



Investigating e-health readiness of higher education institution students

Onneile Juliet Ntseme



orcid.org/0000-0002-4472-1315

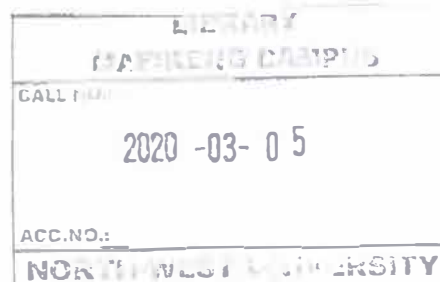
Mini-dissertation submitted in partial fulfilment of the requirements for the degree *Master of Commerce in Computer Science and Information Systems* at the North-West University

Supervisor:
Co-supervisor:

Prof O Jokonya
Dr JE Chukwuere

Date of Graduation: July 2019

Student number: 28088220



DEDICATION

I dedicate this work and all my success to my beloved family members and to the loving memory of my grandfathers, Baraedi Ntseme and Setshwane Sekgwake. I will never forget you. Thank you all: you have successfully made an input into the woman I have become.



ACKNOWLEDGEMENTS

I thank God for my life and the strength he has given me throughout this study. You are forever faithful.

My appreciation goes to my supervisors, Professor O Jokonya and Dr JE Chukwuere for their guidance throughout the study. Thank you for having greatly contributed to the success of this study.

I thank especially my beloved family members: Wamasedi Ntseme, Olivia Ntseme, Unity Sekgwake, Banyana Ntseme, Lebogang Sekgwake, my aunts, siblings and cousins. Thank you for your support.

To my friends at the Department of Information Systems and CARST, thank you for being with me throughout this journey.

ABSTRACT

Information and communication technologies (ICTs) are important for improving healthcare services worldwide. Using tools related to ICTs such as cell phones, video conferencing, computers enhances the delivery of health services as well as electronic health (e-health). Many countries have introduced and implemented e-health, but most research and e-health implementation are still fragmented, especially in developing countries. Therefore, this study investigated the e-health readiness of higher education institution students to use e-health. The study achieved this by identifying the readiness factors that affect the adoption of e-health. The study was based on the conceptual framework (technology readiness and acceptance model for e-health) which was developed by integrating the technology readiness index model and the technology acceptance model.

To carry out this study, a positivist paradigm and a quantitative approach were followed where data was collected from the university of Botswana students using a survey questionnaire. The study established that University of Botswana students' optimism, innovativeness, discomfort and insecurity influence e-health perceived ease of use. However, only optimism and discomfort influence e-health perceived usefulness whereas innovativeness and insecurity did not influence e-health perceived usefulness. Additionally, the study found out that e-health perceived usefulness and e-health perceived ease of use have an influence on e-health adoption. The implications of these findings mean that University of Botswana students being optimistic, their innovativeness, discomfort and insecurity towards e-health technology influence the way they perceive the ease of use of the e-health technology. The university of Botswana students' views on optimism and discomfort of e-health technology influence their perception on the usefulness of e-health technology. In difference, the University of Botswana students' views on innovativeness and insecurity of e-health technology does not technology influence their perception on the usefulness of e-health technology. Furthermore, the implication of the study results is that the University of Botswana students' views also show that e-health perceived usefulness and e-health perceived ease of use have an influence on e-health adoption.

Keywords: e-health, e-health readiness, higher education institution students

Table of Contents

DEDICATION	i
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
LIST OF FIGURES	ix
LIST OF TABLES	x
LIST OF ACRONYMS	xi
1 OVERVIEW OF THE STUDY: CHAPTER 1	1
1.1 INTRODUCTION	1
1.2 BACKGROUND TO THE STUDY	2
1.3 PROBLEM STATEMENT	3
1.4 RESEARCH OBJECTIVES	4
1.4.1 Main objective	4
1.4.2 Sub-Objectives	4
1.5 SIGNIFICANCE OF THE STUDY	5
1.6 DELIMITATIONS	5
1.7 PRELIMINARY CHAPTER DIVISION	6
1.8 CHAPTER SUMMARY	6
2 LITERATURE REVIEW: CHAPTER 2	7
2.1 INTRODUCTION	7
2.2 INTRODUCTION TO E-HEALTH	7
2.2.1 The impact of using e-health	9
2.2.2 Current types of e-health initiatives	11
2.3 READINESS	12
2.3.1 E-health readiness	12
2.3.2 Higher education institution students' e-health readiness	13
2.4 HEALTHCARE	13

