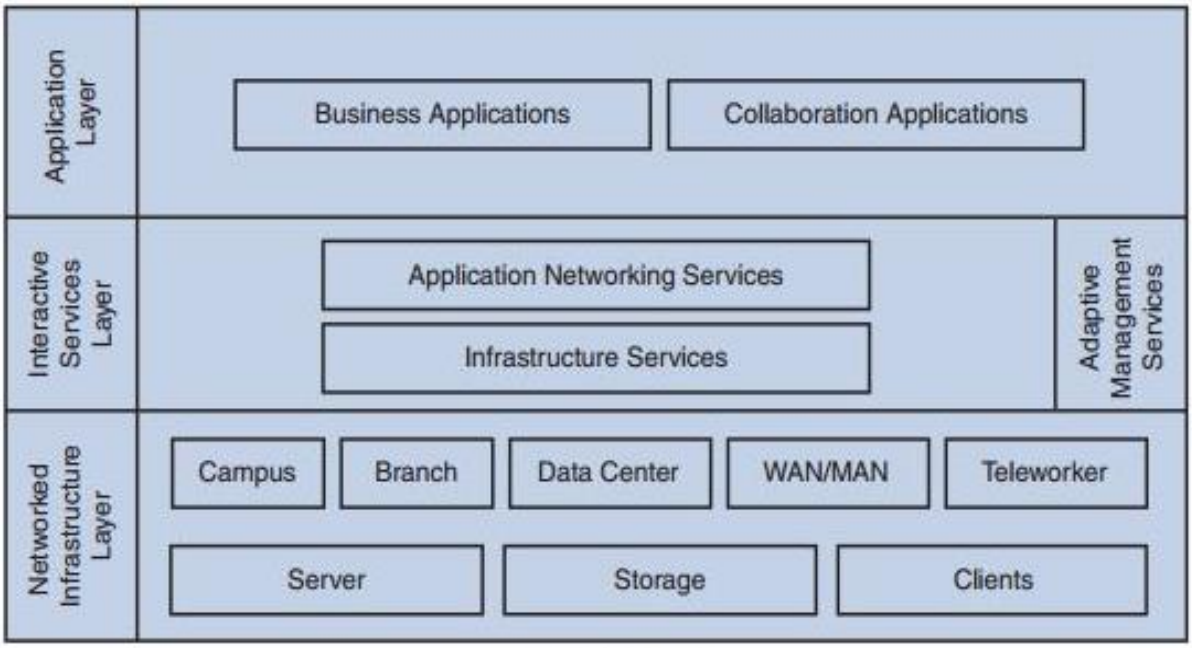



*Figure 6.3 SONA framework (Cisco Systems, 2021)*

The actor oriented network recommended for the information access platform is an organisational framework to facilitate collaboration between HIV and AIDS organisations. This study recommends the actor oriented network for the arrangement of resources and collaboration of activities within a network of HIV and AIDS organisations. The proposed network should be composed of (a) actors (people, organisations, and databases) with the values and abilities to self-organize; (b) a commons where they create and share resources; and (c) structures, protocols, and processes that facilitate multi-actor collaboration (Seid et al, 2021).

The study revealed that the multi-cloud network is suitable for the storage of data and information from multiple HIV and AIDS organisations. Multicloud is a cloud computing deployment model that enables organisations to deliver application services across multiple private and public multiple cloud vendors, multiple cloud accounts, multiple cloud availability

zones, or multiple cloud regions or premises (Juniper Networks, 2021). The proposed multicloud should include two public Infrastructure as a Service (IaaS) providers, a public Platform as a Service (PaaS), on-demand management and security systems from public clouds, a private cloud IaaS for organisational systems of record, and a private Container as a Service (CaaS) stack on either public or private IaaS for systems of engagement and cloud-native applications (Juniper Networks, 2021). Figure 6.4 depicts the proposed multicloud configuration for the HIV and AIDS organisations.

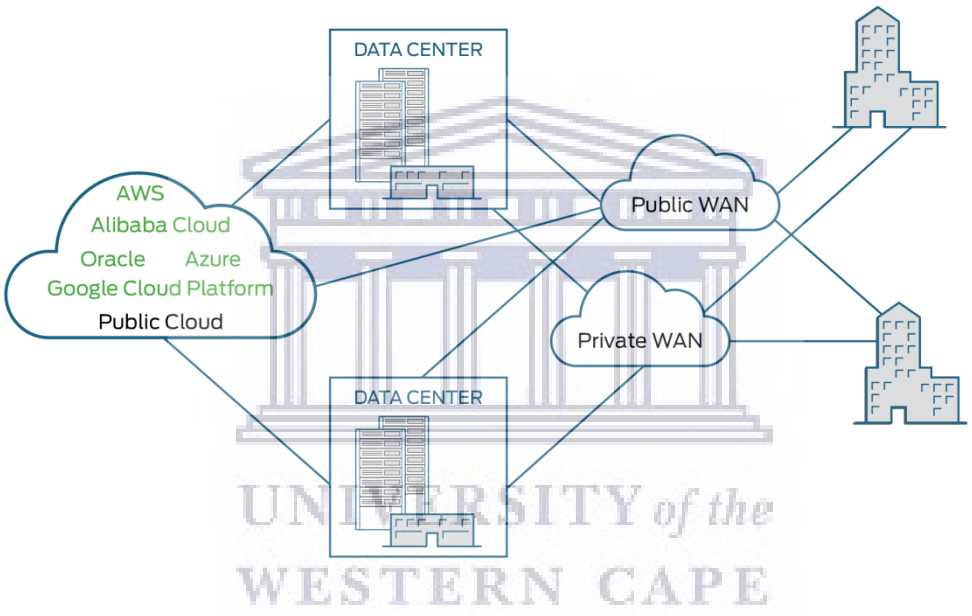



*Figure 6.4 Multi-cloud configuration (Juniper Networks, 2021)*

Figure 6.5 illustrates the interrelationships between the different network configurations proposed for the HIV and AIDS organisations. SONA forms the network backbone of the network. It would guide how the different organisations should to build integrated systems to allow sharing of organisational resources; thereby facilitating collaboration. The actor oriented network is a will guide in the organisation of people, resources and formulation of standards

and protocols across the organisations. The multicloud environment facilitates the storage and sharing of information and data resources.

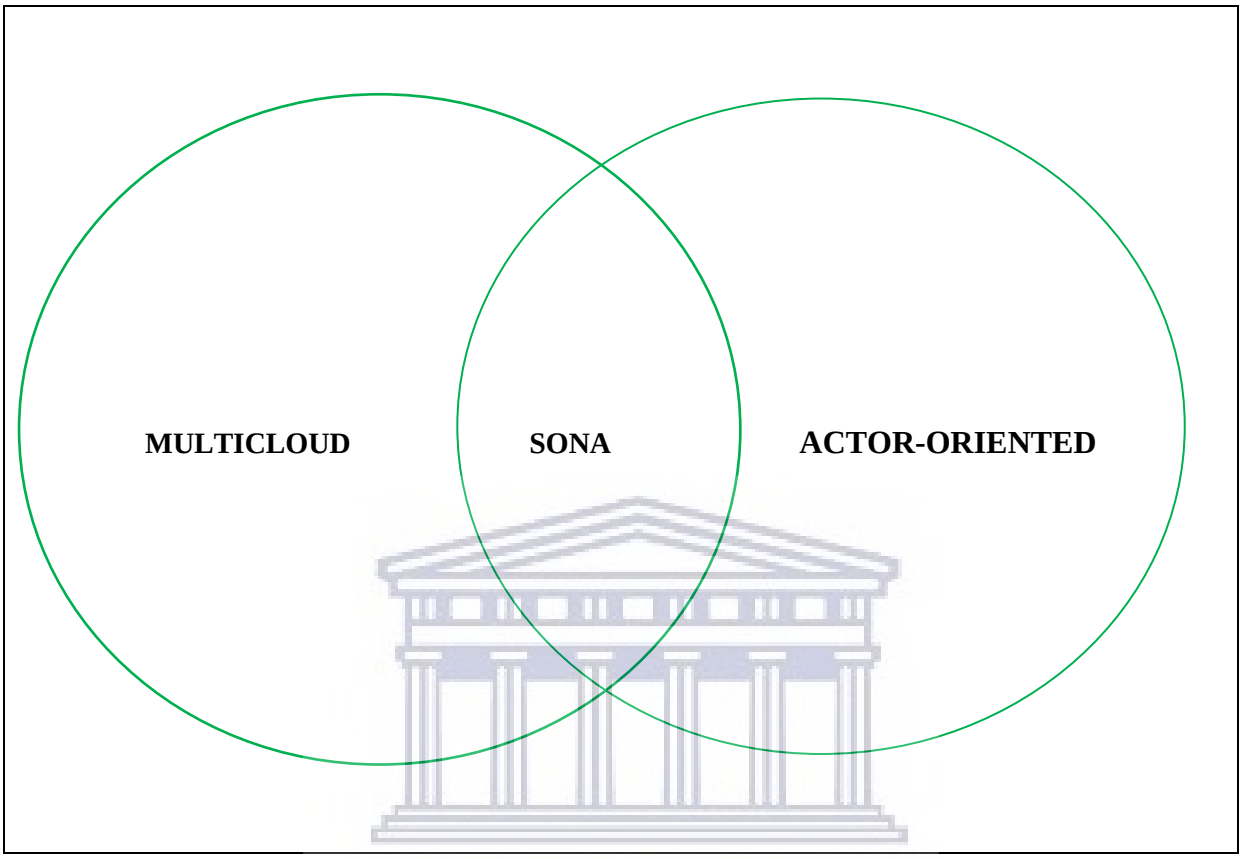



*Figure 6.5 Network Architecture (Source: Author)*



The study recommends the use of open source codes in the development of the information access platform. As discussed earlier, commercial software is difficult to customise for different applications. Open access software applications were recommended after considering factors such as cost, flexibility, and availability. Figure 6.6 presents the study recommendations on design principles organised in line with the HOT-fit model. These were gleaned from different sections of the study findings.

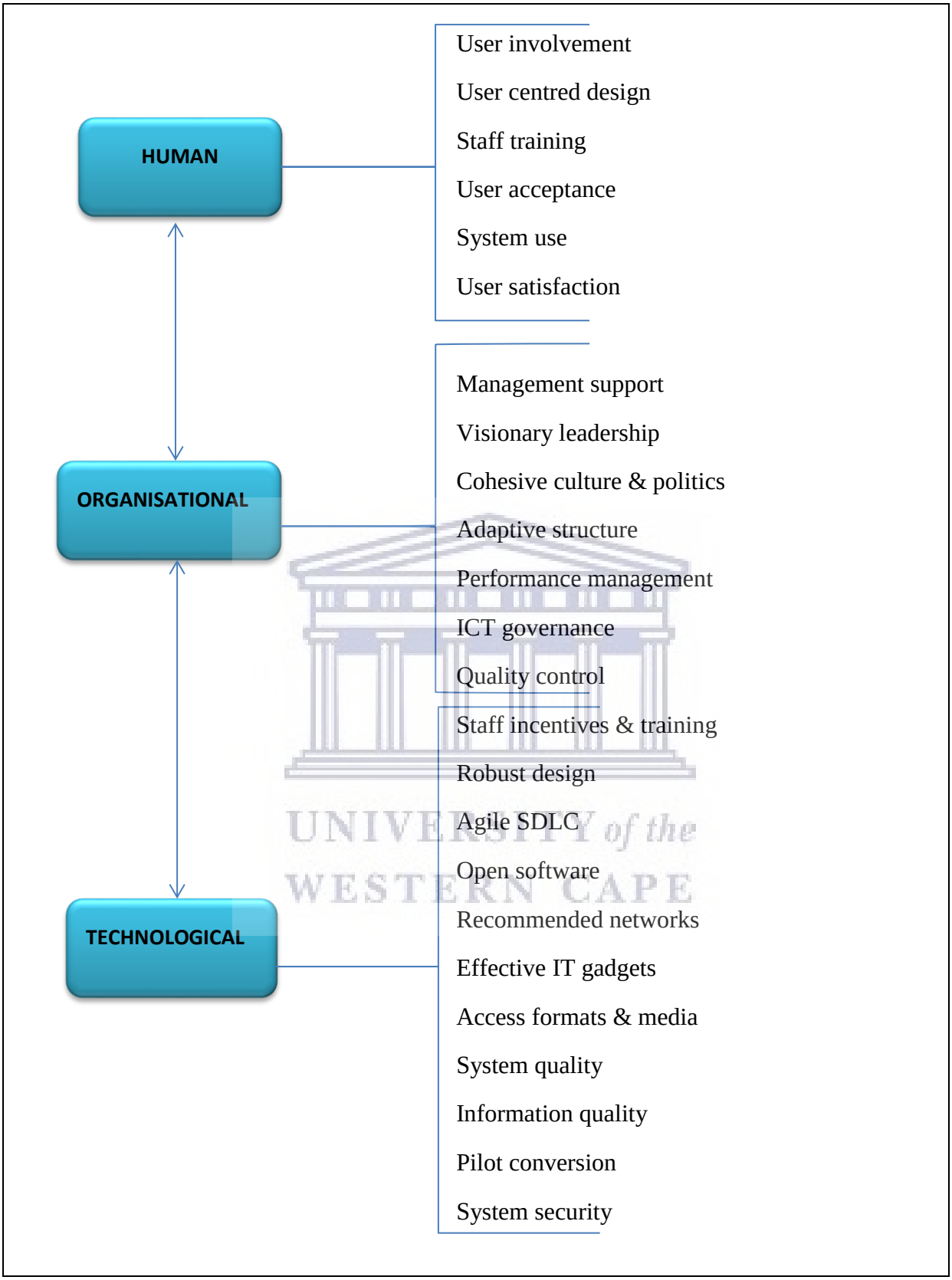



*Figure 6.6 Design principles (Source: Author)*

### 6.2.6 Description of the Platform

The information access platform depicted in Figure 6.7 is an ICT based model for the sharing of network resources and information among HIV and AIDS organisations in Zimbabwe. It seeks to mitigate duplication of activities and reduce redundancy of information. It is designed to facilitate collaboration, standardisation and encourage quality of services among the organisations. It also seeks to improve access to accurate information using multiple and synchronous technologies. It is also designed to improve storage and security of information through the multicloud environment. The multicloud architecture proposed by the Jupiter Networks (2020) is comprised of private HIV and AIDS databases, private networks, a public network, data centres for collecting and managing data, and a public cloud that facilitates access to HIV and AIDS information.

In the proposed information access platform, HIV and AIDS organisations generate information and store it in their private databases. This information is then selected and sent to the data centres, which process and organise the information according to agreed standards. The data centres also control access to the information and decide which information should be sent to the multicloud. When the information is on multicloud, it would be ready for access by any authorised user in the network. The user can get access to the information using iPads or tablets, laptops, smartphones and desktops. The information would have been evaluated for accuracy by the data centres. The users have an option of using social media and internet based sources for their information needs. Access to information on social media and the internet would be moderated by organisational policies and standards. The study recommended that the information access platform should be implemented using the pilot conversion to avoid the risk of losing data and to ensure that the system is rolled out when all the system challenges have been addressed.

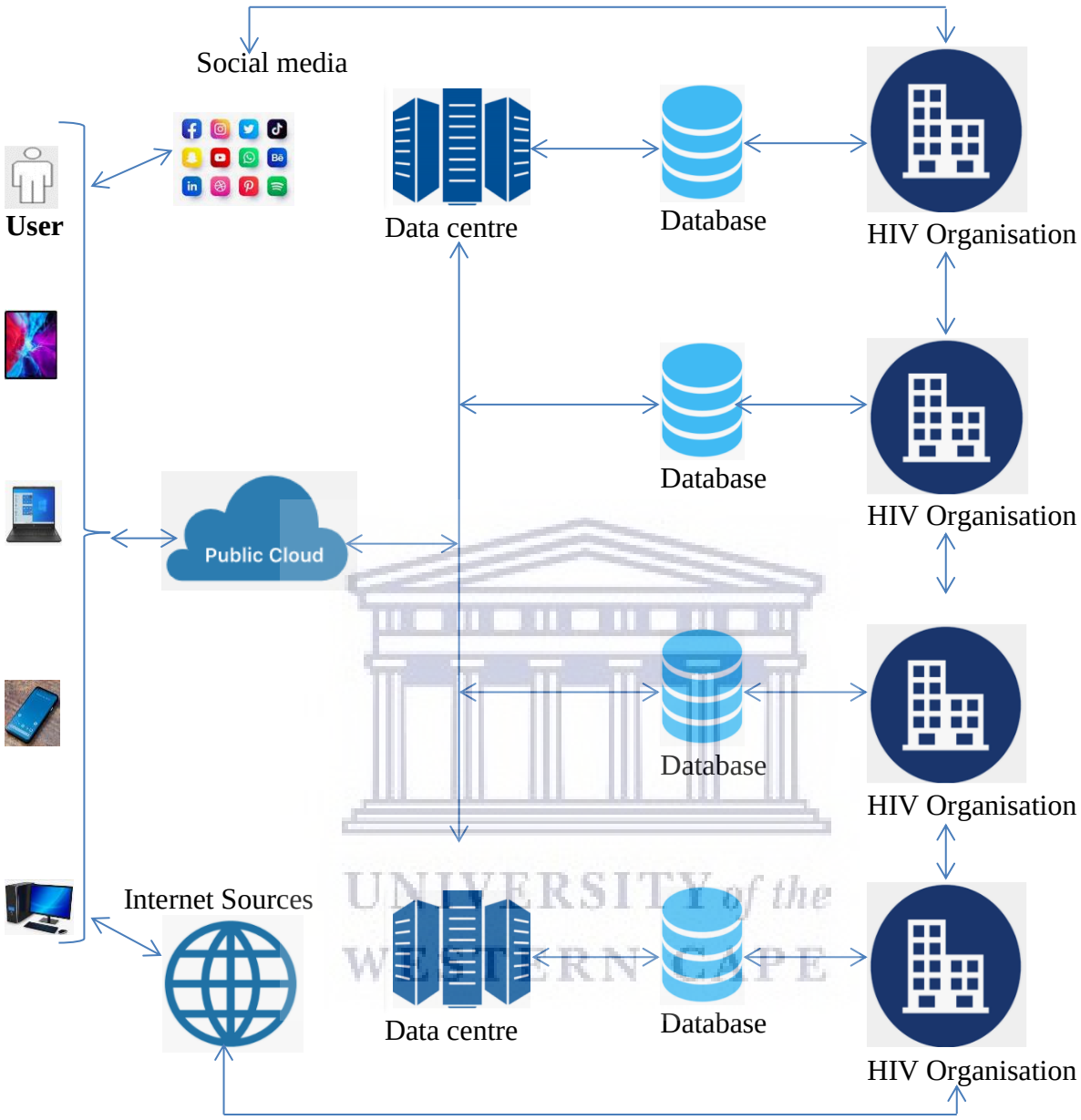



*Figure 6.7 Framework for the Information Access Platform (Source: Author)*

### 6.7 How the system of the platform works

The system users include healthcare workers, and IT professionals in HIV and AIDS organisations in Zimbabwe. All these users have different needs and they use different technology in their different settings. A user can log into the platform using a desktop computer, smartphone, laptop, Ipad or tablet. The user can be directed to the public cloud where all the public HIV and AIDS information will be stored. Individual HIV and AIDS organisations have their private databases that are linked to the public cloud and private data centres. The users can request for access to these private databases, and depending on organisational policies, they will be able to access HIV and AIDS information from other organisations which is not on the public domain or public cloud. This platform allows for quick access and smooth flow of accurate information across HIV and AIDS organisations.

### 6.8 Summary

This chapter interpreted main findings of the study in the context of the literature reviewed and the HOT-fit theory framing the study. The chapter is organised according to the main objectives of the study. It discussed and interpreted findings on the information needs of healthcare workers in HIV and AIDS organisations. In the section of information needs; the chapter discussed the health topics, sources, ICT gadgets, social media and access channels preferred by healthcare workers. The next sections discussed and interpreted the findings related to evaluation of the current ICTs in the organisations using the HOT-fit model and recommended ICTs in line with their effectiveness on information access. The last section presented the proposed information access platform. In developing the information access platform, the chapter gleaned the content and insight from the study findings. The next chapter provides a summary of the study, conclusions and recommendations.

# CHAPTER 7

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Introduction

The general objective of this study was to determine the information needs of the Zimbabwean health workers working with HIV and AIDS organisations and to propose a needs-based ICT platform for accessing the information. This chapter provides a summary of the study, conclusions, key recommendations and pointers to further research to strengthen the findings of this study. The chapter thus provides a general overview of the study. The chapter also outlines the various implications of the study findings. Implications refer to how the research applies to policy, practice, theory, and subsequent research. The conclusions and recommendation are drawn from the findings of the study. Study conclusions pull together the various results of the study, their meanings and importance to the study. The researcher concludes the chapter by identifying and providing further avenues of research arising from the study. Study recommendations request for specific actions in respect to policy, practice, theory, and further research.



## 7.2 Summary

This study sought to develop a needs-based information access platform for healthcare professionals in HIV and AIDS organisations in Zimbabwe. To achieve this, it identified the information needs of the healthcare workers and evaluated the ICTs currently being used in accessing information. The study also used the recommendations by the IT professionals in developing a platform addressing information needs and issues with the current systems.