2.4.1	E-health in Africa.....	13
2.4.2	Healthcare in Botswana	14
2.4.3	E-health in Botswana	15
2.4.3.1	E-health systems and initiatives in Botswana	16
2.5	STATUS QUO OF TECHNOLOGY DEVELOPMENT AND USAGE IN BOTSWANA 17	
2.6	THEORETICAL FRAMEWORKS	23
2.6.1	Technology acceptance model (TAM)	24
2.6.2	Technology readiness index (TRI 2.0).....	24
2.7	CONCEPTUAL FRAMEWORK OF THE STUDY	25
2.7.1	The relevance of the TRAM in this study	28
2.7.2	The use of TRAM in similar studies.....	29
2.7.3	Hypotheses	31
2.8	CHAPTER SUMMARY	32
3	RESEARCH METHODOLOGY AND DESIGN: CHAPTER 3.....	33
3.1	INTRODUCTION.....	33
3.2	RESEARCH DESIGN	33
3.3	RESEARCH PHILOSOPHY	34
3.3.1	Research assumptions	35
3.3.2	Major philosophies.....	36
3.4	APPROACH TO THEORY DEVELOPMENT.....	37
3.5	METHODOLOGICAL CHOICE.....	38
3.5.1	Qualitative research design	38
3.5.2	Mixed method research design	38
3.5.3	Quantitative research design	38
3.6	RESEARCH STRATEGY	39
3.6.1	Survey strategy.....	39

3.7	TIME HORIZON	40
3.8	DATA COLLECTION	40
3.8.1	Primary and secondary data	40
3.8.2	Population and sampling.....	40
3.8.3	Questionnaire	42
3.8.3.1	Measurements.....	42
3.8.4	Pilot testing	45
3.8.5	Administration of the research instrument.....	46
3.9	ANALYSIS TECHNIQUES AND PROCEDURES	46
3.9.1	Data analysis procedures.....	46
3.9.1.1	Validity and reliability.....	46
3.9.1.2	Descriptive and inferential statistics.....	48
3.10	ETHICAL CONSIDERATIONS	49
3.11	CHAPTER SUMMARY	49
4	RESULTS: CHAPTER 4.....	50
4.1	INTRODUCTION.....	50
4.2	DESCRIPTIVE STATISTICS AND FREQUENCIES	50
4.2.1	Demographic statistics	50
4.2.2	Internet access, e-health knowledge, benefits and challenges	53
4.2.2.1	Internet access and e-health knowledge	53
4.2.2.2	Are you aware of the following e-health initiatives	55
4.2.2.3	What are the benefits of adopting e-health initiatives.....	56
4.2.2.4	The following challenges make it hard for me to adopt e-health.....	58
4.3	E-HEALTH TECHNOLOGY READINESS, E-HEALTH PERCEIVED USEFUL, E-HEALTH PERCEIVED EASE OF USE AND E-HEALTH ADOPTION	60
4.3.1	Correlations.....	60
4.3.1.1	Inter-item correlations between the conceptual framework constructs.....	60

4.3.1.2	Inter-item correlations between age, level of study and the conceptual framework constructs	62
4.3.2	Regression analysis	63
4.3.2.1	Regression analysis for H1a, H2a, H3a and H4a	63
4.3.2.2	Regression analysis for H1b, H2b, H3b and H4b	64
4.3.2.3	Regression analysis for H5 and H6	65
4.4	CHAPTER SUMMARY	66
5	DISCUSSION, INTERPRETATION, CONCLUSION AND RECOMMENDATIONS: CHAPTER 5	67
5.1	INTRODUCTION.....	67
5.2	OVERVIEW OF THE STUDY	67
5.3	DISCUSSION AND INTERPRETATION OF FINDINGS	68
5.3.1	Discussion and implications of the findings in relation to sub-objective 1	68
5.3.2	Discussion and implications of the findings in relation to sub-objective 2	71
5.3.3	Discussion and implication of the findings in relation to sub-objective 3	72
5.3.4	Discussion and implication of the findings in relation to sub-objective 4.....	72
5.3.5	Discussion and implications of the findings in relation to the main objective	73
5.4	CONTRIBUTION TO THE BODY OF KNOWLEDGE.....	75
5.5	LIMITATIONS OF THE STUDY	75
5.6	RECOMMENDATIONS AND FUTURE WORK.....	76
5.7	CONCLUSION	76
	REFERENCES.....	77
	APPENDIX A	86
	APPENDIX B	92
	APPENDIX C	93
	APPENDIX D	94
	APPENDIX E	96
	APPENDIX F	97

APPENDIX G 98



LIST OF FIGURES

Figure 2.1: Digital health frontlines in the era of extreme automation.....	8
Figure 2.2: Elements of a basic electronic health record	12
Figure 2.3: Technology Acceptance Model.....	24
Figure 2.4: Technology readiness index	25
Figure 2.5: TRAM for E-health (Conceptual framework).....	26
Figure 2.6: TRAM for E-health with hypotheses	32
Figure 3.1: Research Onion	34
Figure 3.2: Sampling Approach.....	41
Figure 4.1: Gender	50
Figure 4.2: Age	51
Figure 4.3: Faculty	52
Figure 4.4: Level of study	53
Figure 4.5: Do you have regular access to the internet?	54
Figure 4.6: Do you know something about e-health?	55
Figure 4.7: Are you aware of the following e-health initiatives?	56
Figure 4.8: What are the benefits of adopting e-health initiatives?	58
Figure 4.9: The following challenges make it hard for me to adopt e-health	60

LIST OF TABLES

Table 2.1: Household access to internet, mobile cellular telephone, laptop and desktop computer..	18
Table 2.2: Type of internet access	18
Table 2.3: Households' internet access by district.....	19
Table 2.4: Frequency of computer use	20
Table 2.5: Location of computer use	20
Table 2.6: Use of internet by level of education	22
Table 2.7: E-governance users by age	23
Table 3.1: Technology Readiness Index Constructs	43
Table 3.2: Technology Acceptance Model Constructs	44
Table 3.3: E-health Adoption Construct	45
Table 3.4: Reliability analysis of the research questionnaire.....	47
Table 3.5: Reliability analysis of the conceptual framework constructs	48
Table 4.1: Internet Access and E-health Knowledge Statistics	53
Table 4.2: Inter-item correlations of the conceptual framework constructs	62
Table 4.3: Inter-Item Correlations between Age, Level of Study and Conceptual framework Constructs.....	63
Table 4.4: Model Summary 1	63
Table 4.5: Regression Analysis 1	64
Table 4.6: Model Summary 2	64
Table 4.7: Regression Analysis 2.....	65
Table 4.8: Model Summary 3	65
Table 4.9: Regression Analysis 3.....	66

LIST OF ACRONYMS

ICT - Information and Communication Technology

ICTs - Information and Communication Technologies

E-health - Electronic Health

EHR - Electronic Health Record

MOH - Ministry of Health

TRAM - Technology Readiness and Acceptance Model

SDF - System Design Features

PEU - Perceived Ease of Use

PU - Perceived Usefulness

ATU - Attitude Towards Using

OPT - Optimism

INN - Innovativeness

DIS - Discomfort

INS - Insecurity

EPU - E-health Perceived Usefulness

EPEU - E-health Perceived Ease of Use

EA - E-health Adoption

1 OVERVIEW OF THE STUDY: CHAPTER 1

1.1 INTRODUCTION

Information and communication technologies (ICTs) have been used in many sectors such as the commerce and the banking sector to solve problems around the world. While the prior observation is the case, ICTs are also important in the provision of tools and knowledge needed for improving healthcare services delivery in both private and public sectors thereby transforming health operations and processes in developing nations through the use of electronic health (Kgasi & Kalema, 2014).