The study was triggered by the lack of a common platform for sharing HIV and AIDS information among healthcare professionals resulting in duplication of effort and lack of coordination among key stakeholders in the health sector. Therefore, there was a need for a common platform for sharing information and resources among the key HIV and AIDS organisations. Reviewed literature revealed that communication channels tailored to healthcare professionals' needs and preferences are vital for improving information access and knowledge sharing.

An integrated theoretical framework was used for guiding the study. The General Systems Theory (GST) acted as the broad theoretical lens of the study. The Human, Organisation and Technology-fit (HOT-fit) framework provided the basis for evaluating existing ICTs in the health sector and the Social Construction of Technology (SCOT) Theory guided the design of the information access platform by determining healthcare workers' information needs.



A pragmatic philosophy was adopted for the study. The embedded mixed method approach was adopted to gather both qualitative and quantitative data to answer the research questions of the study. Methodological triangulation was used to improve the reliability of the findings. A questionnaire, interviews, and website analysis were used to collect data from healthcare professionals and IT professionals working in HIV and AIDS organisations. Data was collected, analysed and presented qualitatively and quantitatively.

## 7.3 Conclusions

The conclusions of the study were drawn from the research findings. The discussion and interpretation chapter assisted in weaving together the research findings of findings assisted in getting sense out of the data and enabled the researcher to draw conclusions from the data gleaned from different sections. The conclusions of the study were arranged according to the research questions.

### 7.3.1 Information needs of healthcare professionals

The information needs of healthcare professionals include their preferences in terms of the health topics, information sources, the ICT tools to access the information, and preferred access channels.

From the findings, a significant majority of healthcare professionals indicated that they need information on treatment options; followed by policy issues and HIV and AIDS. The least preferred health topics were on symptoms, and causes of HIV and AIDS. Other topics of interest were: African traditional methods of health promotion; antiretroviral treatment use, co-morbidities and clinical outcomes among Africans and prevention measures. The study concludes that healthcare workers need information from a variety of topics. Treatment options; policy issues and HIV and AIDS services were the most common topics needed by the healthcare workers. The study found no relationship between choice of health topics and gender of the research participants.

The data revealed that medical databases are the most predominant source of health information for healthcare professionals, followed by the internet, electronic journals and textbooks respectively. The least preferred sources were printed journals. This shows that healthcare workers use information from a variety of sources although medical databases, the internet and electronic journals are the most predominant source of health information. There was evidence that textbooks are still widely consulted for health information. The least used sources were printed journals. Other sources include professional and non-professional social networks, health support organisations, peers and the mass media. There is a relationship between choice of sources and gender. Females preferred the internet, and electronic journals compared to males preferring medical databases and textbooks. This means that information providers need to consider gender preferences when providing information sources.

It was interesting to note that healthcare workers also widely use social media to access health information. WhatsApp, Twitter, LinkedIn and Skype were the most widely used social media tools. The healthcare professionals also used health blogs, RSS feeds, wikis and podcasts. Of interest to note is that while social media applications would be considered as non-authoritative under the traditional view; notwithstanding, there seems to be a tendency of healthcare workers to use them. This implies that healthcare professionals sometimes do not consider the authority of the sources when looking for information. Another implication is that some social media tools are increasingly becoming more reliable sources of health information. The study noted that males use Twitter, Skype, LinkedIn and Wikis, while females use WhatsApp and RSS feeds more.

The study found out that most preferred ICT gadget was the iPad or tablet, followed by laptops. Desktops and cell phones were the least preferred. Other tools that were highlighted by the respondents were digital stethoscopes, Google Glass, bidirectional video feeds, smart cameras and smart televisions. This shows that healthcare professionals prefer a variety of tools to access health information. Mobile tools were most preferred by the professionals, although it is interesting to note that smartphones were less preferred. From the discussion, this could be attributed to lack of knowledge on the potential applications of smartphones for healthcare delivery.

The study revealed that in terms of actual usage, desktops and laptops were widely used. This entails that the HIV and AIDS organisations are not providing the tools that are preferred by the workers. Therefore, there is a gap between what is preferred by healthcare professionals and what is available. There was no statistically significant relationship between gender and choices of ICTs. The study also concludes that healthcare workers need information in a variety of formats, depending on the need at hand. Video and electronic text formats are the most preferred formats, although hard copy materials are still common formats within the organisations. The study also revealed the influence of gender on information needs.



### 7.3.2 Appropriateness of the current ICTs

The study evaluated the ICTs in terms of their ease of use; ease of learning; response time, availability; access to technical support; and security of system. The ICTs were rated by healthcare workers as good in terms of ease of use; ease of learning; response time. Availability and security were average while access to technical support was poor. The overall rating of the ICTs was average. There were mixed reactions from ICT professionals with the majority saying

that the ICTs were meeting the needs of the workers to a lesser extent because the current technology was not in line with the current technological trends. This study concludes that although the current technologies are good in terms of their use, they are less appropriate to the needs of the healthcare workers because they're out-dated. Access to technical support is limited and security of information remains a challenge.

The information sources and the access channels were also evaluated to determine their appropriateness. The study concludes that the information sources meet the needs of the workers to a lesser extent. The reason for this is that there is lack of subscription funds and the sources are out-dated. Moreover, there is lack of commitment from the management in investing in recent and relevant sources. Although a lack of technological infrastructure and formats not in line with recent technological developments were reported, the information channels were rated average. The website evaluation established that the websites were good in terms of authority, purpose, content, currency, design and navigation. The websites were fair on interactivity.



Although training levels were rated average, the healthcare workers usually used the ICTs. The study findings showed although half of the healthcare workers were satisfied with the ICTs, a large number of them are not satisfied. Organisational issues that related to the ICTs were also evaluated due to their influence on the success of the ICTs. The organisational structures were good, while organisational features like culture, politics and communication were average. Policies and funding were poor. Lack of policies and poor funding could be negatively affecting the acquisition of relevant and current ICT tools and sources.

### 7.3.3 Appropriate ICTs recommended for the platform

The participants made some recommendations on the ICTs that should be used in developing the information access platform. The recommendations were made on the ICT gadgets, sources, including social media, and the information access channels of formats. The recommendations were done according to the perceived effectiveness of the ICTs. The study concludes that a variety of IT tools are suitable for accessing health information. Mobile devices, specifically the iPads or tablets, PDAs and laptops were viewed as the most effective ICT gadgets for information access and sharing. Smartphones and desktops were also recommended but they were viewed as the least effective in comparison with other devices.

Mean rating scores from the study indicated that on average participants view medical databases as the most effective source of HIV and AIDS information. Electronic journals occupied the second place followed by internet and web sources. Print sources had the least scores. The study therefore concludes that medical databases, electronic journals and the internet are the most effective sources of HIV and AIDS information. Print sources were to a lesser extent also recommended and therefore are less effective.



The choice of the information sources was influenced by factors that include trustworthiness, convenience, accessibility; cost, time, nature of information needed and ease of use. Authoritativeness of the source was however the most important factor in determining the effectiveness of the information sources because most respondents chose reputable medical databases such as PubMed, MEDLINE and HINARI, peer-reviewed journals and library materials. A combination of video, audio and electronic text was recommended in accessing the information. Video and electronic resources were considered most effective.

The study also recommended the use of social media for accessing HIV and AIDS information. WhatsApp, Twitter, LinkedIn and Skype were the most recommended social media tools. Health blogs, wikis and podcasts were also recommended. The premise was that information comes in a variety of formats and it is used for different needs. The findings revealed that sometimes these 'non-authoritative' sources were useful in disseminating accurate information in a timely manner.

### 7.3.4 Establishment of the platform for accessing health information

Establishment of an effective information access platform involves a number of activities and it should be informed by applicable system design principles. The healthcare workers and IT professionals made several recommendations. For developing the platform, they recommended the use of a web-based content management system. The use of open source software such as Drupal, Joomla, Dscape or Alfresco was suggested. Due to the lack of IT expertise within the HIV and AIDS organisations, outsourcing of the development process was recommended. Agile SDLC was regarded the most ideal development method because of its flexibility and speed in developing the platform. The Service Oriented Network Architecture (SONA), the actor-oriented network and the multi-cloud network were recommended for the network architecture. The pilot implementation strategy was recommended.

For the information access platform to be effective the users need training on IT related areas that include advanced computer skills; data capture; information organisation; coding; research skills; content creation and synthesis; information retrieval; information evaluation; information storage; communication and networking; data analysis; information security; information visualisation and ethical use of information.

The HIV and AIDS organisations also need to address organisational issues that include organisational support; visionary leadership; cohesive culture; performance management; ICT governance; quality control; inter-professional teams and cooperation between health and social care organisations; staff incentives and training. The recommended principles in designing the information access platform were management approval and support; user centred design; systems approach, robust system design, scalability, integration and interoperability; user training and empowerment; planned implementation; clear policy and standards; and security.

### 7.3.5 Benefits of the platform in enhancing Zimbabwean HIV and AIDS health services

The benefits of the information access platform will be numerous. The benefits that relate to information management include improved storage and backup of information, improved access to information; improved knowledge sharing; improved collaboration. Benefits that relate to HIV and AIDS services will be; less duplication of effort among key stakeholders; improved information access, storage, analysis, and dissemination, enhanced performance analysis and reporting; patient accessibility; and reduced operational costs, reduced expenses associated with paper medical records and reduced medical errors, increased patient information accessibility and improved patient care. The challenges in establishing the information access platform will include, lack of IT expertise, lack of management support and commitment, lack of financial resources, lack of policies and standards, staff resistance to change. Solutions these challenges include, training of users and IT personnel, use of open source applications, stakeholder engagement and lobbying, policy formulation and donor funding and fundraising activities.

### 7.3.6 Implications for theory

As highlighted in the study's background, researchers in the Information Systems (IS) and allied fields challenged researchers to do more research in the area of health information technology theory. Chiasson and Davidson (2004) challenged researchers to embrace the health care sector as a socially important and theoretically interesting context to develop and refine information systems theory as well as to provide contextually-relevant insights on health care information systems development and use. This study achieves tis by providing insight on how information access platforms can be developed from the perspective of both the users and ICT professionals.

The proposed information access platform is informed by the various information needs of healthcare workers. The proposed framework is the first of its kind and it sheds light on a number of issues that relate to accessibility of HIV and AIDS information among healthcare workers in Zimbabwe. The study highlights the unique information needs of healthcare workers in HIV and AIDS organisations. The study established that the concept of information needs need to be broadened to include needed health topics, sources, ICTs and access channels of formats.

The study provides a framework for developing an effective information access platform because of its involvement of the key stakeholders, the users of the platform. There was a lack of a model or framework for developing an information access platform. This study, although unique to healthcare workers can be applied to other organisational contexts. It provides insight into the preferred ICTs, information sources, and formats for accessing information.

The HOT-fit framework used to evaluate the current ICTs established a complex relationship between human, organisational and technological aspects of information systems in organisations. Most evaluations tended to look at technological evaluations. This study revealed that poor organisational cultures, structures and politics negatively affect the effectiveness of information systems.

Establishment of an information access platform is complex and it involves a number of aspects. This study sheds more light on the technological aspects that need to be considered in developing such a system, including the applicable design and implementation principles, methods and strategies. The study also highlights the specific human and organisational issues that need to be addressed in developing an information access platform.



**7.4 Recommendations**

The study makes the following recommendations, based on the findings:

i. The study established that healthcare workers need information on a variety of topics and there was no variation on the choice of topics by organisation or gender. The study therefore recommends that the information access platform should provide a variety HIV and AIDS topics across all the HIV and AIDS organisations to need the diverse needs of the healthcare workers.

ii. HIV and AIDS organisations should establish measures to ensure that healthcare workers access accurate and authoritative information. The study revealed that healthcare workers consult both authoritative sources and social media sources. The study therefore recommends formulation of the policies to guide the use of social media

applications, coupled by custom made social media applications to control access to potentially inaccurate information. Establishment of official social media platforms will improve accountability and accuracy of information.

iii. The study revealed that funding and policies on ICTs were poor. This is negatively affecting the ICT infrastructure and information sources which are out-dated. The study recommends formulation of effective ICT policies to improve organisational culture and politics. There is also a need for management commitment towards the funding of technological infrastructure. The organisations can also consider partnerships and collaboration in ICT projects to mitigate funding challenges.

iv. The use of mobile devices is recommended as points of accessing information. Mobile devices that include smartphones, tablets, iPads, and laptops are more convenient to use especially considering scenarios such as the COVID-19 pandemic which requires healthcare workers to work remotely.

v. Open access software and open system architectures are recommended for developing the information access platform. HIV and AIDS organisation in Zimbabwe should invest in more economic open applications for long term sustainability. Lack of funding has been an on-going challenge in implementing state of the art information technology in the health sector in Zimbabwe. Open source software could be one of the solutions.

vi. User training is one of the key factors that facilitate system success. The study revealed that healthcare workers need to be trained in a number of IT related skills. Organisations therefore should do an audit of the training needs of their workers and offer the relevant ICT related training.

vii. Security of information is important aspect in the health sector. The study established that security of information is still a challenge. The study therefore recommends investment in IT security to improve privacy of information.

viii. The study recommends that the proposed framework for developing the information access platform be implemented. The development of the platform should be in line with the user preferences in the technology, sources, and access channels. The development should be informed by the recommended information system development principles.

### 7.4.1 Further research

The study developed a general framework for developing an information access platform. The approach used for this study was necessary to determine the needs of the healthcare workers and the recommended ICTs, including recommended system development strategies and principles. A follow up study is therefore needed for the technical development of the system.

The study evaluated the current ICTs from a user perspective. It is worth noting that criteria and indicators used by system users merit critical evaluation, as some criteria are overly subjective and the implications of some indicators are not well understood. Users might not be well versed with some issues that relate to technology and technology evaluation. Therefore, further study should consider a combination of both subjective and objective system evaluations for a more complete picture.

## 7.5 Chapter summary and general conclusion

This final chapter provided a summary of the study, conclusions and recommendations. The conclusions of the study were presented according to the research questions of the study. The study adopted the pragmatism philosophical framework. The embedded mixed method

approach was adopted to gather both qualitative and quantitative data. Methodological triangulation was used to address the complex research questions and to improve the reliability of the findings. The data from various sources allowed the researcher to draw patterns from qualitative data and statistical inferences from quantitative data. Embedding the various forms of datasets provided a rich output for the establishment of the information access platform.

The use of the HOT-fit model aides in evaluating current technology and the Social Construction of Technology (SCOT) Theory was important in guiding the development of a user-centred information access platform. The conclusions that were drawn from this study were useful in understanding the various information needs of healthcare workers. The evaluation also revealed gaps which need to be addressed in HIV and AIDS organisations to improve accessibility to relevant and accurate information. The information needs, the evaluation, and recommendations from both healthcare workers and IT professionals aided in the construction of the proposed information access platform. The study revealed that such a platform will improve the management and accessibility of HIV and AIDS information, thereby enhancing HIV and AIDS services in Zimbabwe.

## References


AbouZahr, C., & Boerma, T. (2005). Health information systems: the foundations of public health. *Bulletin of the World Health Organisation*, *83*(8), 578–583.

Adebayo, O.J., Michael. J.A., & Akole, B.O. (2017). Information needs and seeking behaviour of medical students at the college of medicine, University of Ibadan, Nigeria. *Journal of Applied Information Science and Technology*, *10*(2), 49-62.

Adebesin, F., Foster, R., Kotz´e, P., & Van Greunen, D. (2013). A review of interoperability st&ards in e-Health and imperatives for their adoption in Africa. *South African Computer Journal*, *50*(1), 3-5. http://doi.org/10.18489/sacj.v50i1.176

Adjorlolo, S., & Ellingsen, G. (2013). Readiness assessment for implementation of electronic patient record in Ghana: a case of University of Ghana Hospital . *Journal of Health Informatics in Developing Countries*, *7*(2), 128 – 140.

African Population and Health Research Center. (2014). *Launch of the NCD-Info Knowledge Sharing Portal*. https://aphrc.org/blogarticle/launch-of-the-ncd-info-knowledge-sharing-portal/

Agbele, K., Nyongesa, H., & Adesina, A. (2010). ICT and information security perspectives in e-health systems. *Journal of Mobile Communication*, *4*(1), 17-22.

Agency for Healthcare Research and Quality. (2006). *Costs and benefits of health information technology*. https://www.ahrq.gov/ncepcr/tools/health-it/index.html

Agency for Healthcare Research and Quality. (2019). *Health Information Technology integration*. https://www.ahrq.gov/ncepcr/tools/health-it/index.html

Agustini, K., Darmawiguna, I. G. M., Artayasa, I.K.D., & Mertayasa, I. N. E. (2020). Evaluation of the teachers' acceptance to E-Report Card Applications with the Hot-Fit Model Approach. *International Journal of Instruction*, *13*(3), 475-490. http://doi.org/10.29333/iji.2020.13333a.

Ahmed, M. E. (2007). Knowledge of blood pressure measurement among a teaching hospital staff in a developing nation. *Journal of Human Hypertension*, *11*(8), 495-499.

Ajuwon, G. A. (2006). Use of the Internet for health information by physicians for patient care in a teaching hospital in Ibadan. *Nigeria Biomedical Digital Libraries*, *3*(12). http://doi.org/10.1186/1742-5581-3-12

Akhlaq, A., McKinstry, B., Muhammad, K. B., & Sheikh, A. (2016). Barriers and facilitators to health information exchange in low- and middle-income country settings: a systematic review. *Health Policy and Planning*, *31*(9), 1310–1325. http://doi.org/10.1093/heapol/czw056

Akintola, O. (2008). Defying all odds: coping with the challenges of volunteer caregiving for patients with AIDS in South Africa. *Journal of Advanced Nursing*, 63(4), 357-365.

Akussah, M., Asante, E., & Adu-Sarkodee, R. (2015). Impact of electronic resources and usage in academic libraries in Ghana: evidence from Koforidua Polytechnic & All Nations University College, Ghana. *Journal of Education and Practice*, *6*(33), 33-38.

Alavi, M., Archibald, M., McMaster, R., Lopez, V., & Cleary, M. (2018). Aligning theory and methodology in mixed methods research: Before Design Theoretical Placement. *International Journal of Social Research Methodology*, *21*(5), 527-540. http://doi.org/10.1080/13645579.2018.1435016

Alhuwail, D., AlMeraj, Z., & Boujarwah, F. (2018). Evaluating hospital websites in Kuwait to improve consumer engagement and access to health information: a cross-sectional analytical study. *BMC Medical Informatics and Decision Making. 18* (82), 1-11. http://doi.org/10.1186/s12911-018-0660-4

Allcott, H., & Gentzkow, M. (2017). Social media and fake news in the 2016 election. *Journal of Economic Perspectives*, 31(2), 211–236.

Alvarez, A. (2013). *How are physicians using smartphones for professional purposes? Kantar Media Health Research Insights*. http://www.kantarmedia.com/us/thinking-and-resources/blog/how-are-physicians-using-smartphones-for-professional-purposes

Alvesson, M., & Sköldberg, K. (2009). *Reflexive methodology. new vistas for qualitative research.* (2nd ed.). London: Sage

Alzougool, B., Chang, S., & Gray, K. (2008). Towards a comprehensive understanding of health information needs. *Electronic Journal of Health Informatics*, *3*(2), 1-10.

American Nurses Credentialing Center. (2003). *Magnet hospital status*. American Nurses Publishing.

American Nursing Association. (2019). *Prevention and care for HIV*. https://www.nursingworld.org/HIVPosition

Aminpour, F., Sadoughi, F., & Ahamdi, M. (2014). Utilization of open source electronic health record around the world: A systematic review. *Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences*, *19*(1), 57-64.

Amlung, J., Huth, H., Cullen, T., & Sequist, T. (2020). Modernizing health information technology: lessons from healthcare delivery systems. *JAMIA Open*, *3*(3), 369–377. http://doi.org/10.1093/jamiaopen/ooaa027

Anderson, B. R. (2016). Improving healthcare by embracing systems theory. *Journal of Thoracic and Cardiovascular Surgery*, 152(2), 593–594. http://doi.org/10.1016/j.jtcvs.2016.03.029

Anderson, J. G. (1997). Clearing the way for physicians, use of clinical information systems. *Communications of the ACM*, *40*, 83-90.