Healy (2008) states that by using e-health, efficiency in health systems may be enhanced. Electronic health is the use and application of ICTs in the healthcare context to address the needs of patients, healthcare professionals and practitioners (Matusitz & Breen, 2007; Silber, 2003). Furthermore, according to Archbishop Emeritus Desmond Tutu, “e-health is a ray of light on the horizon for health and equity challenges that plague humanity” (Minichiello, Rahman, Dune, Scott & Dowsett, 2013). By tradition, the most reliable source of health-related information to patients are healthcare professionals (De Rosis & Barsanti, 2016; Xiang & Stanley, 2017). Moreover, the recording of patients’ health information has been done and is still being done on paper in most countries. The use of paper to record patients’ information comes with its limitation of poor availability, incomplete data and data that has been fragmented. However, greater accessibility to the internet makes it possible for the broad accessibility of online health-related information that provides people with a new source of health knowledge (Xiang & Stanley, 2017).

Many countries have introduced and implemented e-health. Developed countries are at an advanced level of implementation and adoption of e-health as compared to developing countries. Adding on, it is important in any country to understand the compound processes of change and learning that come with the implementation of e-health at the levels of medical professionals, patients and healthcare organizations (Faber, van Geenhuizen & de Reuver, 2017; Lee, Cain, Young, Chockley & Burstin, 2005) because knowledge is still limited and uncertain on the adoption processes of e-health. Moreover, it is also vital to understand the readiness of stakeholders that are affected by the implementation of e-health as it may assist in determining whether the technology is likely to be adopted.

1.2 BACKGROUND TO THE STUDY

In terms of information and communication technology (ICT), Botswana has an enabling environment that supports and funds ICT from the private and public sector (World Health Organization Regional Office for Africa, 2014). This enabling environment that supports and funds ICT from the private and public sector has been put in place since 1997 (World Health Organization Regional Office for Africa, 2014). Nonetheless Botswana has also developed a national ICT policy aimed at guiding, integrating and coordinating all the ICT initiatives (Government of Botswana, 2004). This was developed after the health electronic readiness (e-readiness) assessment was conducted (World Health Organization Regional Office for Africa, 2014). According to the Government of Botswana (2004), the country is still behind in enjoying the full benefits of ICT when compared to other developing countries. One of the areas addressed in the national ICT policy included the use of ICT in the health sector.

Furthermore, in terms of the health sector, as a developing country, Botswana established an integrated health service plan for 2010-2020. In the ten-year strategic plan, the strategic information management area has the main strategic objective of strengthening the information management system of the national response which would allow information sharing and its use for evidence-based planning (Ministry of Health, Government of Botswana, 2010). Additionally, the main strategic objective was followed by the strategic objective that focuses on e-health whereby the health information system is strengthened to enhance the generation of data that could be further used for evidence-based planning (Ministry of Health, Government of Botswana, 2010).

With the strategies on e-health put in place in Botswana, e-health initiatives are still in their infancy. However, the government of Botswana partnered with developed countries to get support on e-health since it requires substantial financial and human capital investments (Nkwe, 2012). The partnership with other developed countries helped Botswana to get e-health machines from the government of India which enabled projects such as telemedicine and the integrated systems for patient management and health workers getting commissioned (Nkwe, 2011).

E-health initiatives already in place in Botswana and those that are to come in later years are used by several stakeholders, including higher education institution students. According to The Enterprise of HealthCare Magazine (2010) Bokamoso Private Hospital which is located in the capital of Botswana, Gaborone, has a progressive information technology department which

supports the use of electronic medical records and the telemedicine capability that has satellite connectivity.

In terms of technology adoption and use by students in Botswana, a research by Lekopanye and Mogwe (2014) shows that students' at Botho University in Botswana have adopted and accepted ICTs. Furthermore, they state that several people in Botswana are most likely to be exposed to ICTs at later stages of their lives when they are employed or when at tertiary levels (Lekopanye & Mogwe, 2014). In another study by Ntseme, Nametsagang and Chukwuere (2016) the results of the studies on the adoption and use of a form of ICT in the banking industry (mobile banking) showed that younger people in Gaborone used the technology more than other people in older age groups. With regards to the prior statements this mean that university of Botswana students may be part of the young people who have adopted several ICT's hence this may influence their readiness for e-health as they are already used to other related ICT's.