Andersona, C. A., Leahyb, M.J., DelValleb, R., Shermanb, S., & Tanseyc, T.N. (2014). Methodological application of multiple case study design using modified consensual qualitative research (CQR) analysis to identify best practices and organisational factors in the public rehabilitation program. *Journal of Vocational Rehabilitation, 41,* 87–98. http://doi.org/10.3233/JVR-140709

Andone, I., Błaszkiewicz, K., Eibes, M., Trendafilov, B., Montag, C., & Markowetz, A. (2016). How Age and Gender Affect Smartphone Usage. *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing*: Adjunct. 9–12. http://doi.org/10.1145/2968219.2971451

Andualem, M., Kebede, G., & Kumie, A. (2013). Information needs and seeking behaviour among health professionals working at public hospital and health centres in Bahir Dar, Ethiopia. *BMC Health Services Research, 13,* 534. http://doi.org/10.1186/1472-6963-13-534

Anwar, F., & Shamim, A. (2011). Barriers in adoption of health information technology in developing societies. *(IJACSA) International Journal of Advanced Computer Science and Applications*, 2(8), 40-45. http://doi.org/10.14569/IJACSA.2011.020808

Apenteng, B. A, Opoku, S. T., Ansong, D., Akowuah, E.A., Afriyie-Gyawu, E. (2018). The effect of power outages on in-facility mortality in healthcare facilities: Evidence from Ghana. *Global Public Health,* 13(5), 545-555. http://doi.org/10.1080/17441692.2016.1217031

Aqsa, F., & Ricardo C. P. (2018). Security aspects in healthcare information systems: a systematic mapping. *Procedia Computer Science,* 138. http://doi.org/10.1016/j.procs.2018.10.003

Aquil, A., & Sulaiman A. (2017). Knowledge and use of electronic information resources by medical students at Al-Jouf University in Saudi Arabia. *Library Philosophy and Practice* (e-journal). 1524. http://digitalcommons.unl.edu/libphilprac/1524

Arshed, N., & Danson, M. (2015). The literature review. In R. MacIntosh, & K. O'Gorman (Eds.), *Research Methods for Business and Management.* Goodfellow Publishers Limited. https://doi.org/10.23912/978-1-910158-51-7-2790

Asangansi, I., Macleod, B., Meremikwu, M., Arikpo, I., Roberge, D., Hartsock, B., & Mboto, I. (2013). Improving the Routine HMIS in Nigeria through Mobile Technology for Community Data Collection. *Journal of Health Informatics in Developing Countries*, *7*(1), 76 – 87.

Ash, J.S., & Bates, D. W. (2005). Factors and forces affecting EHR system adoption: Report of a 2004 ACMI Discussion. *Journal of the American Medical Informatics Association*, *12*(1): 8-12.

Atinga, R. A., Abor, P. A., Suleman, S. J., Anaba, E. A., & Kipo, B. (2020). E-health usage and healthcare professionals' motivation and job satisfaction in Ghana. *PLoS ONE* 15(9), e0239454. http://doi.org/10.1371/journal.pone.0239454

Avert. (2020). *HIV and AIDS in Zimbabwe*. https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/zimbabwe

Azevedo M.J. (2017). The state of health system(s) in Africa: challenges and opportunities. In: *Historical Perspectives on the State of Health and Health Systems in Africa*, Volume II. African Histories and Modernities. Palgrave Macmillan. https://doi.org/10.1007/978-3-319-32564-4_1

Babb, D. A., Pemba, L., Seatlanyane, P., Charalambous, S., Curchyard, G., & Grant, A. D. (2004). Use of traditional medicine in the era of antiretroviral therapy: experience from South Africa. *Journal of the International AIDS Society*, 1 (B10640), 79-82. http://doi.org/10.1080/13548500600621511

Bailey, C., & Pang, T. (2004). Health information for all? *Lancet. 364*(9430), 223-224. http://doi.org/10.1016/S0140-6736(04)16686-5

Bandiyono, A., & Naufal, M. (2020). Hot-Fit Model framework in central government employee data management systems. *International Journal of Scientific & Technology Research*, *9*(1), 1780-1787.

Bansler, J., & Havn, E. (2010). Pilot implementation of health information systems: issues and challenges. *International journal of medical informatics*, *79*(9), 637-648. http://doi.org/10.1016/j.ijmedinf.2010.05.004

Bansode, S. Y. (2013). Use and impact of electronic journals on the users of University of Pune, Pune, India. *Library Philosophy and Practice (e-journal)*, *847*. https://digitalcommons.unl.edu/libphilprac/847

Baridam, B. B., & Govender, I. (2019). ICT Influence on the healthcare sector in the Niger Delta region: ICT policy at an organisational level. *Development Studies Research*, *6*(1), 142-151. http://doi.org/10.1080/21665095.2019.1680302

Barsky, E. (2006). Introducing Web 2.0: weblogs and podcasting for health librarians. *Journal of Canadian Health Library Association, 27*, 33–34.

Bar-Yam, Y. (2006). Improving the effectiveness of health care and public health: A multiscale complex systems analysis. *American Journal of Public Health, 96*(3), 459–467.

Batambuze, C. (2003). *The role of libraries in providing access to information for children and young adults with special attention to AIDS issues. 69th IFLA General Conference and Council 1-9th August, 2003, Berlin*. http://www.ifla.org/iv/iflaba/papers/o41e-batambuze.pdf

Bates, D. (2001). Reducing the frequency of errors in medicine using Information Technology. *Journal of the American Medical Informatics Association*, *8*(1), 299-308.

Bates, D. (2002). The quality case for information technology in healthcare. *BMC Medical Informatics and Decision Making, 2*(7), 22-256.

Bates, D. (2003). Patient Safety: Improving Safety with Information Technology. *The New England Journal of Medicine. 348*: 2526-2534.

Bauer, M. (2000). Classical content analysis: A review. In M. W. Bauer & G. Gaskell (Eds.), *Qualitative researching with text, image, and sound: A practical handbook* (pp. 131-151). Sage.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: study design and implementation for novice researchers. *The Qualitative Report, 3*(4), 544-559.

Bayley, J. E., & Brown, K. E. (2015). Translating group programmes into online formats: establishing the acceptability of a parents' sex and relationships communication serious game. *BMC Public Health, 15*,1225. https://doi.org/10.1186/s12889-015-2545-0

Bell, J., & Waters, S. (2014). *Doing your research project: a guide for first-time researchers*. (6th ed.). McGraw-Hill Education.

Bem, S. L. (1993). *The lenses of gender*. Yale University Press.

Bennett, N. L., Casebeer, L. L., Zheng, S., & Kristofco, R. (2006). Information-seeking behaviors & reflective practice. *Journal of Continuing Education in the Health Professions, 26*(2),120-127. http://doi.org/10.1002/chp.60

Bevilacqua, L. (2016). *Social Media: An opportunity for HIV prevention.* http://actionaids.org/blog/social-media-opportunity-hiv-prevention

Bidmon, S., & Terlutter, R. (2015). gender differences in searching for health information on the internet and the virtual patient-physician relationship in Germany: exploratory results on how men and women differ and why. *Journal of Medical Internet Research, 17*(6), e156. http://doi.org/10.2196/jmir.4127

Bielecki, A., & Stocki, R. (2010). Systems Theory Approach to the Health Care Organisation on National Level. *Cybernetics and Systems*, 41(1), 489-507. http://doi.org/10.108001969722.2010/.511533

Bij de Vaate, A., Coleman, R., Manneh, H., & Walraven, G. (2002). Knowledge, attitudes and practices of trained traditional birth attendants in the Gambia in the prevention, recognition and management of postpartum haemorrhage. *Midwifery, 18*(1), 3-11.

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool 3 to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research, 26*(1), 1802-1811.

Bitchener, J., & Basturkmen, H. (2006). Perceptions of the difficulties of postgraduate L2 thesis students writing the discussion section. *Journal of English for Academic Purposes, 5*(1), 4-18. http://doi.org/10.1016/j.jeap.2005.10.002

Bjork, S., Kapur, A., King, H., Nair, J., & Ramachandran, A. (2003). Global policy: aspects of diabetes in India. *Health Policy, 66*(1), 61-72.

Blaikie, N. (2010). *Designing Social Research.* Polity Press.

Boote, D. N., & Beile, P. (2005). Scholars before researchers: on the centrality of the dissertation literature review in research preparation. *Educational Researcher, 34*(6), 3-15.

Booth, A., Papaioannou, D., & Sutton, A. (2012). *Systematic approaches to a successful literature review*. Sage.

Boston University School of Public Health. (2016). *Diffusion of Innovation Theory*. http://sphweb.bumc.bu.edu/otlt/MPH-modules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html

Boulos, M. N., Wheeler, S., Tavares, C., & Jones, R. (2011). How smartphones are changing the face of mobile and participatory healthcare: an overview, with example from eCAALYX. *BioMedical Engineering OnLine, 5*, (10) 24. http://doi.org/10.1186/1475-925X-10-24

Brender, J., Nohr, C., & McNair, P. (2000). Research needs and priorities in health informatics. *International Journal of Medical Informatics*, 58, 257-289.

Britto, M. T., Fuller, S. C., Kaplan, H. C., Kotagal, U., Lannon, C., Margolis, P.A., Muething, S.E., Schoettker, P.J., & Seid, M. (2018). Using a network organisational architecture

to support the development of Learning Healthcare Systems. *BMJ Quality & Safety*, 27, 937-946.

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford University Press.

Bryman, A., & Bell, E. (2011). *Business research methods*. Oxford University Press.

Burns, T.R., Corte, U., & Machado, N. (2016). The sociology of creativity: PART III: Applications–The sociocultural contexts of the acceptance/rejection of innovations. *Human Systems Management*, 35(1), 11-34.

Burr, V. (2015). *Social constructionism*. Routledge.

Burton, K.R., Howard, A., & Beveridge, M. (2005). Relevance of electronic health information to doctors in the developing world: results of the Ptolemy Project's Internet-based Health Information Study (IBHIS). *World Journal of Surgery, 29*(9), 1194-1198. http://doi.org/10.1007/s00268-005-7938-2

California Health Care Foundation. (2006). *Open Source Software: A Primer for Health Care Leaders, iHealth Reports*. https://www.chcf.org/wp-content/uploads/2017/12/PDF-OpenSourcePrimer.pdf

Case, O.D. (2002). *Looking for information: a survey of research on information seeking, needs, and behaviour*. Academic Press.

Cell Press. (2014). *Can social media help stop the spread of HIV?* ScienceDaily. www.sciencedaily.com/releases/2014/10/141029124500.htm

Center for Democracy and Technology. (2008). *Comprehensive Privacy and Security: Critical for Health Information Technology*.

Centres for Disease Control and Prevention. (2019). CDC Zimbabwe 2019 Annual Report. https://www.cdc.gov/globalhealth/countries/zimbabwe/annual-report/index.html#

Centres for Disease Control and Prevention. (2020). *Deciding whether a source is reliable.* https://www.cdc.gov/des/consumers/research/understanding_deciding.html

Chanda, L.K., & Shaw, J.G. (2010). The development of telehealth as a strategy to improve health care services in Zambia. *Health Information and Libraries Journal*, 27,133–139.

Chase, J. (2013). IPads and other drugs. *Medical Marketing & Media: The Interactive Guide*. 10–11. https://www.mmm-online.com/home/channel/features/healthcare-professionals-the-ipad-and-other-drugs

Chaudhry, B. (2005). *Health Information Technology (HIT) Adoption –Standards and Interoperability*. RAND Health Working Paper. https://books.google.co.zw/books?isbn=9264084614 .

Chaudhry, B., Wang, J. & Wu, S. (2006). Systematic review: impact of health information technology on quality, efficiency and costs of medical care. *Annals of Internal Medicine,* 144, E12-22. http://doi.org/10.7326/0003-4819-144-10-200605160-00125

Chawurura, T., Manhibi, R., Dijk, J., & Van Stam, G. (2019). eHealth in Zimbabwe, a Case of Techno-Social Development. In: *Information and Communication Technologies for*

*Development. Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D* (pp.15-26). http://doi.org/10.1007/978-3-030-18400-1_2

Chen, J. (2020). *Social media demographics to inform your brand's strategy in 2020*. https://sproutsocial.com/insights/new-social-media-demographics/

Cheng, B., Alexandr, K., & Marina, P. (2018). Electronic Health Records in the United States and Russia: Challenges and Opportunities for Collaborative Leadership. *Stanford US-Russia Forum Research Journal*, *9*(1), 23-35.

Chiasson, M. W., & Davidson, E. (2004). Pushing the contextual envelope: Developing and diffusing IS theory for health information systems research. *Information and Organisation, 14*(3), 155–188.

Chih-Hui, L., & Sapphire, L. (2017). Systems theory. In C.R. Scott, & L. Lewis (Eds.), *The International Encyclopedia of Organisational Communication* (pp. 1-18). John Wiley & Sons. http://doi.org/10.1002/9781118955567

Chikonzo, A. (2005). Librarians and the use of information communication technologies in the provision of HIV/AIDS information in developing countries. *World Library and Information Congress: 71th IFLA General Conference and Council*. 14th - 18th August 2005. Oslo. http://archive.ifla.org/IV/ifla71/papers/101e-Chikonzo.pdf

Chikuni, D. S. (2016). Potential/preparedness of e-health services in Zimbabwe. *International Journal of Research in IT and Management*, *6*(1), 26–30.

Chilundo, B., & Aanestad, M. (2004). Negotiating multiple rationalities in the process of integrating the information systems of disease-specific health programmes. *The Electronic Journal of Information Systems in Developing Countries, 20*(2), 1–28.

Chismar, W. G., & Wiley-Patton, S. (2003). Does the extended technology acceptance model apply to physicians. In System Sciences, 2003. *Proceedings of the 36th Annual Hawaii International Conference on (pp. 8-16).* http://doi.org/10.1.1.97.9056

Choo, C.W. (2006). *The knowing organisation*. Oxford University Press.

Chou, W. S., Hunt, Y. M., Beckjord, E. B., Moser, R. P., & Hesse, B. W. (2009). Social media use in the United States: implications for health communication. *Journal of Medical Internet Research, 11*(4), e48. http://doi.org/10.2196/jmir.1249

Chowdhury, N. (2000). *Information and Communications Technologies and IFPRI's mandate: a conceptual framework*. http://www.ifpri.org/divs/cd/dp/ictdp01.pdf

Chu, A., Phommavong, C., Lewis, J., Braa, J., & Senyoni, W. (2018). *Applying ICT to Health Information Systems (HIS) in Low Resource Settings: Implementing DHIS2 as an Integrated Health Information Platform in Lao PDR.* https://link.springer.com/chapter/10.1007/978-3-319-59111-7_44

Cisco Systems. (2007). *What Is Cisco SONA?* https://www.cisco.com/c/dam/global/it_it/solutions/ent/tecnologie/routing/pdf/sona.pdf

Cisco Systems. (2021). *How Cisco IT uses SONA Framework to optimize network capabilities*. https://www.cisco.com/c/dam/en_us/about/ciscoitatwork/downloads/ciscoitatwork/pdf/Cisco_IT_Case_Study_SONA.pdf

Clarke, M. A., Belden, J. L., Koopman, R. J., Steege, L. M., Moore, J. L., Canfield, S. M., & Kim, M. S. (2013). Information needs and information-seeking behaviour analysis of primary care physicians and nurses: a literature review. *Health Information & Libraries Journal*. *30*(3), 178-190. http://doi.org/10.1111/hir.12036.

Cline, R.J., & Haynes, K.M. (2001). Consumer health information seeking on the Internet: the state of the art. *Health Education Research*, *16*(6), 671–692.

Cloud Standards Customer Council. (2017). *Impact of cloud computing on healthcare.* https://www.omg.org/cloud/deliverables/CSCC-Impact-of-Cloud-Computing-on-Healthcare.pdf

Collins, S.A., Vawdrey, D.K., Kukafka, R., & Kuperman, G.J. (2011). Policies for patient access to clinical data via PHRs: current state and recommendations. *Journal of the American Medical Informatics Association,* 18 (Supplement 1), i2–i7. http://doi.org/10.1136/amiajnl-2011-000400

Colombani, F., Sibé, M., Kret, M., Quintard, B., Ravaud, A., & Saillour-Glénisson, F. (2019). EPOCK study protocol: a mixed-methods research program evaluating cancer care coordination nursing occupations in France as a complex intervention. *BMC Health Services Research, 19*(483). https://doi.org/10.1186/s12913-019-4307-7.

Compeau, D., & Higgins, C. A. (1995). Computer Self-Efficacy: Development of a Measure and Initial Test. *MIS Quarterly*, *19*(2), 189-211.

Congressional Budget Office. (2008). *Evidence on the Costs and Benefits of Health Information Technology*. Congressional Budget Office, Washington, D.C.

Cooper, D.R., & Schindler, P.S. (2011). *Business research methods* (11th ed.). McGraw-Hill/Irwin.

Corder, G. W., & Foreman, D. I. (2009). *Nonparametric Statistics for Non-Statisticians*. John Wiley & Sons.

Cordon, C. P. (2013). System theories: an overview of various system theories and its application in healthcare. *American Journal of Systems Science*, 2(1), 13-22. http://doi.org/10.5923/j.ajss.20130201.03

Coye, M., Ateret, J., Haselkorn, A., & DeMello, S. (2009). Remote patient management: Technology-enabled innovation and evolving business models for chronic disease care. *Health Affairs, 28*(1), 126-135.

Cressman, D. (2009). *A Brief Overview of Actor-Network Theory: Punctualization, Heterogeneous Engineering & Translation* https://dphu.org/uploads/attachements/books/books_2726_0.pdf

Cresswell, K. M., Bates, D. W., Sheikh, A. (2013). Ten key considerations for the successful implementation and adoption of large-scale health information technology. *Journal of the American Medical Informatics Association,* 20(e1), e9–e13. http://doi.org/10.1136/amiajnl-2013-001684

Creswell, J. W. (2003). *Designing and Conducting Mixed Methods Research* (2nd ed.). Sage.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Sage.

Creswell, J. W. (2009). *Research design: qualitative, quantitative, and mixed methods approaches* (3rd ed.). Sage.

Creswell, J. W. (2012). *Educational research: planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). NJ: Pearson Education.

Creswell, J. W. (2013). *Qualitative inquiry and research design: choosing among five approaches* (3rd ed.). Sage.

Creswell, J. W. (2014). *Research design: qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Sage.

Cubbage, J. (2014). African Americans and social media. In K. Langmia, T. C. Tyree, P. O'Brien, & I. Sturgis (Eds,). *Social media: Pedagogy and practice* (pp. 103-127). University Press of America.

Curry, L., & Numez-Smith, M. (2015). *Mixed methods in health sciences research: a practical primer*. Sage.

D'Adamo, M., Fabic, M. S., & Ohkubo S. (2012). Meeting the health needs of healthcare professionals: what have we learned? *Journal of Health Communication*, *17* (Supplement 2), 23–29. https://doi.org/10.1080/10810730.2012.666626

Databerry. (2021). *Why are databases important in healthcare?* https://www.databerry.com/news/why-are-databases-important-in-healthcare/

Davidson, E., Baird, A., & Prince, K. (2018). Opening the envelope of health care information systems research. *Information and Organisation*, *28*, 140–151 https://doi.org/10.1016/j.infoandorg.2018.07.001

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-339.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*, 982-1003. http://dx.doi.org/10.1287/mnsc.35.8.982

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace1. *Journal of Applied Social Psychology*, *22*(14), 1111-1132.

Davis, J. (2015). *Health IT outsourcing: a rising priority*. https://www.healthcareitnews.com/news/health-it-outsourcing-rising-priority

Dawber, J., Crow, N., Hulcombe, J., & Mickan, S. (2017). *A realist review of allied health management in Queensland Health: what works, in which contexts and why*. State of

Queensland (Queensland Health). https://www.health.qld.gov.au/__data/assets/pdf_file/0024/691431/ah-mgmt-in-qh.pdf

De Benedictis, A., Lettieri, E., Masella, C., Gastaldi, L., Macchini, G., Santu C., & Tartaglini, D. (2019). WhatsApp in hospital? An empirical investigation of individual and organisational determinants to use. *PLoS ONE. 14*(1), e0209873. http://doi.org/10.1371/journal.pone.0209873

De la Torre Díez, I., Martínez-Pérez, B., & Lopez-Coronado, M. (2013). Analyzing open-source and commercial EHR solutions from an international perspective. *Proceedings of the 15th International Conference on E-Health Networking, Application & Services (IEEE Healthcom*, Lisboa, Portugal. http://doi.org/10.1109/HealthCom.2013.6720708

De Rosis, S., & Seghieri, C. (2015). Basic ICT adoption and use by general practitioners: an analysis of primary care systems in 31 European countries. *BMC Medical Informatics and Decision Making, 15*(70) http://doi.org/10.1186/s12911-015-0185-z

Deane, P. (2018). *A guide for interdisciplinary researchers: Adding axiology alongside ontology and epistemology*. https://i2insights.org/2018/05/22/axiology-and-interdisciplinarity/.

Deetjen, U. (2016). European e-prescriptions: benefits and success factors. http://www.politics.ox.ac.uk/materials/publications/15224/workingpaperno5ulrikedeetjen.pdf

Dekker, S. W., & Leveson, N. G. (2014). The bad apple theory won't work: response to 'Challenging the systems approach: why adverse event rates are not improving' by Dr Levitt. *BMJ Quality & Safety, 23*(12), 1050-1051. http://doi.org/10.1136/bmjqs-2014-003585

DeLone, W.H., & McLean, E.R. (1992). Information systems success: the quest for the dependent variable. *Information Systems Research*, 3(1), 60–95.

DeLone, W.H., & McLean, E.R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

Demergazzi, S., Pastore, L., Bassani, G., Arosio, M., & Lonati, C. (2020). Information Needs and Information-Seeking Behavior of Italian Neurologists: Exploratory Mixed Methods Study. *Journal of Medical Internet Research, 22*(4), e14979. http://doi.org/10.2196/14979

Dery, S., Vroom, F. C., Godi, A., Afagbedzi, S., & Dwomoh, D. (2016). Knowledge and use of information and communication technology by health sciences students of the University of Ghana. *Ghana Medical Journal, 50*(2), 180-188. http://doi.org/10.4314/gmj.v50i3.10

Dijkema, S. E. (2016). *The Interpretative flexibility of smart Wearables*. (Unpublished master's thesis) https://dspace.library.uu.nl/bitstream/.../Master%20Thesis%20S.E.%20Dijkema.pdf

Diviani, N., Van den Putte, B., Giani, S., & Van Weert, J. C. (2015). Low health literacy and evaluation of online health information: a systematic review of the literature. *Journal of medical Internet research*, *17*(5), e112. http://doi.org/10.2196/jmir.4018

Djordjevic, B., Spirtovic, O., & Acimovic, D. (2016). Social Constructivism and Technology. *International Journal of Business and Social Science*, *7*(11), 178-189.

Doolin, W. R., & Lowe, A. D. (2002). To reveal is to critique: actor-network theory and critical information systems research. *Journal of technology*, 17, 69-78. http://doi.org/10.1080/02683960210145986

Dubow, J., & Chetley, A. (2011). *Improving health, connecting people: the role of ICTs in the health sector of developing countries*. http://www.healthlink.org.uk

Dudovskiy, J. (2018). *The Ultimate Guide to Writing a Dissertation in Business Studies: A Step-by-Step Assistance.* https://research-methodology.net/about-us/ebook

Easterby-Smith, M., Thorpe, R., & Jackson, P. (2008). *Management Research*. Sage.

Edelstein, P. (2017). Top trends in health information & communications technology for 2017. https://www.elsevier.com/connect/top-trends-in-health-information-and-communications-technology-for-2017

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *The Academy of Management Journal*, *50*(1), 25-32.

EKOS research associates. (2007). Electronic health information and privacy survey: what Canadians think — 2007. https://www.infoway-inforoute.ca/en/component/edocman/resources/reports/privacy/14-ekos-survey-on-electronic-health-information-and-privacy-full

Erlirianto, L. M., Ali, A. H. N., & Herdiyanti, A. (2015). The Implementation of the Human, Organisation, and Technology–Fit (HOT–Fit) Framework to evaluate the Electronic Medical Record (EMR) System in a Hospital. *Procedia Computer Science*, *72*(1), 580 – 587. http://doi.org/10.1016/j.procs.2015.12.166

Evans, B. C., Coon, D. W., & Ume, E. (2011). Use of theoretical frameworks as a pragmatic guide for mixed methods studies a methodological necessity? *Journal of Mixed Methods Research*, *5*(4), 276–292. http://doi.org/10.1177/1558689811412972

Eysenbach, G., & Diepgen, T. (1998). Towards quality management of medical information on the internet: evaluation, labelling, and filtering of information. *British Medical Journal*, *317*,1496–1500.

Fehse, K., Krabbendam, K., & Boer, H. (2002). The role of politics in the implementation of information systems: a hospital case. *International Journal of Healthcare Technology and Management*, *4*(3), 1-16. http://doi.org/10.1504/IJHTM.2002.001139

Fincham, J.E. (2008). Response rates and responsiveness for surveys, standards, and the journal. *American Journal of Pharmaceutical Education*, *72*(2), 43–47. http://doi.org/10.5688/aj720243

Fiorio, C. V., Gorli, M., & Verzillo, S. (2018). Evaluating organisational change in health care: the patient-centered hospital model. *BMC Health Services Research*, *18*(1), 95. http://doi.org/10.1186/s12913-018-2877-4

Flanagin, A. J., & Metzger, M. J. (2008). Digital Media and Youth: Unparalleled Opportunity and Unprecedented Responsibility. In M. J. Metzer., & A. J, Flanagin (Eds.), *Digital Media, Youth, Credibility* (p.5). The John D. Catherine T. MacArthur Foundation Series on Digital Media and Learning. MIT Press.

Flick, U. (2014). *An Introduction to Qualitative Research*. (5th ed.). Sage.

Fogelson, N. S., Rubin, Z. A., & Ault, K. A. (2013). Beyond likes and tweets: an in-depth look at the physician social media landscape. *Clinical Obstetrics and Gynecology*, *56*(3), 495-508. http://doi.org/10.1097/GRF.0b013e31829e7638

Font, V. M. (2021). *Principle for system development: the context of systems analysis and design*. https://ultimatesdlc.com/sdlc-principles

Food and Agriculture Organisation. (2020). *Information and Communication Technologies (ICT)*. http://aims.fao.org/information-and-communication-technologies-ict

Furusa, S.S., & Coleman, A. (2018). Factors influencing e-health implementation by medical doctors in public hospitals in Zimbabwe. *South African journal of Information Management*, *20*(1), a928. http://doi.org/10.4102/sajim.v20i1.928

Gahtani, S. S., Hubona, G. S., & Wang, J. (2007). Information technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT. *Information & Management*, *44*, 681-691.

Gandhi, T. K., Weingart, S. N., Seger, A. C., Borus, J., Burdick, E., Poon, E. G., Leape, L. L., & Bates, D.W. (2005). Outpatient prescribing errors and the impact of computerized prescribing. *Journal of General Internal Medicine*, *20*(9), 837–841. http://doi.org/10.1111/j.1525-1497.2005.0194.x

Gao, S. (2010). *Advanced Health Information Sharing with Web-Based GIS*. (Unpublished PhD, University of New Brunswick). https://www.collectionscanada.gc.ca/obj/thesescanada/vol2/002/NR82752.PDF?oclc_number=896786630

Geers, B., & Page, S. (2007). *ICT for Mitigating HIV/AIDS in Southern Africa* (2nd ed.). Spider. https://spider1.blogs.dsv.su.se/wp-content/blogs.dir/362/files/2016/11/Spider-ICT4D-series-1-ICT-for-mitigating-HIV-AIDS-in-southern-Africa.pdf

Geissbuhler, A. (2013). Lessons learned implementing a regional health information exchange in Geneva as a pilot for the Swiss national e-health strategy. *International Journal of Medical Informatics*, *82*(5), E118–E124. http://doi.org/10.1016/j.ijmedinf.2012.11.002

George, D. R., Rovniak, L. S., & Kraschnewski, J. L. (2013). Dangers and opportunities for social media in medicine. *Clinical Obstetrics and Gynecology*, *56*(3), 453-462. http://doi.org/10.1097/GRF.0b013e318297dc38

Gergen, K. (2001). Psychological science in a postmodern context. *American Psychologist*, 56, 803-813.

Ghia, C. J., Patil, A. S., Ved, J. K., & Jha, R. K. (2013). Benefits of telemedicine and barriers to its effective implementation in rural India: a multicentric E-survey. *Indian Medical Gazette, 146*, 1 – 7.

Gibbs, G.R. (2007). Analyzing qualitative data. Sage. https://dx.doi.org/10.4135/9781849208574

Gichoya, D. (2005). Factors affecting the successful implementation of ICT projects in government. *The Electronic Journal of e-Government, 3*(4), 175-184.

Gilhooly, D. (2005). Innovation and investment: information and communication technologies and the Millennium Development Goals. UN ICT Task Force. http://www.unicttaskforce.org/perl/documents.pl?do=download;id=844 .

Gill, J., & Johnson, P. (2010*). Research Methods for Managers* (4th ed.). Sage.

Girma, S., Alenko, A., & Agenagnew, L. (2020). Knowledge and precautionary behavioural practice toward COVID-19 among health professionals working in public university hospitals in Ethiopia: A Web-Based Survey. *Risk Management and Healthcare Policy, 13,*1327-1334. http://doi.org/10.2147/RMHP.S267261

Giuseppe, A., Valerio, P., & Antonio, P. (2018). The role of Information and Communication Technologies in Healthcare: Taxonomies, Perspectives, and Challenges. *Journal of Network and Computer Applications, 107*(1), 125-154.

Godlee F., Pakenham-Walsh, N., Ncayiyana, D., Cohen, B., & Parker, A. (2004). Can we achieve health information for all by 2015. *The Lancet, 364*(9430), 295-300.

Gold, J., Lim, M. S., Hocking, J. S., Keogh, L.A., Spelman, T., & Hellard M. E. (2011). Determining the impact of text messaging for sexual health promotion to young people. *Sexually Transmitted Diseases*, *38*(4), 247-252.

Gomes, C., & Coustasse, A. (2015). Tweeting and treating: how hospitals use Twitter to improve care. *Health Care Manager*, *34*(3), 203-214. http://doi.org/10.1097/HCM.0000000000000063

Gordon, D. (2013). *The Mobile Phone: Effective New Weapon in HIV Prevention.* https://www.theaidsreader.com/articles/mobile-phone-effective-new-weapon-hiv-prevention

Gough, A., Hunter, R. F., Ajao, O., Jurek, A., McKeown, G., Hong, J., Barrett, E., Ferguson, M., McElwee, G., McCarthy, M., & Kee, F. (2017). Tweet for behavior change: Using social media for the dissemination of public health messages. *JMIR Public Health Surveillance*, *3*(1), e14. http://doi.org/10.2196/publichealth.6313

Government Accountability Office. (2005). *Health care: Continued leadership needed to define and implement information technology standards*. *GAO-05-1054T*, GAO, Washington, D.C.

Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: creating the blueprint for your "house". *Administrative issues journal: connecting education, practice and research, 4*(2), 12-26.

Greene, J. C. (2007). *Mixed methods in social inquiry*. Jossey-Bass.

Greenhalgh, T., Morris, L., Wyatt, J. C., Thomas, G., & Gunning, K. (2013). Introducing a nationally shared electronic patient record: case study comparison of Scotland, England Wales and Northern Ireland. *International Journal of Medical Informatics, 82*(5), e125-38. http://doi.org/10.1016/j.ijmedinf.2013.01.002

Gund, A., Lindecrantz, K., Schaufelberger, M., Patel, H., & Sjöqvist, B. (2012). Attitudes among healthcare professionals towards ICT and home follow-up in chronic heart failure care. *BMC medical informatics and decision making*, *12*(1), 1-12. http://doi.org/10.1186/1472-6947-12-138

Gutiérrez-Ibarluzea, I., Chiumente, M., & Dauben, H. P. (2017). The life cycle of health technologies, challenges and ways forward. *Frontiers in Pharmacology*, *8*,14. http://doi.org/10.3389/fphar.2017.00014

Gwandure, C., & Mayekiso T. (2013). The Impact of Dwindling Donor Funding on HIV and AIDS Projects in Sub-Saharan Africa. *Insight, 42*(4) https://www.ajol.info/index.php/ai/article/view/87668

Haider, S. (2019). Information technology systems in public health and clinical care: some Punjub Information Technology Board initiatives. *Annals of King Edward Medical University, 25*. https://doi.org/10.21649/akemu.v25iS

Hamilton, B. A. (2005). *Geospatial interoperability return on investment study*. National Aeronautics and Space Administration Geospatial Interoperability Office. http://lasp.colorado.edu/media/projects/egy/files/ROI_Study.pdf

Hammond, E. (2008). *A perspective on interoperability*. Paper presented at the conference on Making the e-Health Connection: Global Partnerships, Local Solutions, The Rockefeller Foundation, Bellagio Italy, July 2008. http://ehealth-connection.org/.

Hanif, F., Read, J. C., Goodcare, J. A., Chaudhry, A., & Gibbs, P. (2009). The role of quality tools in assessing reliability of the Internet for health information. *Informatics for Health and Social Care, 34*(4), 231-243.

Haque, M., Emerson, S. H., Dennison, C. R., Navsa, M., & Levitt, N. S. (2005). Barriers to initiating insulin therapy in patients with type 2 diabetes mellitus in public-sector primary health care centres in Cape Town. *Southern African Medical Journal*, *95*(10), 798-802.

Hardey, M. (2008). Public health and web 2.0. *Journal of Royal Society of Health,*128, 171–179.

Harerimana, A., & Mtshali, N. G. (2019). Types of ICT applications used and the skills' level of nursing students in higher education: A cross-sectional survey. *International Journal of Africa Nursing Sciences*, *11*(1), 1-15. http://doi.org/10.1016/j.ijans.2019.100163

Harty, C. (2005). Innovation in construction: A sociology of technological approach. *Building Research & Information, 33* (6), 512-522.

Haux, R., Howe, J. Marschollek, M., Plischke, M., & Wolf, K.H. (2008). Health-enabling technologies for pervasive health care: on services and ICT architecture paradigms. *Informatics for Health & Social Care*, *33*(2), 77 – 89.

Hawkes, B. (2007). Data Protection Guidelines on research in the Health Sector. https://www.dataprotection.ie/documents/guidance/Health_research.pdf

Hayajneh, Y. (2007). Management for healthcare series: System and system theory. *Management of health care professional series, 1 - 5.* http://www.hayajneh.org/a/readings/systems-Theory.pdf

Hazzam, J., & Lahrech, A. (2018). Health care professionals' social media behavior and the underlying factors of social media adoption and use: quantitative study. *Journal of Medical Internet Research*, *20*(11), e12035. http://doi.org/10.2196/12035

Heale, R., & Twycross, A. (2015). Validity and Reliability in Quantitative Studies. *Evidence Based Nursing*, *18*(4), 66-67.

Healthcare Information and Management Systems Society. (2008). HIMSS analytics report: security of patient data. *Journal of Healthcare Protection Management*, *24*(2), 14-26.

Hernandez-Avila, J. E., Palacio-Mejia, L. S., Lara-Esqueda, A., Silvestre, A., Agudelo-Botero, M., Diana, M. L., Hotchkiss, D.R., Plaza, B., & Parbul, A. S. (2013). Assessing the process of designing and implementing electronic health records in a state wide public health system: the case of Colima, Mexico. *Journal of the American Medical Informatics Association*, *20*(2), 238–244. http://doi.org/10.1136/amiajnl-2012-000907

Higgins, O., Sixsmith, J., Barry, M. M. & Domegan, C. (2011). *A literature review on health information seeking behaviour on the web: a health consumer and health professional perspective.* Stockholm: ECDC. https://www.ecdc.europa.eu/sites/default/files/media/en/publications/Publications/Literature%20review%20on%20health%20information-seeking%20behaviour%20on%20the%20web.pdf.

Hilao, M. P., & Wichadee, S. (2017). Gender differences in mobile phone usage for language learning, attitude, and performance. *Turkish Online Journal of Distance Education-TOJDE,* 18(2), 68-79.

Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, S., & Taylor, R. (2005). Can electronic medical record systems transform medical care? Potential health benefits, savings and costs. *Health Affairs*, *24*(5), 1103-1118.

Himss Analytics. (2010). *The 2010 HIMSS Analytics Report: Security of Patient Data Technical Report.* https://www.kroll.com/-/media/kroll/pdfs/publications/himss-analytics-report-2010.pdf

Hofmann, B. (2002). Is there a technological imperative in health care? *International Journal of Technology Assessment in Health Care, 18*(3), 675-689.

Holden, R. J., & Karsh, B. T. (2010). The technology acceptance model: its past and its future in health care. *Journal of Biomed Information, 43*,159–172.

Househ, M. (2013). The use of social media in healthcare: organisational, clinical, and patient perspectives. *Studies in Health Technology and Informatics*, 183(1), 244-248.

Hughes, B., Joshi, I., Lemonde, H., & Wareham, J. (2009). Junior physician's use of Web 2.0 for information seeking and medical education: a qualitative study. *International Journal of Medical Informatics, 78*(10), 645-655. http://doi.org/10.1016/j.ijmedinf

Hughes, B., Wareham, J., & Joshi, I. (2010). Doctors' online information needs, cognitive search strategies, and judgments of information quality and cognitive authority: how predictive judgments introduce bias into cognitive search models. *Journal of the American Society for Information Science and Technology, 61*, 433–452. http://doi.org/10.1002/asi.21245

Hughes, D., Rowe, M., Batey, M., & Lee, A. (2012). A tale of two sites: Twitter vs Facebook and the personality predictors of social media usage. *Computers in Human Behavior, 28*(2), 561–569. http://doi.org/10.1016/j.chb.2011.11.001

Humphreys, L. (2005). Reframing social groups, closure, and stabilization in the social construction of technology. *Social epistemology, 19*(2-3), 231-253.

Hunt, A., Matthew, G., & Chuan, Y. (2018). Trends in the Diffusion of Misinformation on Social Media. https://web.stanford.edu/~gentzkow/research/fake-news-trends.pdf .

Idemudia, E., Raisinghani, M. S., Adeola, O., & Achebo, N. (2017). The effects of gender on social media adoption the effects of gender on the adoption of social media: an empirical investigation. *Proceedings of the Twenty-third Americas Conference on Information Systems*, Boston. https://www.researchgate.net/publication/319130496_The_Effects_of_Gender_On_Social_Media_Adoption_The_Effects_of_Gender_On_The_Adoption_of_Social_Media_An_Empirical_Investigation#fullTextFileContent

INDEPTH Network. (2013). INDEPTH Data Repository. https://indepth-ishare.org/index.php/catalog/central/about

Information-technology Promotion Agency. (2012). *The Seventeen principles for system development a "Cho-joryu" approach*. https://www.ipa.go.jp/files/000009684.pdf

Ingwersen, P., & Jarvelin, K. (2005). *The turn: integration of information seeking and retrieval in context*. Springer.

Institute of Medicine. (2001). *Crossing the Quality Chasm: A New Health System for the 21st Century*. National Academy Press.

Islam, N. (2016). *The use of Information and Communication Technology (ICT) and business management: Contemporary issues and challenges*. https://doi.org/10.2139/ssrn.2856262

Iyamu, T. (2020). A framework for selecting analytics tools to improve healthcare big data usefulness in developing countries. *South African Journal of Information Management 22*(1), a1117. https://doi.org/10.4102/sajim.v22i1.1117 .

Jackson, F. S., Perkins, F., Khandor, E., Cordwell, L., Hamann, S., & Buasai, S. (2006). Integrated health promotion strategies: a contribution to tackling current and future health challenges. *Health Promotion International, 21*(supplement 1), 75-83.

Jeffery, R., Navarro, T., Lokker, C., Haynes, R.B., Wilczynski, N. L., & Farjou, G. (2012). How current are leading evidence-based medical textbooks? An analytic survey of four

online textbooks. *Journal of Medical Internet Research, 14*(6), e175. http://doi.org/10.2196/jmir.2105

Jeppsson, A., Östergren, O., & Hagström, B. (2013). Restructuring a ministry of health–an issue of structure and process: a case study from Uganda. *Health Policy Plan*, *18*(1), 68-73. http://doi.org/10.1093/heapol/18.1.68

Ji, X., Chun, S. A., Cappellari, P., & Geller, J. (2017). Electronic medical records and health care. *Journal of Information Science, 43*(2), 221-245 http://doi.org/10.1177/0165551515625029

Jones, K., Eathington, P., Baldwin, K., & Sipsma H. (2014). The impact of health education transmitted via social media or text messaging on adolescent and young adult risky sexual behavior: a systematic review of the literature. *Sexually Transmitted Diseases, 41*(7), 413–9. http://doi.org/10.1097/OLQ.0000000000000146

Juniper Networks. (2021). *What is multicloud?* https://www.juniper.net/us/en/products-services/what-is/multicloud

Kaerasora, G. (2017). *Health facilities go paperless.* The Sunday Mail. http://www.sundaymail.co.zw/health-facilitiesgo-paperless/.

Kahouei, M., Farrokhi, M., Abadi, Z.N., & Karimi, A. (2016). Concerns and hopes about outsourcing decisions regarding health information management services at two teaching hospitals in Semnan, Iran. *Health Information Management Journal*, *45*(1), 36-44. http://doi.org/10.1177/1833358316639455

Kamau, N., & Ouma, S. (2009). *The impact of E-resources in the provision of health and medical information services in Kenya*. Nairobi: Kenya Medical Research Institute http://www.icml9.org/program/track1/public/documents/Nancy%20Kamau-164845.doc

Kankanhalli, A., Hahn, J., Tan, S. & Gao, G. (2016). Big data and analytics in healthcare: Introduction to the special section. *Information Systems Frontiers, 18*(2), 233–235. https://doi.org/10.1007/s10796-016-9641-2

Kaplan, A., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, 53(1), 59–68. http://doi.org/10.1016/j.bushor.2009.09.003

Kaplan, B., & Shaw, N. (2002). People, organisational and social issues: Evaluation as an Exemplar. *Yearbook of Medical Infomatics*, 63-76.

Karim, A. (2011). The significance of management information systems for enhancing strategic and tactical planning. *Journal of Information Systems and Technology Management, 8*(2) http://dx.doi.org/10.1590/S1807-17752011000200011

Kawonga, M., Blaauw, D., & Fonn, S. (2016). The influence of health system organisational structure and culture on integration of health services: the example of HIV service monitoring in South Africa. *Health Policy and Planning*, *31*(9), 1270–1280. http://doi.org/10.1093/heapol/czw061

Kelly, C., & William. T. (2014). Point and Counterpoint: Patient Control of Access to Data in Their Electronic Health Records. *Journal of general internal medicine, 30* (Supplement 1), 38–41. http://doi.org/10.1007/s11606-014-3061-0

Khajouei, R., & Abbasi, R. (2017). Evaluating nurses' satisfaction with two nursing information systems. *Computers, Informatics, Nursing, 35*(6), 307-314. http://doi.org/10.1097/CIN.0000000000000319

Khalifa, M. (2013). Barriers to Health Information Systems and Electronic Medical Records Implementation A Field Study of Saudi Arabian Hospitals. *Procedia Computer Science, 21*(1), 335 – 342. http://doi.org/10.1016/j.procs.2013.09.044

Khalifa, M. (2017). Perceived benefits of implementing and using hospital information systems and electronic medical records. *Studies in Health Technology and Informatics, 238*, 165-168.