University of Botswana students are also not left out in terms of using information communication technologies. Their use of the internet has been documented by researchers. For example, Ajiboye and Tella (2007) conducted a research and found out that university of Botswana undergraduate students mostly indicated that the internet was crucial in their search of academic information. However, Dintoe (2017) states that technology adoption and diffusion were slow at the University of Botswana due to the historical and contextual circumstances of Botswana. The author also adds that the lack of technology infrastructure resulted in little technology being available to use outside the university (Dintoe, 2017). With all this mentioned in the literature there is a need to investigate the readiness of higher education students in Botswana to adopt e-health.

1.3 PROBLEM STATEMENT

Patient centred healthcare system is becoming a trend around the world (Hellberg & Johansson, 2017). According to Hellberg and Johansson (2017) in the last decade there has been growing attention in terms of patient centred health information technology from the health sector, information technology developers and policy makers. Being one of the supportive systems in the healthcare system, e-health is most likely to help address the challenges faced by health systems in developing countries (Coleman, Herselman & Potass, 2012). Some of these challenges faced by health systems include the use of paper-based patient health records which makes it difficult to track patient's health problems and the long queues at hospitals and clinics caused by patients who seek medical assistance. Despite the well documented benefits on e-

health such as the increase in the quality of data, reduced errors and costs in the health sector, most developing countries find it challenging to adopt e-health (Mugo & Nzuki, 2014). This means that there is a need to investigate the readiness to adopt e-health from hospitals to the patients who are at the receiving end.

Before the implementation of any e-health system, the readiness and the preparedness must be established to avoid failure to innovate (Chattopadhyay, Li, Land & Ray, 2008; Kiberu, 2016; Li, Ray, Seale & MacIntyre, 2012). Several studies have been done on e-health as demonstrated by several authors (Coleman *et al.*, 2012; Hoque, Bao & Sorwar, 2016; Lee *et al.*, 2005; Partnaik & Partnaik, 2015; Yusif & Soar, 2014). However, research in e-health seems to be disjointed in developing countries (Mugo & Nzuki, 2014).

Literature shows that several studies have been conducted on the readiness to adopt e-health by developing countries with most studies focusing on the readiness of practitioners or healthcare providers (Abdullrahim & Coster, 2016; Coleman *et al.*, 2012; Kiberu, 2016; Lee *et al.*, 2005; Li *et al.*, 2012; Partnaik & Partnaik, 2015; Rezai-Rad, Vaezi & Nattagh, 2012; Saleh, Khodor, Alameddine & Baroud, 2016; Yusif & Soar, 2014) and a few studies focusing on the patients readiness to adopt e-health in developing countries (Heart & Kalderon, 2013; Khatun, Heywood, Ray, Hanifi, Bhuiya & Liawa, 2015; Khatun, Heywood, Ray, Bhuiya & Liawa, 2016). Chattopadhyay *et al.* (2008) states that the analysis of e-health readiness is still limited to its broader perspective. Also, the existing literature has failed to neither capture, determine nor recognise the factors affecting the e-health readiness of students (higher education institution students) who are also the significant recipients of health services. This study therefore seeks to address the gaps identified by the literature through investigating the e-health readiness of higher education institution students in Botswana.

1.4 RESEARCH OBJECTIVES

1.4.1 Main objective

The main objective of this study is to investigate readiness factors that affect adoption of e-health by higher education institution students.

1.4.2 Sub-Objectives

To achieve the above main objective in section 1.4.1 the following sub-objectives are used as drivers for this study:

- a. To investigate technology readiness factors affecting e-health adoption among students in higher education institutions

- b. To investigate perceived usefulness as a factor that affect e-health adoption by students in higher education institutions
- c. To investigate perceived ease of use as a factor that affect e-health adoption by students in higher education institutions
- d. To develop and validate a conceptual framework for e-health adoption by higher education institution students

1.5 SIGNIFICANCE OF THE STUDY

This study investigates the e-health readiness of higher education institution students in Gaborone, Botswana. The study addresses the research gaps identified in section 1.3. It provides useful information on the e-health readiness of higher education institution students in Gaborone, Botswana, to different stakeholders such as the government and healthcare providers. Furthermore, the results of this research could be used by healthcare service providers and the government to make informed decisions on the implementation of e-health initiatives hence it anticipates the issue of failure after introducing the e-health technology to the student community.