Khumalo, N. B., Dube, A., Mnjama, N. (2017). The role of records management professionals in the national health information system and e-health in hospitals in Bulawayo, Zimbabwe. *ESARBICA Journal: Journal of the Eastern and Southern Africa Regional Branch of the International Council on Archives, 36*(1), 47-63). https://www.ajol.info/index.php/esarjo/article/view/162306.

Kikoba, B. (2018). *Health Information System integration approaches: a case of EMR and DHIS2 Tanzania*. https://www.grin.com/document/437199

Kim, S. S., & Malhotra N. K. (2005). A longitudinal model of continued is use: an integrative view of four mechanisms underlying post-adoption phenomena. *Management Science, 51*(5), 741 -755.

Kinyua, F., Kiptoo, M., Kikuvi, G., Mutai, J., Meyers, A. F., Muiruri, P., & Songok, E. (2013). Perceptions of HIV infected patients on the use of cell phone as a tool to support their antiretroviral adherence; a cross-sectional study in a large referral hospital in Kenya. *BMC Public Health*, *13*, 987. http://doi.org/10.1186/1471-2458-13-987

Klein, H. K., & Kleinman, D.L. (2002). The Social Construction of Technology: Structural Considerations'Science, *Technology and Human Values, 27*(1), 28-52. http://doi.org/10.1002/jid.1719

Kostagiolas, P., Korfiatis, N., Kourouthanasis, P., & Alexias, G. (2013). Work-related factors influencing doctors search behaviors and trust toward medical information resources. *International Journal of Information Management*, *34*(2), 80–88.

Kothari, A., Boyko, J. A., Conklin, J., Stolee, P., & Sibbald, S. L. (2015). Communities of practice for supporting health systems change: a missed opportunity. *Health Research Policy and Systems, 13*(1), 2-9. http://doi.org/10.1186/s12961-015-0023-x

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement,* 30(1), 607-610.

Kreps, G. L., & Neuhauser, L. (2010). New directions in e-Health communication: opportunities and challenges. *Patient Education and Counselling, 78*(3), 329-336. http://doi.org/10.1016/j.pec.2010.01.013

Kritz, M., Gschwandtner, M., Stefanov, V., Hanbury, A., & Samwald, M. (2013). Utilization and perceived problems of online medical resources and search tools among different groups of European physicians. *Journal of Medical Internet Research*, *15*(6), e122. http://doi.org/10.2196/jmir.2436

Kriznik, N. M, Lamé, G. & Dixon-Woods, M. (2019). Challenges in making standardisation work in healthcare: lessons from a qualitative interview study of a line-labelling policy in a UK region. *BMJ Open;9*:e031771. doi:10.1136/bmjopen-2019-031771.

Kuhn, K. A., & Giuse, D. A. (2001). From hospital information systems to health information systems - problems, challenges, perspective. *Methods of Information in Medicine*, 40(4), 275-287.

Kumar, R. (2014). *Research methodology: a step-by-step for beginners* (4th ed.). Sage.

Kumar, R., Shaikh, B., Chandio, A., & Ahmed, J. (2012). Role of health management information system in disease reporting at a rural district of Sindh . *Pakistan Journal of Public Health*, *2*(2), 10–12.

Kumar, V. (2011). Impact of health information systems on organisational health communication and behavior. *The Internet Journal of Allied Health Sciences and Practice*, *9*(2), Article 8.

Kuo, K. M., Liu, C.F., Talley, P. C., & Pan, S. Y. (2018). Strategic improvement for quality and satisfaction of hospital information systems. *Journal of Healthcare Engineering, 2018*, 3689618. http://doi.org/10.1155/2018/3689618

Kureya, T., Chadambuka, E., Mhlanga, M., Ndaimani, A., & Makoni, P. (2017). An evaluation of the Malaria Surveillance System of Chipinge District, Manicaland Province. *International Journal of Health Sciences & Research, 7*(11), 197-209.

Laki, D. G. (2016). Factors influencing health information-seeking behavior among health care providers at health facilities in Tanga region: a case study of Muhef Project. *Universal Journal of Public Health*, *4*(6), 279-297. http://doi.org/10.13189/ujph.2016.04

Lalband, N., & Kavitha, D. (2019). Software Engineering for Smart Healthcare Applications. *International Journal of Innovative Technology and Exploring Engineering (IJITEE), 8*(6S4), 325-331.

Lancaster, G. (2005). *Research Methods in Management: A concise introduction to research in management and business Consultancy.* Elsevier Butterworth-Heinemann.

LaPelle, N. R., Luckmann, R., Simpson, E. H., & Martin, E. (2006). Identifying strategies to improve access to credible and relevant for public HPs: a qualitative study. BMC Public Health, *6*(1), 89-93. http://doi.org/10.1186/1471-2458-6-89

Latour, B. (1987). *Science in Action*. Harvard University Press.

Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford University Press.

Laudon, K. C., & Laudon, J. P. (2014). *Management information systems: managing the digital firm*. Pearson Education Limited.

Law, J. (2008). Actor-network theory and material semiotics. In B. Turner (Ed.). *The new Blackwell companion to social theory* (pp. 141-158). Wiley-Blackwell.

Lee, L. M., Teutsch, S. M., Thacker, S. B., & Louis, M. E. (2010). *Principles and practice of public health surveillance.* Oxford University Press.

LeMay, N. V., & Bocock, P. J. W. (2012). Building a national model for knowledge exchange in Malawi: findings from a health information needs assessment. *Journal of Health Communication*, *17*(2), 64–78. http://doi.org/10.1080/10810730.2012.666623

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). *Social Media and Mobile Internet Use Among Teens and Young Adults*. Washington, DC: Pew Internet & American Life Project. http://www.pewinternet.org/files/old-media//Files/Reports/2010/PIP_Social_Media_and_Young_Adults_Report_Final_with_toplines.pdf

Leonardi, P. M., & Barley, S. R. (2010). What's under construction here? Social action, materiality, and power in constructivist studies of technology and organizing. *Academy of Management Annals*, *4*(1), 1-51.

Lepore, L., Metallo, C., Schiavone, F., & Landriani, L. (2018). Cultural orientations and information systems success in public and private hospitals: preliminary evidences from Italy. *BMC Health Services Research, 18,* 554. http://doi.org/10.1186/s12913-018-3349-6

Levine, C. (2008). *Rough crossings: Family caregivers' odysseys through the health care system*. United Hospital Fund

Lewis, D., Hodge, N., Gamage, D., & Whittaker, M. (2012). Understanding the role of technology in health information systems. *Pacific Health Dialog, 18,* 144–54.

Lewis, J. L., & Sheppard, S. R. J. (2006). Culture and communication: can landscape visualization improve forest management consultation with indigenous communities? *Landscape and Urban Planning*, *77*(3), 291–313.

Li, Y. (2016). *Expatriate manager's adaption and knowledge acquisition: personal development in multi-national companies in China*. Springer Publications.

Lialiou, P., & Mantas, J. (2016). Online information seeking behaviour by nurses and physicians: a cross-sectional study. *Studies in Health Technology and Informatics,* 225, 33-37.

Liang, X., Yang, J., Abdullah, A. S., He, Z., & Yang, L. (2020). The Evaluation of the effect of ICT in HIV prevention in the general population in China based on an information-motivation-behavioral skill model. *BioMed Research International* (e-journal). https://doi.org/10.1155/2020/8786467

Lin, H. C., Chiou, J. Y., Chen, C. C., & Yang, C. W. (2016). Understanding the impact of nurses' perception and technological capability on nurses' satisfaction with nursing information system usage: A holistic perspective of alignment. *Computers in Human Behavior*, 57(1), 143-152. http://doi.org/10.1016/j.chb.2015.12.001

Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences revisited. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (4th ed., pp. 97–128). Sage.

Littlejohn, S. W., & Foss, K. A. (2009). *Encyclopedia of Communication Theory*, Vol.1. Sage.

Liu, J. (2013). *Breaking the Mould: An Educational Perspective on Diffusion of Innovation/Unified Theory of Acceptance and Use of Technology*. https://en.wikibooks.org/wiki/Breaking_the_Mold:_An_Educational_Perspective_on_Diffusion_of_Innovation/Unified_Theory_of_Acceptance_and_Use_of_Technology

Livas, C., Delli, K., & Ren, Y. (2013). Quality evaluation of the available internet information regarding pain during orthodontic treatment. *Angle Orthodontist*, 83(3), 500–506. http://doi.org/10.2319/052512-435.1

Lorence, D., & Park, H. (2007). Gender and online health information: a partitioned technology assessment. *Health Information and Libraries Journal*, *24*(3), 204–209. http://doi.org/10.1111/j.1471-1842.2007.00712.x

Lorenzi, N. M., & Riley, R. T. (2003). Organisational ISSUES=change. *International Journal of Medical Informatics, 69*(2-3), 197-203.

Love, D. E., Luis, M., Paita, C., & Custer. W. S. (2001). Data Sharing and Dissemination Strategies for Fostering Competition in Health Care Health Services Research. *Health services research, 36* (1), 277-290.

Lupianez-Villanueva, F., Mayer, M., & Torrent, J. (2009). Opportunities and challenges of Web 2.0 within the health care systems: an empirical exploration. *Informatics for Health and Social Care, 34*(3), 117-126.

Macchiusi, L., & Trinidad, S. (2001). Information and Communication Technologies: the adoption by an Australian University. In A. Herrmann & M. M. Kulski (Eds.), *Expanding Horizons in Teaching and Learning: Proceedings of the 10th Annual Teaching Learning Forum*, February 7-9, Curtin University of Technology, Perth, Australia. http://cleo.murdoch.edu.au/confs/tlf/tlf2001/macchiusi.html

Madathil, K. C., Rivera-Rodriguez, A. J., Greenstein, J. S., & Gramopadhye, A. K. (2015). Healthcare information on YouTube: a systematic review. *Health Informatics Journal*, *21*(3), 173–194. http://doi.org/10.1177/1460458213512220

Madden, M., & Fox, S. (2008). *Riding the waves of "Web 2.0*. Washington, DC: Pew Internet Life Project. http://www.pewinternet.org/pdfs/PIP_Web_2.0.pdf

Madden, M., Lenhart, A., Cortesi, S., Gasser, U., Duggan, M., Smith, A., & Beaton, M. (2013). Teens, Social Media, and Privacy. Washington, DC: Pew Internet and American Life Project. http://www.pewinternet.org/files/2013/05/PIP_TeensSocialMediaandPrivacy_PDF.pdf

Madison, N. (2014). *Healthcare information systems: opportunities and challenges*. Book Sections/Chapters. Paper 14. http://doi.org/10.4018/978-1-4666-5888-2.ch332

Maged, N., Boulos, K., & Wheeler, S. (2007). The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education. Health

*Information and Libraries Journal*, *24*(1), 2–23. http://doi.org/10.1111/j.1471-1842.2007.00701.x/pdfv

Maggio, L. A., Aakre, C. A., Del Fiol, G., Shellum, J., & Cook, D. A. (2019). Impact of clinicians' use of electronic knowledge resources on clinical and learning outcomes: systematic review and meta-analysis. *Journal of Medical Internet Research*, *21*(7), e13315. http://doi.org/10.2196/13315

Mahomoodally, M. F. (2013). Traditional medicines in Africa: an appraisal of ten potent African medicinal plants. *Evidence-Based Complementary and Alternative Medicine,2013,* Article 617459. http://doi.org/10.1155/2013/617459

Maillet, É., Mathieu, L., & Sicotte, C. (2015). Modelling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT. *International journal of medical informatics*, *84*(1), 36–47. http://doi.org/10.1016/j.ijmedinf.2014.09.004

Majeed, M. T., & Khan, F. N. (2019). Do information and communication technologies (ICTs) contribute to health outcomes? An empirical analysis. *Quality and Quantity*, *53*(1), 183–206. https://doi.org/10.1007/s11135-018-0741-6

Maldonado, U. P. T., Khan, G. F., Moon, J., & Jeung, J. (2010). E-learning motivation and educational portal acceptance in developing countries. *Online Information Review*, *35*(1), 66-85.

Malovec, S. N., Borycki, E. M., & Kushniruk, A. W. (2015). An evaluation of health information technology outsourcing success. *Studies in Health Technology and Informatics*, *208*(1), 253-257.

Mandaza-Mapesa, N. (2016). *Health Information Technology implementation strategies in Zimbabwe*. (Unpublished PhD, Walden University). https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=3555&context=dissertations

March, M. A., Vaikosen, H. A., & Akporoghene, E. A. (2020). Information needs and seeking behaviour of nurses at Rivers State University Teaching Hospital, Port-Harcourt. *Journal of Information and Knowledge Management*, *11*(3), 63-74. http://doi.org/10.4314/iijikm.v11i3.7

Marchewka, J. T. (2003). *Information Technology Project Management*. John Wiley and Sons.

Markus, M. L., Majchrzak, A., & Gasser, L. (2002). A design theory for systems that support emergent knowledge processes. *MIS Quarterly, 26* (3), 179-212.

Marques, A., Oliveira, T., & Martins, M. O. (2011). Medical Records System Adoption in European Hospitals. *The Electronic Journal Information Systems Evaluation*, 14(1), 89-99.

Maryati, M. Y., Ray J. P., & Lampros, K. S. (2006). Towards a Framework for Health Information Systems Evaluation. *Proceedings of the 39th Hawaii International Conference on System Sciences*. http://www.researchgate.net/publication/4216197_Towards_a_Framework_for_Health_Information_Systems_Evaluation

Maryati, M., & Yusof, A. (2018). An evaluation framework for health information systems: Human, organisation and technology-fit factors (HOT-fit). *International Journal of Medical Informatics*, *7*(6), 377-385. http://doi.org/10.1016/j.ijmedinf

Masoni, M., & Guelfi, M. R. (2020). WhatsApp and other messaging apps in medicine: opportunities and risks. *Internal and Emergency Medicine*, *15*, 171–173. http://doi.org/10.1007/s11739-020-02292-5

Matingwina, T & Raju, J. (2017). An integrated framework for disseminating health information to students in Zimbabwe, *Libri*, *67*(1). http://doi.org/10.1515/libri-2016-0054

Mavambo Trust. (2021). *Background*. https://mavambotrust.org.zw/?page_id=7.

Meade, N., & Islam, T. (2006). Modelling and forecasting the diffusion of innovation: A 25-year review. *International Journal of Forecasting*, *22*, 519-545. http://dx.doi.org/10.1016/j.ijforecast.2006.01.005

Melkote, R.S., & Steeves, L. (2001). *Communication for Development in the Third World: Theory and Practice for Empowerment* (2nd ed.). Sage.

Mendis, S., Abegunde, D., Oladapo, O., Celletti, F., & Nordet P. (2004). Barriers to management of cardiovascular risk in a low-resource setting using hypertension as an entry point. *Journal of Hypertension*, 22(1), 59-64.

Meric, F., Bernstam, E.V., Mirza, N.Q., Hunt, K. K., Ames, F.C., Ross, M. I., Kuerer, H. M., Pollock, R. E., Musen, M. A., & Singletary, S. E. (2002). Breast cancer on the world wide web: cross sectional survey of quality of information and popularity of websites. *British Medical Journal*, *324* (7337), 577–581.

Mertens, D. (2009). *Transformative research and evaluation*. Guilford.

Metzger, M. J., & Flanagin, A. J. (2011). Using Web 2.0 technologies to enhance evidence-based medical information. *Journal of Health Communication*, *16*(1) 45–58. http://doi.org/10.1080/10810730.2011.589881

Meyer, M., Levine, W. C., Brzezinski, P., Robbins. J., Lai, F., Spitz, G., & Sandberg, W. S. (2005). Integration of hospital information systems, operative and peri-operative information systems, and operative equipment into a single information display. *AMIA Annual Symposium Proceedings*, 1054.

Michelsen, K., Brand, H., Achterberg, P. W., & Wilkinson, J. R. (2015). *Promoting better integration of health information systems: best practices and challenges. Copenhagen: WHO Regional Office for Europe*. (Health Evidence Network (HEN) synthesis report). https://www.euro.who.int/data/assets/pdf_file/0003/270813/Promoting-better-integration-of-HIS-best-practices-and-challenges.pdf

Mikalef, P., Kourouthanassis, P. E., & Pateli, A. G. (2017). Online information search behaviour of physicians. *Health Information and Libraries Journal*, 34(1), 58-73. http://doi.org/10.1111/hir.12170

Mills, A.J., Durepos, G., & Wiebe, E. (2010). *Multiple-Case Designs*. Encyclopedia of Case Study Research. https://dx.doi.org/10.4135/9781412957397.n216

Mills, J., Bonner, A., & Francis, K. (2006). The Development of Constructivist Grounded Theory. *International Journal of Qualitative Methods*, *5*(1), 25-35. https://doi.org/10.1177/160940690600500103

Mindset. (2013). *Mindset Health encourages the use of technology to support healthcare professionals in their daily environments*. http://www.mindset.co.za/programmes/health

Ministry of Health and Child Welfare. (2014). *National Health Information Strategy 2009-2014*. http://zdhr.uz.ac.zw/xmlui/handle/123456789/1450

Ministry of Health and Child Welfare. (2020). *Validating 8 programme registers in electronic health records in UMP district.* https://apps.mohcc.gov.zw/mrs-docs/doc/Requirements/08.03.2020v2%20Validating%20Programme%20Registers%20in%20Electronic%20Health%20Records%20in%20UMP%20District_editedRTG.docx

Miranda, S., & Tarapanoff, K. M. A. (2008). Information needs and information competencies: a case study of the off-site supervision of financial institutions in Brazil. *An International Electronic Journal, 13*(2), 1-24.

Mobasheri, M., Mirzaeian, R., Sharifi-Rad, J., & Amini, A. (2014). *A comparative study of challenges and opportunities of outsourcing in health information technology*. https://www.imedpub.com/articles/a-comparative-study-of-challenges-and-opportunities-of-outsourcing-in-health-information-technology.pdf

Mohamed, K., & Osama, A. (2015). Hospital Information Systems (HIS) Acceptance and Satisfaction: A Case Study of a Tertiary Care Hospital. *Procedia Computer Science, 63*(1), 198-204. http://doi.org/10.1016/j.procs.2015.08.334

Mohammad, Z. (2013). Mixed method research: instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies*, *3*(2), 254-262.

Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of Medical Internet Research*, *15*(4), e85. http://doi.org/10.2196/jmir.1933

Morse, J. (2001). Situating grounded theory within qualitative inquiry. In R. Schreiber & P.N. Stern (Eds.), *Using grounded theory in nursing* (pp.1-16). Springer.

Moucheraud, C., Schwitters, A., Boudreaux, C., Giles, D., Kilmarx, P. H., Ntolo, N., Bangani, Z., St. Louis, M. E., & Bossert. T. J. (2017). Sustainability of health information systems: a three-country qualitative study in southern Africa. *BMC Health Services Research*, *17*(1) 23-24. http://doi.org/10.1186/s12913-016-1971-8

Muessig, K. E., Nekkanti, M., Bauermeister, J., Bull, S., & Hightow-Weidman L.B. (2015). A systematic review of recent smartphone, Internet and Web 2.0 interventions to address the HIV continuum of care. *Current HIV/AIDS Reports*, *12*(1), 173–190. http://doi.org/10.1007/s11904-014-0239-3

Mugo, F. W. (2010). *Sampling in research*. http://www.answers.com/topic/sampling.html

Mujera, E., & Simbini, T. (2006). *E-Health in Zimbabwe: the role and the capacity of the University of Zimbabwe College of Health Sciences Library*. http://www.sim.hcuge.ch/helina/42.pdf

Munawar, K. (2020). *Healthcare Explainer Videos: Uses, Best Practices and Examples.* http://motioncue.com/healthcare-explainer-videos

Muslimin, I., Hadi, S.P., & Nugroho, E. (2017). An Evaluation Model Using Perceived User Technology Organisation Fit Variable for Evaluating the Success of Information Systems. *Scientific Journal of Informatics*, *4*(2), 86-93.

Musoke, M. G. (2000). Information and its value to healthcare professionals in rural Uganda: a qualitative perspective. *Health Libraries Review, 17*(4), 194-202.

Mutula, S. M. (2005). Peculiarities of the digital divide in sub-Saharan Africa. *Program, 39* (2),122-138. https://doi.org/10.1108/00330330510595706

Myers, M. D. (2008). *Qualitative Research in Business & Management*. Sage.

National AIDS Council. (2014). *Global AIDS Response Country Progress Report Zimbabwe* http://www.unaids.org/sites/default/files/country/documents/ZWE_narrative_report_2014.pdf

National AIDS Council. (2017). *Overview of NAC*. http://nac.org.zw/about-us

National Association for Healthcare Quality. (2005). *Can applying systems theory improve quality in healthcare systems?* https://pdfs.semanticscholar.org/cff8/709b1720bf32b8f1d175875388411d4f5816.pdf

National Health Care Trust, Zimbabwe. (2015). Health information systems development. http://www.nationalhealthcaretrust.org.zw/pages/health_information_systems_development

National Library of Uganda. (2001). *Information in support of the HIV/AIDS Control Programme*. NLU.

Ndarukwa, P., Chimbari, M. J., Sibanda, E. N., & Ndarukwa, P. (2020). Algorithm for asthma diagnosis and management at Chitungwiza Central Hospital, Zimbabwe. *Pan African Medical Journal*, *37*(85), 1-9. http://doi.org/10.11604/pamj.2020.37.85.19543.

Negandhi, P., Negandhi, H., Sharma, K., Wild, S., & Zodpey, S. (2015). *Human Resources for Health, 13*,31. http://doi.org/10.1186/s12960-015-0024-4

Nelson, S. B. (2006). Privacy and medical information on the Internet. *Respiratory Care*, *51*(2), 183–187.

Neuhauser, L., & Kreps, G. L. (2003). Rethinking communication in the e-Health era. *Journal of Health Psychology*, *8*(1), 7-23. http://doi.org/10.1177/1359105303008001426

Neuhauser, L., & Kreps. G. L. (2010). E-health communication and behavior change: promise and performance. *Social Semiotics, 20*(1), 7-24. http://doi.org/10.1080/10350330903438386

Neuman, W. L. (2006). *Social research methods: qualitative and quantitative approaches.* Allyn & Bacon.

Neuman, W. L. (2011). *Social research methods: qualitative and quantitative approaches* (7th ed.). Allyn & Bacon.

Ngulube, P. (2004). A double-edged sword: Challenges and opportunities offered by the digital age to the African information society. ProLISSA 2004. *Proceedings of the 3rd biennial DISSAnet Conference: 21-40, Pretoria.*

Ngulube, P. (2020). Theory and theorising in information science scholarship. In P. Ngulube (Ed.), *Handbook of Research on Connecting Research Methods for Information Science Research* (pp. 18-39). IGI Global.

Nguyen, Q. (2011). The views and expectations of young healthy adults about using an online personal health record. (Unpublished Master of Science in Experimental Medicine, McGill University, Montreal, QC). http://mcgill-fammedstudies-recherchemedfam.pbworks.com/w/file/fetch/55332819/QuynhNguyen_e-thesis.pdf

Ngwakongnwi, E., Atanga, M. B., & Quan, H. (2014). Challenges to implementing a National Health Information System in Cameroon: Perspectives of Stakeholders. *Journal of Public Health in Africa*, *5*(1), 322. http://doi.org/10.4081/jphia.2014.322

Nkanata, M. G., Makori, E., Ondieki., & Irura, G. (2018). Comparative Analysis of Hospital Information Management Systems Among Healthcare Workers in Two Selected Hospitals in Kenya. *Library Philosophy and Practice (e-journal), 2056.* http://digitalcommons.unl.edu/libphilprac/2056

Nolan, T., Angos, P., Cunha, A. J., Muhe, L., Qazi, S., & Simoes, E. A. (2001). Quality of hospital care for seriously ill children in less-developed countries. *Lancet*, *357*(9250), 106-110.

Norbet, G. L. & Lwoga, E. T. (2013). Information seeking behaviour of physicians in Tanzania. *Information Development*, *29*(2), 1-12.

Nsubuga, P., Mabaya, S., Apollo, S., Sithole, N., Komtenza, B., Matare, T., Chimwaza, A., Takarinda, K., Moyo, B., Mbano, L., Choto, R., Moyo, T., Lowrance, D., Low-Beer, D., Mugurungi, O. & Alex Gasasira. (2020). Evaluation of the Zimbabwe HIV case surveillance pilot project, 2019. *Pan African Medical Journal*, *37*, 353. doi:10.11604/pamj.2020.37.353.25600.

Nyamai, C. (2002). *Harnessing ICTs for the community health. The AfiAfya initiative* http://www.iconnect-online.org/Stories/Story.import4924

Obimbo, E., Musoke, R. N., & Were, F. (1999). Knowledge, attitudes and practices of mothers and knowledge of healthcare professionals regarding care of the newborn umbilical cord. *East African Medical Journal*, *76*(8), 425-429.

O'Brien, N., Tan, J., & Yuan, Y. (2016). The Role of Social Networking in Healthcare. *Proceedings of the 49th Hawaii International Conference on System Sciences (HICSS).* http://doi.org/10.1109/HICSS.2016.38

O'Connor, C., Friedrich, J. O., Scales, D. C., & Adhikari, N. K. J. (2009). The use of wireless e-mail to improve healthcare team communication. *Journal of the American Medical Informatics Association*, *16*(5), 705–713. http://doi.org/10.1197/jamia.M2299

OECD. (2009). *OECD Health Data 2009 – Statistics and Indicators for 30 countries.* www.oecd.org/health/healthdata

OECD. (2010a). Health care systems: Getting more value for money. *OECD Economics Department Policy Notes, No. 2*. https://www.oecd.org/eco/growth/46508904.pdf

OECD. (2010b). Improving Health Sector Efficiency: The Role of Information and Communication Technologies. https://rowman.com/ISBN/9789264084605

OECD. (2021). *Information and Communication Technologies (ICTs) in Health Systems- Case studies*. https://www.oecd.org/els/health-systems/informationandcommunicationtechnologiesictsinhealthsystems-casestudies.htm.

Office of U.S. Global AIDS Coordinator and the Bureau of Public Affairs. (2009). Phones for Health: Major Public-Private Partnership to Use Mobile Phones to Fight HIV/AIDS pandemic. https://2006-2009.pepfar.gov/press/80471.htm

Ohio University. (2020). *5 Benefits of Health Information Technology for Nurse Practitioners* https://onlinemasters.ohio.edu/blog/5-benefits-of-health-information-technology-for-nurse-practitioners

Ojuondo, G., & Kwanya, T. (2014). The Role of ICTs in Health Communication in Slums in Kenya. *International Research Journal of Social Sciences*, *3*(10), 28-34.

Oleribe, O. O., Momoh, J., Uzochukwu, B. S. C., Mbofana, F., Adebiyi, A., Barbera, T., Williams, R., & Taylor-Robinson, S. D. (2019). Identifying key challenges facing healthcare systems in Africa and potential solutions. *International Journal of General Medicine*. *12*, 395-403. https://doi.org/10.2147/IJGM.S223882

Olive, P. (2012). *The SAGE dictionary of social research methods: purposive sampling*. http://www.srmo.sagepub.com/view/the-sage-dictionary-of-social-research-methods/n162.xml

Oluyemi, E. A., & Olayanju, A. R. (2020). Electronic health record design for inclusion in sub-Saharan Africa medical record informatics. *Scientific African*, *7*. e00304. http://doi.org/10.1016/j.sciaf.2020.e00304

Omune, O., & Kandiri, J. M. (2018). Hospital information systems capability and end-user satisfaction in hospitals of Nairobi County, Kenya. *International Academic Journal of Information Systems and Technology*. *2*(1), 102-125.

Online Notes Nepal. (2021). *Principle for System Development.* https://bcisnotes.com/thirdsemester/system-analysis-and-design/principle-for-system-development

Ormandy, P. (2010). Defining information need in health - assimilating complex theories derived from information science. *Health Expectations*, *14*(1), 92-104.

Othieno, C. J., Okech, V. C., Omondi, J.A., & Makanyengo, M. A. (2001). How Kenyan physicians treat psychiatric disorders. *East African Medical Journal*, *78*(4), 204-207.

Page, J., Heller, R. F., Kinlay, S., Lim, L. L., Qian, W., & Suping, Z. (2000). Where do developing World clinicians obtain evidence for practice: a case study on pneumonia.

*Journal of Clinical Epidemiology*, *53*(7), 669-675. http://doi.org/10.1016/s0895-4356(99)00231-0

Pakenham-Walsh, N., & Bukachi, F. (2009). Information needs of health care workers in developing countries: a literature review with a focus on Africa. *Human Resources for Health, 7*,30. http://doi.org/10.1186/1478-4491-7-30

Pareek, S., & Gupta, D. K. (2013). Academic Library Websites in Rajasthan: an analysis of Content, *Library Philosophy and Practice,* (e-journal). *913*. http://digitalcommons.unl.edu/libphilprac/913

Park, J.S. (2014). Impacts of hospitals' innovativeness on information system outsourcing decisions. *Healthcare Informatics Research*, 2, 135-144. http://doi.org/10.4258/hir.2014.20.2.135

Pastorino, R., Vito, C., Migliara, G., Glocker, K., Binenbaum, I., Ricciardi, W., & Boccia, S. (2019). Benefits and challenges of Big Data in healthcare: an overview of the European initiatives, European. *Journal of Public Health*, *29*(3), 23–27. http://doi.org/10.1093/eurpub/ckz168

Patel, V. N, Abramson, E., Edwards, A. M., Cheung, M. A., Dhopeshwarkar, R. V., & Kaushal, R. (2011). Consumer attitudes toward personal health records in a beacon com-munity. *American Journal of Managed Care, 17,* e104-20 https://pubmed.ncbi.nlm.nih.gov/21774099/.

Patient Empowerment Network. (2019). Health care and social media: importance of facing their challenges. https://powerfulpatients.org/2019/12/18/health-care-and-social-media-importance-of-facing-their-challenges/#:~:text=Social%20media%20is%20one%20of,is%20also%20on%20the%20rise

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage.

Patton, M. Q. (2015). *Qualitative research and evaluation methods* (4th ed.). Sage.

Perry, C., & Jensen, O. (2001). Approaches to combining induction and deduction to one research study. *Proceedings of the Australian and New Zealand Marketing Academy Conference,* 1-5. http://anzmac.org/conference/2001/anzmac/AUTHORS/pdfs/Perry1.pdf

Pettigrew, S. F. (2000). Ethnography and Grounded Theory: A Happy Marriage. In S.J. Hoch, R.J. Meyer, & U.T. Provo (Eds.). *Advances in Consumer Research* (pp. 256-260). Association for Consumer Research.

Petula, S. (2005). *Can Applying Systems Theory Improve Quality in Healthcare Systems?* http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.470.9969&rep=rep1&type=pdf

Phillips, D. C., & Burbules, N. C. (2000). *Postpositivism and educational research*. Rowman & Littlefield.

Plsek, P. E. (1999). Innovative thinking for the improvement of medical systems. *Annals of Internal Medicine*, *131*(6), 438–444.

Polit, D. F., & Beck, C. T. (2014). *Essentials of nursing research: appraising evidence for nursing research* (8th ed.). Wolters Kluwer/Lippincott Williams & Wilkins.

Power, R., & Hunter, G. (2001). Developing a strategy for community-based health promotion targeting homeless populations. *Health Education Research, 16*(5), 593–600. http://doi.org/10.1093/her/16.5.593

Prell, C. (2009). Rethinking the social construction of technology through 'following the actors': A reappraisal of technological frames. *Sociological Research Online, 14*(3), 339-340. http://doi.org/10.5153/sro.1913

Pricewaterhouse Coopers. (2007). *The Economics of IT and Hospital Performance*. https://www.longwoods.com/articles/images/PwCWhitePaper.pdf

Product Tribe. (2021). *Why Agile SDLC Model is the best for your start up*. https://producttribe.com/project-management/agile-sdlc-guide

Pyrczak, F. (2005). *Writing empirical research reports: a basic guide for students of the social; and behavioral sciences* (5th ed.). Pyrczak Publishing.

Qazi, M. S., & Ali, M. (2009). Pakistan's health management information system: health managers' perspectives . *JPMA. The Journal of the Pakistan Medical Association, 59*(1),10-14.

Qualtrics. (2020). *What is ANOVA (Analysis Of Variance) and what can I use it for?* https://www.qualtrics.com/experience-management/research/anova

Raj, S., Sharma, V. L., Singh, A. J., & Goel, S. (2016). Evaluation of quality and readability of health information websites identified through India's major search engines. *Advances in Preventive Medicine, 4815285*, 6. http://doi.org/10.1155/2016/4815285

Raman, J., Samost, L., Leveson, N. G., Dobrilovic, N., Oldham, M., & Dekke, S. W. (2016). When a checklist is not enough: how to improve them and what else is needed. *The Journal of Thoracic and Cardiovascular Surgery, 52*(2), 585-592. http://doi.org/10.1016/j.jtcvs.2016.01.022

Randolph, J. J. (2009). A Guide to Writing the Dissertation Literature Review. *Practical Assessment, Research and Evaluation, 14*(13), 1-13.

Raosoft. (2004). *Sample Size Calculator*. http://www.raosoft.com/samplesize.html

Ratner, C. (2002). Subjectivity and objectivity in Qualitative Methodology. *Forum: Qualitative Social Research, 3*(3), 16.

Regional AIDS Training Network in collaboration with Kigali Health Institute HIV and AIDS Capacity Building Conference REPORT. (2009). *HIV Training and Capacity Building Trends and Challenges*. HIV and AIDS Capacity Building Conference REPORT. http://www.ratn.org/index.php?option=com_docman&task=doc_download&gid=72&Itemid=85

Reja, U., Manfreda, K. L., Hlebec, V., & Vehovar, V. (2003). Open-ended vs. close-ended questions in Web questionnaires. *Metodoloskizvezki, 19*(1), 159-177.

Renahy, E., & Chauvin, P. (2006). Internet uses for health information seeking: a literature review. *Revue d'Épidémiologie et de Santé Publique*. *54*(3), 263-275. http://doi.org/10.1016/s0398-7620

Renahy, E., Parizot, I., & Chauvin, P. (2010). Determinants of the frequency of online health information seeking: results of a Web-based survey conducted in France in 2007. *Informatics for Health & Social Care*, *35*(1), 25–39. http://doi.org/10.3109/17538150903358784

Restless Development. (2021). *Restless Zimbabwe.* https://restlessdevelopment.org/country/zimbabwe/.

Rice, R. E. (2006). Influences, usage, and outcomes of Internet health information searching: multivariate results from the Pew surveys. *International Journal of Medical Informatics, 75*(1), 8-28. http://doi.org/10.1016/j.ijmedinf.2005.07.032

Rodd, J. (2011). *Sample Design for Surveys*. www.colorado.edu/.../foote/.../Rodd_GeoMeth_Sampling_110214.docx

Rogers, E. (1983). *Diffusion of Innovations* (3rd ed.). The Free Press.

Romi, I. (2010). A Model of Organisational Politics Impact on Information Systems Success. *Proceedings of the International Joint Conference on Computer, Information, and systems Sciences, and Engineering, CISSE2008, December, 5 – 12, 2008*, University of Bridgeport. https://www.academia.edu/9751502/A_Model_of_Organisational_Politics_Impact_on_Information_Systems_Success

Rubinelli, S., Collm, A., Glässel, A., Diesner, F., Kinast, J., Stucki, G., & Brach, M. (2013). Designing interactivity on consumer health websites: PARAFORUM for spinal cord injury. *Patient Education and Counselling*, *93*(3), 459-463. http://doi.org/10.1016/j.pec.2013.09.015

Rubins, D., Wright, A., Alkasab, T., Ledbetter, M.S., Miller, A., Patel, R., Wei, N., Zuccotti, G., & Landman. A. (2019). Importance of clinical decision support system response time monitoring: a case report. *Journal of the American Medical Informatics Association, 26*(11), 1375-1378. http://doi.org/10.1093/jamia/ocz133

Sæbø, J., Kossi, E., Titlestad, O., Tohouri, R., & Braa, J. (2011). Comparing strategies to integrate health information systems following a data warehouse approach in four countries. *Information Technology Development*, *17*(1), 42–60.

SAfAIDS, (2008). *SAfAIDS Annual Report 2008*. SAfAIDS.

Sakyi, E. K., Koku, J., & Adzei, F. A. (2011). Barriers to implementing health sector administrative decentralisation in Ghana: a study of the Nkwanta district health management team. *Journal of Health Organisation and Management*, *25*, 400–419. http://doi.org/10.1108/14777261111155038/full/html

Salkind, N. (2010). *Encyclopedia of research design*. Sage.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students.* Pearson Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2011). *Research Methods for Business Students* (5th ed.). Pearson Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research Methods for Business Students* (6th ed.). Pearson Education Limited.

Savel, T. G., & Foldy, S. **(**2012). The role of public health informatics in enhancing public health surveillance. https://www.cdc.gov/mmwr/preview/mmwrhtml/su6103a5.htm

Schein, R., Wilson, K., & Keelan, J. (2017). A report for Peel public health: Literature review on effectiveness of the use of social media. https://www.peelregion.ca/health/resources/pdf/socialmedia.pdf

Scherman, J. (2019). 5 *Ways technology in healthcare is transforming the way we approach medical treatment*. https://www.rasmussen.edu/degrees/health-sciences/blog/technology-in-healthcare-transformation

Schwandt, T. A. (2001). *Dictionary of qualitative inquiry* (2nd ed.). Sage.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching*, 5(9), 9–16. https://doi.org/10.5539/elt.v5n9p9

Scott, J. T., & Rundall, T. G. (2005). Kaiser Permanente's experience of implementing an electronic medical record: A qualitative study. *British Medical Journal, 331*(7528), 1313-1316. http://doi.org/10.1136/bmj.38638.497477.68

Scutaru, M., Ţoev, R., Romanca, M., & Alexandru, M. (2009). A new approach for a healthcare network architecture and security. *Mathematical methods and applied computing*, https://www.researchgate.net/publication/228656220_A_new_approach_for_a_healthcare_network_architecture_and_security

Seddon, P., & Kiew, M. Y. (1996). A partial test and development of the DeLone and McLean model of IS Success. *Australian Journal of Information*, 4, 90-109.

Sedigheh, M., Noor, A. M. S., & Masoud, A. (2013). Determinants of it-related innovation acceptance and use behaviour: theoretical integration of unified theory of acceptance and use of technology and entrepreneurial potential model. *Social technologies*, 3(2), 243–260.

Sedlack, D. J., & Tejay, G. P. S. (2011). *Improving information security through technological frames of reference.* https://aisel.aisnet.org/sais2011/30/

Seid, M., Hartley, D. M., Dellal, G., Myers, S., & Margolis, P. A. (2021). Organizing for collaboration: An actor-oriented architecture in Improve Care Now. *Learning Health Systems, 4*(1), e10205. http://doi.org/10.1002/lrh2.10205 .

Seidenberg, P., Nicholson, S., Schaefer, M., Semrau, K., Bweupe, M., Masese, N., Bonawitz, R., Chitembo, L., Goggin, C., & Thea, D.M. (2012). Early infant diagnosis of HIV infection in Zambia through mobile phone texting of blood test results. *Bulletin of the World Health Organisation, 90*(1), 348–356.

Seitio-Kgokgwe, O., Gauld, R. D., Hill, P. C., & Barnett, P. (2014). Assessing performance of Botswana's public hospital system: the use of the World Health Organisation Health System Performance Assessment Framework. *International Journal of Health Policy and Management, 3*(1), 179–189. http://doi.org/10.15171/ijhpm.2014.85

Shahmoradi, L., & Habibi-Koolaee, M. (2016). Integration of health information systems to promote health Iran. *Journal of Public Health, 5*(8), 1096–1097.

Sharp, D. (2006). *Smart Internet 2010—Social Networks.* Melbourne: Swinburne University of Technology/Smart Internet Technology. http://smartinternet.com.au/ArticleDocuments/121/Social-Networks-2010.pdf.aspx

Shekelle, P., & Goldzweig, C. L. (2009). *Costs and benefits of health information technology: an updated systematic review*. The Health Foundation.

Shiferaw, F., & Zolfo, M. (2012). The role of information communication technology (ICT) towards universal health coverage: the first steps of a telemedicine project in Ethiopia. *Global Health Action, 5,* 1 – 8. http://doi.org/10.3402/gha.v5i0.15638

Sibanda, M., Naidoo, P. J., & Nlooto, M. (2016). African Traditional Medicine Use amongst People Living with HIV/AIDS in Sub-Saharan Africa in the Era of Antiretroviral Therapy. International *Journal of Public Health and Safety, 1*(2), 1-4.

Simon, S. R., Kaushal, R., Cleary, P. D., Jenter, C. A., Volk, L. A., Poon, E. G., Orav E. J., Lo, H. G., Williams, D. H., & Bates, D. W. (2007). Correlates of Electronic Health Record Adoption in Office Practices: A Statewide Survey. *Journal of the American Medical Informatics Association, 14*(1), 110–117. http://doi.org/10.1197/jamia.M2187

Singh, K. P., & Singh. G. M. (2012). Use of e-journals by medical professionals: a study of Indian Council of Medical Research (ICMR) Libraries in Delhi. *Library Philosophy and Practice* (e-journal). 810. https://digitalcommons.unl.edu/libphilprac/810

Siwicki, B. (2017). *Healthcare pros increasingly using tablets, smartphones for job functions.* https://www.healthcareitnews.com/news/healthcare-pros-increasingly-use-using-tablets-smartphones-job-functions

Smith, C. (2002). *Open Source software and the NHS: White Paper*. National Health Service Information Authority. http://pascal.case.unibz.it/retrieve/2888/5.pdf

Smith, P.C., & Häkkinen, U. (2006). Information strategies for decentralisation. *Decentralisation in Health Care.* World Health Organisation.

Soriyan, H. A., Mikko, J., Makanjuola, R. O. A., & Awolowo, O. (2010). *Developing appropriate healthcare information systems for Africa: the made-in-Nigeria primary healthcare hospital information system project* http://www.uneca.org/adf99/soriyan.doc

Soule, D. (2020). *The biggest barriers to healthcare interoperability*. https://www.healthcatalyst.com/insights/healthcare-interoperability-barriers-solutions

Spring, H. (2010). Health professionals of the future: teaching information skills to the Google generation. *Health Information and Libraries Journal, 27,* 158–162.

Statistics How To. (2021). *Test of Association*. https://www.statisticshowto.com/test-of-association

Stout, P. A., Villegas, J., & Kim, H. (2001). Enhancing learning through use of interactive tools on health-related websites, *Health Education Research*, *16*(6), 721–733. http://doi.org/10.1093/her/16.6.721

Straub, R. (2013). *Why managers haven't embraced complexity*. Harvard Business Review.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Sage.

Stroetmann, K. A., Jones, T., Dobrev A., & Stroetmann, V. N. (2006). *E-health is worth it: the economic benefits of implemented e-health solutions at ten European sites*. Directorate General Information Society and Media, Brussels, European Commission.

Sturges, P. (2001).The poverty of librarianship: an historical critique of public librarianship in anglophone Africa. *Libri, 51, 38–48.*

Suleiman, B. A., Houssein, A. I., Mehta, F., & Hinderaker, S. G. (2003). Do doctors in north-western Somalia follow the national guidelines for tuberculosis management? *East Mediterranean Health Journal, 9*(4), 789-795.

Surendran, P. (2012). Technology acceptance model: A survey of literature. *International Journal of Business and Social Research, 2*, 175-178.

Survey Monkey. (2020). *Gathering demographic information from surveys.* https://www.surveymonkey.com/mp/gathering-demographic-information-from-surveys

Survey Monkey. (2020). *Response rate*. https://help.surveymonkey.com/articles/en_US/kb/Response-Rate-Tips-How-to-improve-low-response-rates

Sutton, R. T., Pincock, D., Baumgart, D. C., Sadowski, D. C., Fedorak, R. N., & Kroeker, K. I. (2020). An overview of clinical decision support systems: benefits, risks, and strategies for success. *Nature Partner Journals - Digital Medicine, 3*(17). http://doi.org/10.1038/s41746-020-0221-y

Sylla, A. H., Robinson, E. T., Raney, L., & Seck, K. (2012). Qualitative study of health information needs, flow, and use in Senegal . *Journal of Health Communication, 17*(2), 46 – 63. http://doi.org/10.1080/10810730.2012.666624

Taderera, B. H. (2019). Do national human resources for health policy interventions impact successfully on local human resources for health systems: a case study of Epworth, Zimbabwe. *Global Health Action, 1*(1), https://doi.org/10.1080/16549716.2019.1646037.

Taggart, T., Grewe, M. E., Conserve, D. F., Gliwa, C., & Roman, I. M. (2015). Social Media and HIV: A Systematic Review of Uses of Social Media in HIV Communication. *Journal of Medical Internet Research*, *17*(11), e248. http://doi.org/10.2196/jmir.4387

Tankovska, H. (2021). *Gender distribution of social media audiences worldwide as of January 2021, by platform*. https://www.statista.com/statistics/274828/gender-distribution-of-active-social-media-users-worldwide-by-platform

Tapera, O., Dreyer, G., Kadzatsa, W., Nyakabau, A. M., Stray-Pedersen, B. & Sjh, H. (2019). Health system constraints affecting treatment and care among women with cervical cancer in Harare, Zimbabwe. *BMC Health Services Research, 19*(1), 829. doi: 10.1186/s12913-019-4697-6.

Tatnall, A., & Gilding, A. (1999). Actor-Network Theory and information systems research. *Proceeding 10th Australasian Conference on Information Systems*, 955–966.

Taylor, R., & Bower, A. (2005). Promoting health information technology: is there a case for more-aggressive government action? *Health Affairs*, *24*(5), 1234-1345.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(1), 144-176. http://doi.org/10.1287/isre.6.2.144

Teddlie, C., & Tashakkori, A. (2011). Mixed methods research: contemporary issue in an emerging. In A. Tashakkori & C. Teddlie. (Eds.). *Sage handbook of mixed methods in social and behavioural research* (4th ed., pp. 285-299). Sage.

Tez, M., & Yıldız, B. (2017). How Reliable Are Medical Textbooks? *Journal of Graduate Medical Education*, *9*(4), 550. http://doi.org/10.4300/JGME-D-17-00209.1

The Zimbabwe National Network of People Living with HIV (ZNNP). (2021). *About us.* https://www.znnp.org/about.

Thompson, R. L., Higgins, C.A., & Howell, J. M. (1991). Personal computing: toward a conceptual model of utilization. *MIS Quarterly*, *15*(1), 124-143.

Uganda National Commission for UNESCO. (2002). *Nakaseke Multipurpose Community Telecentre Pilot Project: Impact study reports*. (Unpublished).

UNAIDS. (2000). *Collaboration with traditional healers in HIV and AIDS prevention and care in Sub-Saharan Africa*. https://data.unaids.org/publications/irc-pub01/jc299-tradheal_en.pdf .

UNAIDS. (2010). *Report on the global AIDS epidemic: Country Progress Indicators 2004 To 2010.* http://www.unaids.org/documents/20101123_GlobalReport_Annexes2_em.pdf

UNAIDS. (2016a). *Information and communications technologies Engaging the private sector and communities in HIV programmes with gay men and other men who have sex with men.* https://www.unaids.org/sites/default/files/media_asset/20160504_JC2824_ICTs_en.pdf

UNAIDS. (2016b). Preventing HIV with social media and mobile phones. http://www.unaids.org/en/resources/presscentre/featurestories/2011/may/20110502sm

UNAIDS. (2020). Country: Zimbabwe. https://www.unaids.org/en/regionscountries/countries/zimbabwe

UNDP. (2006). *Information and communications for development*. http://www.academia.edu/16946526/2010.

UNESCO. (2017). Communication and Information: HIV and AIDS. http://www.unesco.org/new/en/communication-and-information/crosscutting-priorities/hiv-and-aids

United Nations Development Programme. (2021). *Innovation in the Zimbabwe health information system*. https://www.undp-capacitydevelopment-health.org/files/capacities/dhis/dhis_case_study-web.pdf .

United Nations Economic Commission for Africa. (2010). *Information and Communication Technology for the Health Sector*. http://www.uneca.org/aisi/docs/pfshealth.pdf .

University of Southern California. (2016). *Communication studies: The literature review*. http://libguides.usc.edu/c.php?g=234974&p=1559473.

University of Southern California. (2021). *Research guides.* https://libguides.usc.edu/writingguide/literaturereview.

Van Baalen, P., Van Fenema, P., & Loebbecke, C. (2016). Extending the Social Construction of Technology (SCOT) Framework to the Digital World. *Proceedings of the Thirty Seventh International Conference on Information Systems, Dublin*. https://pdfs.semanticscholar.org/091d/553d63e32653a24bc73d80e8e55bbcbdff2a.pdf

Venkatesh, V., Davis, F. D., & Morris, M. (2007). Dead or Alive? The Development, Trajectory and Future of Technology Adoption Research. *Journal of Association for Information System,* 8(4), 267–286.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology, *MIS Quarterly, 36* (1), 157-178.

Ventola, C. L. (2014a). Social media and health care professionals: benefits, risks, and best practices. *Pharmacy & Therapeutics, 39*(7), 491-520.

Ventola, C. L. (2014b). Mobile devices and apps for health care professionals: uses and benefits. *Pharmacy & Therapeutics, 39*(5), 356-364.

Vest, J. R., & Jasperson, S. (2012). How are health professionals using health information exchange systems? Measuring usage for evaluation and system improvement. *Journal of Medical Systems, 36*(5), 3195-3204. http://doi.org/10.1007/s10916-011-9810-2

Vladimir, S. L. (2007). Systems science, information systems theory, and informational macrodynamics: review. *Kybernetes, 36*(2), 192-224. http://doi.org/10.1108/03684920710741224

Volkoff, O., Strong, D. M., & Elmes, M. B. (2007). Technological Embeddedness and Organisational Change. *Organisation Science, 18*(5), 832-848. https://doi.org/10.1287/orsc.1070.0288

Von Bertalanffy, L. (1968). *General System Theory*. George Braziller.

Wagner, C., Kawulich, B., & Garner, M (2012). *Doing social research: A global context*. McGraw-Hill Higher Education.

Walker, J.M. (2005). Electronic medical records and health care transformation. *Health Affairs*, 24(5), 1118-1120.

Wallace, S., Clark, M., & White J. (2012). 'It's on my iPhone': attitudes to the use of mobile computing devices in medical education, a mixed-methods study. *BMJ Open*, *2*(4), e001099. http://doi.org/10.1136/bmjopen-2012-001099

Walshe, C. E., Caress, A. L., Chew-Graham, C., & Todd, C. J. (2004). Case studies: a research strategy appropriate for palliative care? *Palliative Medicine Journal*, *8*(8), 677-684.

Wang, T., Wang, Y., & McLeod, A. (2018). Do health information technology investments impact hospital financial performance and productivity? *International Journal of Accounting Information Systems*, *28*(1), 1-13. http://doi.org/10.1016/j.accinf.2017.12.002

Wangulu, E. (2004). Information, the Only Tool against HIV/Aids. *The standard*, 2004. http://allafrica.com/stories/200412300901.html

Ware, N. C., Pisarski, E. E., Tam, M., Wyatt, M. A., Atukunda, E., & Musiimenta, A. (2016). The Meanings in the messages: how SMS reminders and real-time adherence monitoring improve antiretroviral therapy adherence in rural Uganda. *AIDS*, *30*,1287–1293. http://doi.org/10.1097/QAD.0000000000001035

Weare, C., & Lin, W. Y. (2000). Content analysis of the World Wide Web—Opportunities and challenges. *Social Science Computer Review*, *18*(3), 272-292.

White, S. V., & Hewes, C. J. (2003). Linda Aiken on the healthcare industry and workplace issues. *Journal for Healthcare Quality*, *25*(3), 21–23.

Williams, D. C., Warren, R. W., Ebeling, M., Andrews, A.L & Teufel, R. J. (2019). Physician use of electronic health records: survey study assessing factors associated with provider reported satisfaction and perceived patient impact. *JMIR medical informatics*, *7*(2), e10949. http://doi.org/10.2196/10949

Williams-Jones, B., & Graham, J. E. (2003). Actor-network theory: a tool to support ethical analysis of commercial genetic testing. *New Genetics and Society*, *22*(3), 271-296.

Wilson, T. D. (1999). Models in information behavior research. *Journal of Documentation*. *55*(3), 249-270.

World Health Organisation. (2019). *Zimbabwe HIV Patient Monitoring and Case-Based Surveillance – Leveraging on data to end AIDS by 2030*. https://www.afro.who.int/news/zimbabwe-hiv-patient-monitoring-and-case-based-surveillance-leveraging-data-end-aids-2030.

World Health Organisation. (2008). *WHO guideline on transfer of technology***.** Working document QAS/08.259. http://www.who.int/medicines/services/expertcommittees/pharmprep/Draft_TechnologyTransferGuideline_QAS08_259_27Jun08.pdf

World Health Organisation. (2012). Report on Strengthening National Health Information Systems: Workshop on the use of Geographical Information System HealthMap Harare, Zimbabwe, 1–4 July 2012.

World Health Organisation. (2021). *Health information and knowledge management: web-based platform and integrated data warehouse*. https://www.afro.who.int/health-topics/health-information-and-knowledge-management

Yin, R.K. (1994). *Case Study Research: Design and Method* (2nd ed.). Sage.

Yin, R.K. (2009). *Case Study Research: Design and Methods*. (4th ed.). Sage.

Young, S. D., Zhao, M., Teiu, K., Kwok, J., Gill, H., & Gill, N. (2013). A social-media based HIV prevention intervention using peer leaders. *Journal of Consumer Health on the Internet*, *17*(4),353–361. http://doi.org/10.1080/15398285.2013.833445

Young, S.D., Holloway, I., Jaganath, D., Rice, E., Westmoreland, D., & Coates, T. (2014). Project HOPE: online social network changes in an HIV prevention randomized controlled trial for African American and Latino men who have sex with men. *American Journal of Public Health*, *4*(9), 1707–1712. http://doi.org/10.2105/AJPH.2014.301992

Yuen, Y. Y., Yeow, P.H.P., Lim, N., & Saylani, N. (2010). Internet banking adoption: comparing developed and developing countries. *Journal of Computer Information Systems*, *51*(1), 52-61.

Yusof, M. M., Kuljis, J., Papazafeiropoulou, A., & Stergioulas. L. K. (2008). An evaluation framework for Health Information Systems: human, organisation and technology-fit factors (HOT-fit). *International Journal of Medical Informatics*, *77*(6), 386–398.

Zambrano, R., & Seward, R. K. (2013). *Mobile technologies and empowerment*. http://www.makingitmagazine.net/?p=7477#Ruhiya

Zhao, M., Hamadi, H., Haley, D. R., White-Williams, C., Liu, X., & Spaulding, A. (2019). The relationship between health information technology laboratory tracking systems and hospital financial performance and quality. *Hospital topics*, *97*(3), 99–106. https://doi.org/10.1080/00185868.2019.1623735

Zhao, Y., & Zhang, J. (2017). Consumer health information seeking in social media: a literature review. *Health information and Libraries Journal*, 34, 268–283. http://doi.org/10.1111/hir.12192

Zigdon, A., Zigdon, T., & Moran, D. S. (2020). Attitudes of nurses towards searching online for medical information for personal health needs: cross-sectional questionnaire study. *Journal of Medical Internet Research*, *22*(3), e16133. http://doi.org/10.2196/16133.

Zimbabwe Community Health Intervention Research Behavioural Change Programme (ZiCHIRe). (2021). *About ZiCHIRe BC*. https://zichirebc.org/about/aboutbackground/.

## APPENDIX A: UWC ETHIC CLEARANCE

UNIVERSITY of the WESTERN CAPE

OFFICE OF THE DIRECTOR: RESEARCH
RESEARCH AND INNOVATION DIVISION

Private Bag X17, Bellville 7535
South Africa
T: +27 21 959 4111/2948
F: +27 21 959 3170
E: research-ethics@uwc.ac.za
www.uwc.ac.za

27 January 2020

Mr T Gandiwa
Library and Information Sciences
**Faculty of Arts**

**Ethics Reference Number:** HS19/10/26

**Project Title:** The use of Information and Communication Technologies for accessing HIV and AIDS information by health workers in Zimbabwe.

**Approval Period:** 22 January 2020 - 22 January 2021

I hereby certify that the Humanities and Social Science Research Ethics Committee of the University of the Western Cape approved the methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

**Please remember to submit a progress report in good time for annual renewal.**

The Committee must be informed of any serious adverse event and/or termination of the study.



*Ms Patricia Josias*
*Research Ethics Committee Officer*
*University of the Western Cape*

***NHREC REGISTRATION NUMBER - 130416-049***

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

## APPENDIX B: RESEARCH SITE ETHIC CLEARANCE/PERMISSION-NAC

☎ 263-4-791170-2/8
100 CENTRAL AVENUE
HARARE
Email:
secretariat@nac.org.zw

NATIONAL AIDS COUNCIL

P.O.BOX MP 1311
MT PLEASANT
HARARE
ZIMBABWE

06 October 2020

University of the Western Cape
Department of Library and Information Science
Private Bag X17
Bellville 7535
Republic of South Africa

Dear Tapiwa Gandiwa

**RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH AT NATIONAL AIDS COUNCIL**

The above refers

This letter serves as authorisation for you to carry out a study entitled "The use of Information and Communication Technologies for accessing HIV and AIDS information by health workers in Zimbabwe". We are glad to offer you the opportunity to carry out the study as per your request.

Should you require additional information, please do not hesitate to conduct the undersigned.

Regards

**A. Mpofu**
**Monitoring and Evaluations Director**
National AIDS Council

NATIONAL AIDS COUNCIL
MONITORING & EVALUATION DIRECTOR
06 OCT 2020
P. O. BOX MP 1311
ZIMBABWE

## APPENDIX C: RESEARCH SITE ETHIC PERMISSION- ZICHIRe

ZiCHIRe-BC
Zimbabwe Community Health Intervention Research Project

University of Zimbabwe
Family Medicine, Global & Public Health Unit

Zimbabwe Community Health Intervention Research Behavioural Change Programme
Head Office 10 Walterhill, Eastlea, Harare. Contact: 0771 019 125
@zichire, ZICHIRE, www.zichirebc.org, Email: info@zichirebc.org,

06 October 2020

University of the Western Cape

Department of Library and Information Science

Private Bag X17

Bellville 7535

Republic of South Africa

Dear Tapiwa Gandiwa

**RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH AT ZICHIRe**

The above refers

This letter serves as authorisation for you to carry out a study entitled "The use of Infomation and Communication Technologies for accessing HIV and AIDS information by health workers in Zimbabwe. We are glad to offer you the opportunity to carry out the study as per your request. Should you require additional information please do not hesitate to conduct the undersigned



Regards


**W. Chikanya**

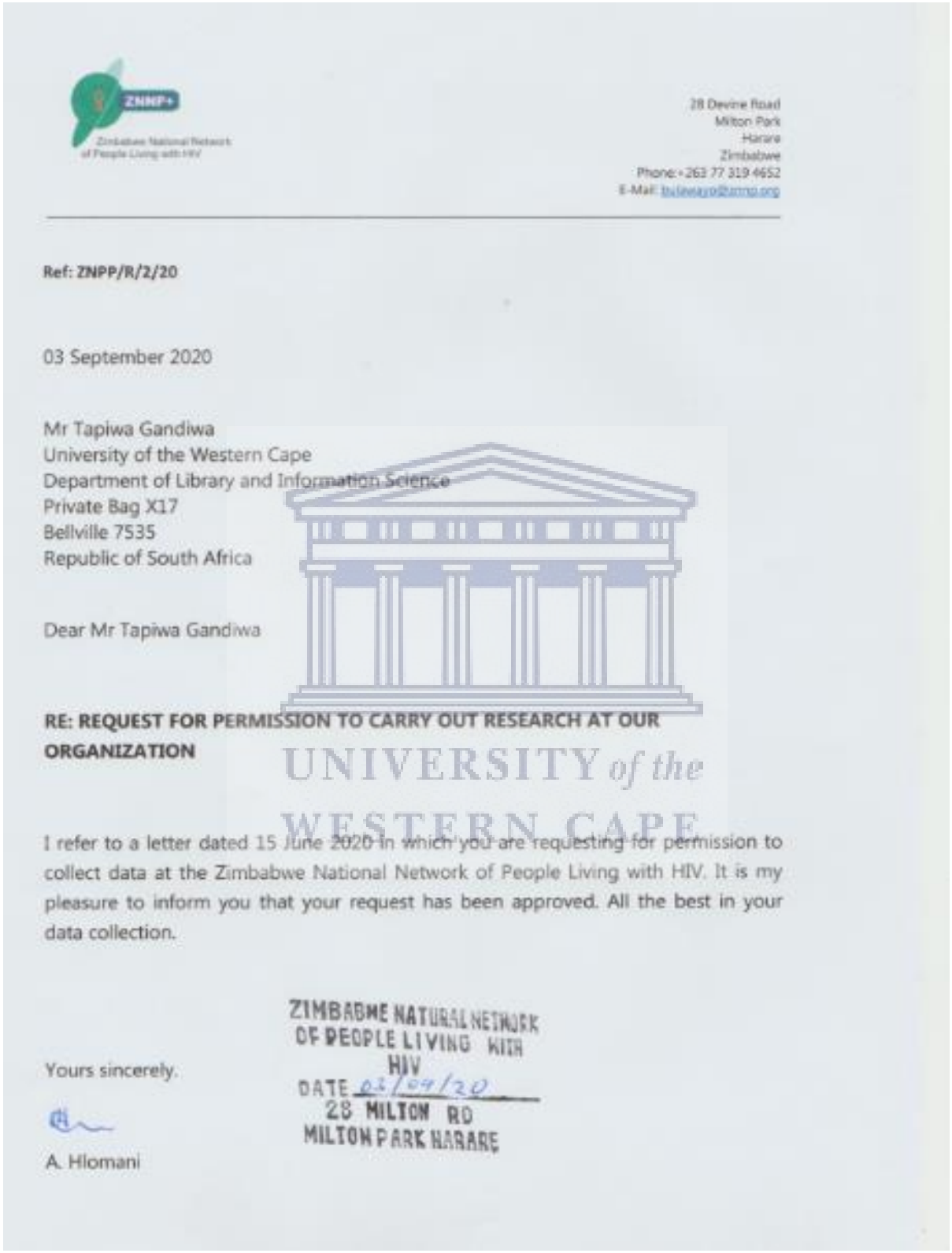
**Programmes Director**

**ZICHIRe-BC**

**Phone: +263 719 019 125**

**chikanyaw@zichirebc.org**

**APPENDIX D: RESEARCH SITE ETHIC PERMISSION – ZNNP**



ZNNP+
Zimbabwe National Network of People Living with HIV

28 Devine Road
Milton Park
Harare
Zimbabwe
Phone: +263 77 319 4652
E-Mail: bulawayo@znnp.org

**Ref: ZNPP/R/2/20**

03 September 2020

Mr Tapiwa Gandiwa
University of the Western Cape
Department of Library and Information Science
Private Bag X17
Bellville 7535
Republic of South Africa

Dear Mr Tapiwa Gandiwa

**RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH AT OUR ORGANIZATION**



I refer to a letter dated 15 June 2020 in which you are requesting for permission to collect data at the Zimbabwe National Network of People Living with HIV. It is my pleasure to inform you that your request has been approved. All the best in your data collection.

ZIMBABWE NATURAL NETWORK
OF PEOPLE LIVING WITH
HIV
DATE 03/09/20
28 MILTON RD
MILTON PARK HARARE

Yours sincerely.

A. Hlomani

## APPENDIX E: RESEARCH SITE ETHIC PERMISSION – MAVAMBO

Mavambo Trust
P.O Box 79
St Fidelis Roman Catholic
J. Tapedza St
Mabvuku


22 September 2020

To Whom It May Concern

**RE: REQUEST FOR PERMISSION TO CARRY OUT A RESEARCH STUDY AT MAVAMBO TRUST**

This letter serves to inform you that Tapiwa Gandiwa, a student at the Western Cape University has been granted permission to conduct gather data at Mavambo Trust. Permission was granted to administer questionnaires and to conduct an interview on a topic entitled: "The use of Information and Communication Technologies for accessing HIV and AIDS information by health workers in Zimbabwe".



Yours Faithfully

BENJAMIN POSVO

PROVINCIAL DIRECTOR

**APPENDIX F: RESEARCH SITE ETHIC PERMISSION – RESTLESS DEVELOPMENT**

Agriculture house
1 Adylinn Road
Marlborough
Room 116
Harare
Zimbabwe
+263 242 300811/19

03 October 2020

Mr Tapiwa Gandiwa
University of the Western Cape
Department of Library and Information Science
Private Bag X17
Bellville 7535
Republic of South Africa

Dear Tapiwa Gandiwa

**RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH**

In response to your letter dated 17 June 2020requesting for permission to conduct a research at Restless Development on a topic titled: "The use of Information and Communication Technologies for accessing HIV and AIDS information by health workers in Zimbabwe", I am pleased to inform you that permission has been granted to administer questionnaires and interviews.



RESTLESS DEVELOPMENT
1 ADYLINN ROAD
MALBOROUGH HARARE
TEL 0242 300811
DATE 23/10/2020

Yours faithfully

F. MURONZI

DIRECTOR

## APPENDIX G: CONSENT LETTER: INTERVIEW

**Consent Form - Interview** University of the Western Cape

**Project:** *The use of Information and Communication Technologies for accessing HIV and AIDS information by healthcare professionals in Zimbabwe.*

**Researcher:** Tapiwa Gandiwa

**Please initial box**

1. I confirm that I have read and have understood the information sheet explaining the above research project and I have had the opportunity to ask questions about the project. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. (If I wish to withdraw I may contact the lead researcher at any time) ☐
3. I understand my responses and personal data will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the reports or publications that result for the research. ☐
4. I agree to have the interview audio-recorded. ☐
5. I agree that the data collected from me may be used in future research. ☐
6. I agree to take part in the above research project. ☐

***[Since this is a sample form, you do not need to get it signed for the purposes of ethics clearance. It will have to be signed when you actually do your interviews.]***

| _____ | _____ | _____ |
|---|---|---|
| Name of Participant (*or legal representative*) | Date | Signature |
| _____ | _____ | _____ |
| Name of person taking consent *(If different from lead researcher)* | Date | Signature |
| _____ | _____ | _____ |
| Lead Researcher | Date | Signature |

(*To be signed and dated in presence of the participant*)

*Copies: All participants will receive a copy of the signed and dated version of the consent form and information sheet for themselves. A copy of this will be filed and kept in a secure location for research purposes only.* ***[Enter full names and contact details in the blocks below.]***

| **Researcher:** | **Supervisor:** | **HOD:** |
|---|---|---|
| Tapiwa Gandiwa<br>gandiwatapie@gmail.com<br>+263777957050 | Dr Lizette King<br>lking@uwc.ac.za<br>021 9592535 | Prof Sandy Zinn<br>szinn@uwc.ac.za<br>021 959 2137 |

## APPENDIX H: CONSENT LETTER: QUESTIONAIIRE

**Consent Form – questionnaire** University of the Western Cape

**Project**: *The use of Information and Communication Technologies for accessing HIV and AIDS information by healthcare professionals in Zimbabwe.*

**Researcher:** Tapiwa Gandiwa

**Please initial box**

7. I confirm that I have read and have understood the information sheet explaining the above research project and I have had the opportunity to ask questions about the project. ☐

8. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. (If I wish to withdraw I may contact the lead researcher at anytime) ☐

9. I understand my responses and personal data will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the reports or publications that result for the research. ☐

10. I agree that the data collected from me may be used in future research. ☐

11. I agree to take part in the above research project. ☐



***[Since this is a sample form, you do not need to get it signed for the purposes of ethics clearance. It will have to be signed when you actually do your interviews.]***

| _____ | _____ | _____ |
|---|---|---|
| Name of Participant (*or legal representative*) | Date | Signature |
| _____ | _____ | _____ |
| Name of person taking consent *(If different from lead researcher)* | Date | Signature |
| _____ | _____ | _____ |
| Lead Researcher (*To be signed and dated in presence of the participant*) | Date | Signature |

*Copies: All participants will receive a copy of the signed and dated version of the consent form and information sheet for themselves. A copy of this will be filed and kept in a secure location for research purposes only.* ***[Enter full names and contact details in the blocks below.]***


**Researcher:**

Tapiwa Gandiwa
gandiwatapie@gmail.com
+263777957050

**Supervisor:**

Dr Lizette King
lking@uwc.ac.za
021 959 2535

**HOD:**

Prof Sandy Zinn
szinn@uwc.ac.za
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## APPENDIX I: CONSENT LETTER: WEBSITE EVALUATION RUBRIC

**Consent Form – Website Evaluation Rubric** University of the Western Cape

**Project**: *The use of Information and Communication Technologies for accessing HIV and AIDS information by healthcare professionals in Zimbabwe.*

**Researcher:** Tapiwa Gandiwa

**Please initial box**

12. I confirm that I have read and have understood the information sheet explaining the above research project and I have had the opportunity to ask questions about the project. ☐

13. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. (If I wish to withdraw I may contact the lead researcher at anytime) ☐

14. I understand my responses and personal data will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the reports or publications that result for the research. ☐

15. I agree that the data collected from me may be used in future research. ☐

16. I agree to take part in the above research project. ☐



***[Since this is a sample form, you do not need to get it signed for the purposes of ethics clearance. It will have to be signed when you actually do your interviews.]***

| _____ | _____ | _____ |
|---|---|---|
| Name of Participant (*or legal representative*) | Date | Signature |
| _____ | _____ | _____ |
| Name of person taking consent *(If different from lead researcher)* | Date | Signature |
| _____ | _____ | _____ |
| Lead Researcher (*To be signed and dated in presence of the participant*) | Date | Signature |

*Copies: All participants will receive a copy of the signed and dated version of the consent form and information sheet for themselves. A copy of this will be filed and kept in a secure location for research purposes only.* ***[Enter full names and contact details in the blocks below.]***


**Researcher:**

Tapiwa Gandiwa
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lking@uwc.ac.za
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021 959 2137

## APPENDIX J: QUESTIONNAIRE FOR HEALTHCARE PROFESSIONALS

### UNIVERSITY OF WESTERN CAPE, LIBRARY AND INFORMATION SCIENCE DEPARTMENT

**Informed Consent letter**

**Researcher:** Tapiwa Gandiwa

**Institution:** University of Western Cape

**Cell:** 00263777957050

**E-mail:** gandiwatapie@gmail.com

**Supervisor:** Dr Lizette King

**Institution:** University of Western Cape

**Phone number:**

**E-mail:** lking@uwc.ac.za

I am Tapiwa Gandiwa, a PhD student in Library and Information Science Department at the University of Western Cape. I kindly request you to complete this questionnaire as part of the survey that I am conducting in fulfilment of the Doctoral Degree. The study aims at developing an ICT framework to facilitate information access and sharing among healthcare professionals working in HIV and AIDS organisations in Zimbabwe.

The questionnaire will take about 15 minutes to complete. Your participation is voluntary; you have the right to withdraw anytime and to omit questions that make you uncomfortable; nothing will be held against you. All responses are confidential and the data collected will be presented anonymously. Your signature indicates that you have read the information provided above and that you have decided to participate. You may withdraw at any time without prejudice after signing this form should you choose to discontinue participation in this study.

Thank you for your participation.

_____

Signature Date

_____

Participant's Signature Date

Questionnaire number.....

*Please tick in the appropriate box(es) and provide further explanation where necessary. You may tick on more than one box where necessary*

**DEMOGRAPHIC CHARACTERISTICS**

**1.** Name of organisation……

**2.** Department……

**3.** Gender……

**INFORMATION NEEDS OF HEALTHCARE PROFESSIONALS**

*Please tick in the appropriate box(es) and provide further explanation where necessary.*

**4**. Which HIV and AIDS topics would you expect to receive?

| | | | |
|---|---|---|---|
| Causes | [ ] | Symptoms | [ ] |
| Treatment options | [ ] | HIV and AIDS services | [ ] |
| Policy issues | [ ] | | |

If other, please specify.....



**5.** Which information sources do you prefer to use for accessing HIV and AIDS information?

| | | | |
|---|---|---|---|
| Textbooks | [ ] | Electronic Journals | [ ] |
| Internet | [ ] | Medical databases | [ ] |
| Printed Journals | [ ] | Other | [ ] |

If other, please specify.....

**6.** Which ICT tools would you prefer to access HIV and AIDS information on the Internet?

| | | | |
|---|---|---|---|
| Cellphone | [ ] | Laptop | [ ] |
| Desktop | [ ] | Ipad/Tablet | [ ] |
| Other | [ ] | | |

If other, please specify.....

**7.** Which Web 2.0 and Social Media tools would you prefer for accessing and sharing HIV and AIDS information?

| | | | |
|---|---|---|---|
| Blogs | [ ] | Wikis | [ ] |
| Twitter | [ ] | RSS Feeds | [ ] |
| VoiP | [ ] | Facebook | [ ] |
| Linkedin | [ ] | Tumblr | [ ] |
| Pinterest | [ ] | Reddit | [ ] |
| Other | [ ] | YouTube | [ ] |
| Whatsapp | [ ] | RSS feeds | [ ] |
| Podcast | [ ] | Drop box | [ ] |
| Yokoos | [ ] | MySpace | [ ] |
| Skype | [ ] | Delicious | [ ] |
| Picasa | [ ] | Viber | [ ] |

If other, please specify.....

**8**. Which information media and channels best suit you for accessing or sharing information?

| | | | |
|---|---|---|---|
| Video | [ ] | Audio | [ ] |
| Electronic Text | [ ] | Hard copies | [ ] |
| Other | [ ] | | |

If other, please specify.....

**EVALUATION OF ICTs USED BY HEALTHCARE PROFESSIONALS**

TECHNOLOGICAL



**9.** Which ICT tools have you used to access HIV and AIDS information on the Internet?

| | | | |
|---|---|---|---|
| Cellphone | [ ] | Laptop | [ ] |
| Desktop | [ ] | Ipad/Tablet | [ ] |
| Other | [ ] | | |

**10** Which Web 2.0 and Social Media have you used for accessing and sharing HIV and AIDS information?

| | | | |
|---|---|---|---|
| Blogs | [ ] | Wikis | [ ] |
| Twitter | [ ] | RSS Feeds | [ ] |
| VoiP | [ ] | Facebook | [ ] |
| Linkedin | [ ] | Tumblr | [ ] |
| Pinterest | [ ] | Reddit | [ ] |
| Other | [ ] | | |

If other, Please specify.....

| **11.** Please rate the ICTs that you have used at your organisation in terms of the variables below: | | | | |
|---|---|---|---|---|
| *Coding* | *1* | *2* | *3* | *4* |
| | Poor | Average | Good | Excellent |
| A. Ease of use | | | | |
| B. Ease of learning | | | | |
| C. Response time | | | | |
| D. Availability | | | | |
| E. Access to technical support | | | | |
| F. Security | | | | |

**12.** In general, how do you rate the ICTs and information systems used at your organisation for disseminating HIV and AIDS information?

Poor [ ] Average [ ]
Good [ ] Excellent [ ]

HUMAN

**13**. To what extent have you used the current ICTs in your organisation?
Usually [ ]1 Sometimes [ ]2
Rarely [ ]3 Never [ ]4

**14**. How would you rate your current training and knowledge of the system?

Poor [ ] 1 Average [ ]2
Good [ ] 3 Excellent [ ]4



**15.** To what extent are you satisfied with the current ICTs?

Very unsatisfied [ ]1 Unsatisfied [ ]2
Neutral [ ]3 Satisfied [ ]4
Very satisfied [ ]5

**16.** Given an option of accepting or rejecting the system, which one would you choose?

I would accept it [ ]1 I would reject it [ ]2

**ORGANISATIONAL**

| **17.** Please rate your system in terms of the following organisational features and their alignment to current ICTs. | | | | |
|---|---|---|---|---|
| *Coding* | *1* | *2* | *3* | *4* |
| | Poor | Average | Good | Excellent |

| | | | | |
|---|---|---|---|---|
| A. Structure | | | | |
| B. Culture | | | | |
| C. Politics | | | | |
| D. Communication | | | | |
| E. Funding | | | | |
| F. Policies | | | | |

**RECOMMENDED INFORMATION SYSTEM**

Please recommend the most appropriate ICTs that you think will be effective in accessing and sharing HIV and AIDS information. In your recommendation, please rank the ICTs according to their effectiveness using the scale below:

1: Not effective 2: Slightly effective 3: Effective 4: Above average 5: Very effective

| **No.** | | **ICT tool** | *Ranking* | | | | |
|---|---|---|---|---|---|---|---|
| | | | *1* | *2* | *3* | *4* | *5* |
| **18** | **Sources** | Internet and web based sources | | | | | |
| | | Print materials (Text books) | | | | | |
| | | Electronic Journals | | | | | |
| | | Medical databases | | | | | |
| | | | | | | | |
| **19** | **ICT gadgets** | Cellphone | | | | | |
| | | Laptop | | | | | |
| | | Desktop | | | | | |
| | | Ipad/Tablet | | | | | |
| | | PDAs | | | | | |
| | | | | | | | |
| **20** | **Media &Channels** | Audio | | | | | |
| | | Video | | | | | |
| | | Print | | | | | |
| | | Electronic | | | | | |
| | | | | | | | |

**21.** Which other ICTs would you recommend for accessing and sharing health information by healthcare professionals?

……
……
……
……

**22.** What kind of training do you need to effectively utilize ICTs?

……
……

……
……

**23**. What organisational issues should be addressed by an ICT policy to facilitate sharing of health information by healthcare professionals?

……
……
……
……

**ESTABLISHMENT OF THE SYSTEM**

**24**. What system development method would you recommend for developing an HIV and AIDS information access platform?

| | | | |
|---|---|---|---|
| Lifecycle approach | [ ] | Rapid application development | [ ] |
| End user development | [ ] | Prototyping | [ ] |
| Insourcing | [ ] | Outsourcing | [ ] |

If other, Please specify.....

**25.** Which software would you recommend for the development of the platform?

| | | | |
|---|---|---|---|
| Open source | [ ] | Commercial packages | [ ] |
| Freeware | [ ] | Shareware | [ ] |

If other, Please specify.....

**26**. What system design principles do you propose for developing an effective platform for accessing health information in Zimbabwe?

……
……
……



**BENEFITS OF THE INFORMATION ACCESS PLATFORM**

**27**. How will an information access platform enhance Zimbabwean HIV and AIDS health services?

……
……
……
……

**28**. What are the specific benefits of the information access platform in enhancing HIV and AIDS health services? Select from option 1 to 5 for each reason

Key 1= strongly agree 2=agree 3=neutral 4= disagree 5=strongly disagree

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Ease of access to information | □ | □ | □ | □ | □ |
| Knowledge sharing | □ | □ | □ | □ | □ |
| Collaboration | □ | □ | □ | □ | □ |
| Storage and backup | □ | □ | □ | □ | □ |
| Peer review | □ | □ | □ | □ | □ |
| Accuracy and reliability of information | □ | □ | □ | □ | □ |
| Security of information | □ | □ | □ | □ | □ |

If other, Please specify.....

…….END……

*Thank you very much for your time*

**APPENDIX K: INTERVIEW SCHEDULE FOR IT ADMINISTRATORS**
Instructions are in *Italics*

**Introduction:**

(*Read out the following*)

I am Tapiwa Gandiwa, a PhD student in Library and Information Science Department at the University of Western Cape. I kindly request your time to interview you by asking you some questions that relate to the application of ICTs in accessing HIV and AIDS information. The study I am conducting is in fulfilment of the Doctoral Degree. The study aims at developing an ICT framework to facilitate information access and sharing among healthcare professionals working in HIV and AIDS organisations in Zimbabwe.

The interview will take about 30 minutes to complete. Your participation is voluntary; you have the right to withdraw anytime and to omit questions that make you uncomfortable; nothing will be held against you. All responses are confidential and the data collected will be presented anonymously. Your signature indicates that you have read the information provided above and that you have decided to participate. You may withdraw at any time without prejudice after signing this form should you choose to discontinue participation in this study.

Your answers will be treated confidentially and your identity will not be revealed. There are no right or wrong answers. Your participation in this study is voluntary. You also do not have to answer any questions that make you uncomfortable. The results of this study will be used to help improve information access by healthcare professionals working in HIV and AIDS organisations.



**Interview topics**

Information needs; Evaluation of existing ICTs, Recommended ICTs

**Information needs**

1. As an IT administrator, what do you think are the preferred sources that are used by healthcare professionals in accessing information?*(Sources include textbooks, internet, journals and medical databases)*

2. Which ICT tools (or gadgets) is mostly used and preferred by the healthcare professionals to access information online?

3. Which Web 2.0 and Social Media tools are most preferred for accessing and sharing HIV and AIDS information?

4.Which information media and channels are preferred by healthcare professionals for accessing information?

*(channels and media include audio, video, print and electronic)*

**Evaluation of ICTs**

5. To what extend do you think the current ICTs tools are effective in meeting the information needs of healthcare professionals? Please may you explain your answer?

6. To what extend do you think the current information sources are effective in meeting the information needs of healthcare professionals? Please may you explain your answer?

7. To what extend do you think the current media and channels are effective in meeting the information needs of healthcare professionals? Please may you explain your answer?

8. Please rate the current ICTs used in your organisation in terms of:

i. System use;
ii. Ease of use;
iii. Ease of learning;
iv. Response time;
v. Access to technical support; and
vi. Security.



**Recommended Information System**

9. Which ICT tools or gadgets do you think are most effective for accessing information by healthcare professionals? Please state the reasons.

10. Which information sources do you think are most effective for accessing information by healthcare professionals? Please state the reasons.

11. Which media and channels do you think are most effective for accessing information by healthcare professionals? Please state the reasons.

12. Which software would you recommend to manage the database system for the healthcare professionals?

13. Which network architecture is suitable for linking healthcare professionals from various HIV and AIDS organisations in Zimbabwe?

14. What kind of IT training is needed for healthcare professionals to effectively utilise the health information system?

15. What issues should be addressed by the ICT policy for healthcare professionals?

16. Do you have any other recommendation on improving the efficiency and effectiveness of the proposed information system?

**Establishment of the system**

17. Which software would you recommend for developing the information access platform?

18. What system development methodology would you propose?

19. Which implementation strategy would you recommend when the system is complete?

**Benefits of the system**

20. What are the benefits of the information access platform in the area of HIV and AIDS services?

21. What would be the challenges in introducing such a system?

22. How can the challenges be addressed?

**Thank you for your participation**

**APPENDIX L: WEB EVALUATION RUBRIC**

| **Title of the organisation:**<br>**URL:** | | | | | |
|---|---|---|---|---|---|
| | **Poor [1]** | **Fair [2]** | **Good [3]** | **Excellent [4]** | **Comment** |
| **Authority** | No author is listed and no e-mail contact is provided | No author is listed but an e-mail contact is provided. | An author is listed with no credentials and you cannot tell if the author is the creator of the material | An author is listed with appropriate credentials and is the creator of the material. | |
| **Purpose** | The purpose is unclear or cannot be determined. | The Web site has more than one purpose but meets only a few of my objectives | The purpose is somewhat clear and meets most of my objectives. | The purpose of the Web site is clear and meets my objectives. | |
| **Content** | The information on the Web site does not relate to my objectives. | The information relates to my objectives, but many of the links do not work. | The information relates to my objectives, links work, but the site is not well organized. | The information relates to my objectives, the links work, and the site is well organized. | |
| **Currency** | Information on the site has not been revised in the last 18 months, or no date can be located. | Information on the site has not been updated in the last year, but the information still is of good quality. | Information has been updated in the last six months and seems to reflect currency. | Information has been updated in the last three months and is accurate. | |
| **Design** | The Web site design is inappropriate for my audience. | The Web site loads slowly and the general appearance is poor. | The Web site loads well, but the site is not easy to navigate. | The Web site loads well, is easy to navigate, visually pleasing, and easy to read. | |
| **Navigation** | User becomes lost in navigating on or between pages | Navigation structures may be awkward or difficult to use | Simple navigation structures make site quite easy for user | Simple and powerful navigation structures make navigation feel intuitive | |
| **Interactivity** | Lacks enhancements to actively involve the learner. | Minimal enhancements to actively involve the learner. | Contains some enhancements to actively involve the learner. | Possess many enhancements that require learner to remain actively involved. | |
| | | | | **Total** | |