In the field of information systems, this study provides insights into the determinants or factors affecting the e-health readiness of students in a higher education institution (University of Botswana) in Gaborone, Botswana. The study also adds knowledge to the research community by reducing the disjointed research on e-health in developing countries as little research has been done on the readiness of higher education institution students who are treated as end users of e-health in a developing country context such as Botswana. Other researchers could use the information from this study and buttress research on e-health.

1.6 DELIMITATIONS

This study focused only on investigating the readiness of higher education students to adopt e-health as it does not involve hospitals, clinics, or employees in the health sector. The study employed the technology readiness index and some constructs of the technology acceptance model (TAM) model to investigate the readiness of higher education institution students to adopt e-health. Furthermore, this study does not make generalizations of the whole student population in Botswana as it focuses only on a specific higher education institution.

1.7 PRELIMINARY CHAPTER DIVISION

- **Chapter 1:** This chapter discusses the overall introduction to this study. Contained in it is the study background, the problem statement, research objectives, the significance of the study, delimitations of the study and the proposed structure of the study.
- **Chapter 2:** This chapter focuses on the review of the literature related to the study hence interrogates the views of different authors on the topic of e-health.
- **Chapter 3:** This chapter outlines the research methodology and design selected for use in this study to get answers to the research objectives. The study's data collection methods are discussed in detail in this chapter as well as the sampling and the data analysis methods.
- **Chapter 4:** This chapter presents the results of the study obtained and analysis using SPSS and excel. The chapter also presents the significant interpretation and the discussion of the findings of the study.
- **Chapter 5:** This chapter presents the conclusions of this study. Conclusions are made based on the outcomes of the analysis of the results addressing the main objective and sub-objectives. At the end of the chapter, a conclusion for the whole research is given.

1.8 CHAPTER SUMMARY

Problems in the healthcare can be eliminated by the use of ICTs such as e-health. Several countries, especially developing ones, have started using e-health to overcome problems in the healthcare system. However, for countries that are still developing and are starting to rollout e-health initiatives, an e-health readiness assessment is necessary not only to the service providers of the healthcare system, but readiness assessment is also important at the lower end of the users (patients) who use e-health.

This chapter gave a brief introduction into the research; the problem driving this research was stated. The study's main objective and sub-objectives that address the overall research topic were also stated. Furthermore, the significance of this study and the preliminary study layout are also given. The next chapter discusses literatures that relates to e-health.

2 LITERATURE REVIEW: CHAPTER 2

2.1 INTRODUCTION

Chapter 1 of this study focused on outlining the background, problem statement, research objectives, significance of the study and the delimitations of the study.

In this chapter related literature to the study is reviewed from relevant materials with a focus on keywords such as e-health, e-health records, telemedicine, technology readiness, readiness, technology acceptance model and technology adoption. The aim of using related literature was to get various insights on e-health concepts and prospects on e-health readiness as well as to check what has been done by other researchers and practitioners and identify the gaps hence the achievement of the objectives of this study. An effort was also made to develop the integrated technology readiness and acceptance model for e-health.

2.2 INTRODUCTION TO E-HEALTH

According to Minichiello *et al.* (2013) e-health is internet based healthcare issued in the health sector for educational, clinical, administrative purposes and preventative purposes both on site and off site. However, Coleman *et al.* (2012) and Kampmeijer, Pavlova, Tambor, Golinowska and Groot (2016) adopted the World Health Organization's (WHO) definition on e-health as the use of ICT to improve the healthcare systems by connecting providers, governments and patients. The researchers further assert that e-health educates and informs healthcare professionals, consumers and managers and encourages innovation in the delivery of healthcare and health system management. On the other hand, Kampmeijer *et al.* (2016) states that e-health is any kind of electronic device or monitoring system that physicians apply in the healthcare practice or used by individuals to improve their health status. Furthermore, Madanian (2016) argues that e-health includes a variety of technologies such as telemedicine, big data, mobile health, electronic health records (EHR) and auto identification. It is a moot point that e-health does more to offer health services by providing home online health information websites, home monitoring systems, automated online therapy, shared electronic records, interactive EHR, healthcare systems portals, tailored health education programmes and advanced telehealth applications (Madanian, 2016).

With regards the definitions provided by different authors it is clear that e-health involves the use of ICTs in the healthcare sector to perform different duties thereby improving the delivery of services in the sector. In this study, the definition of Madanian (2016) is adopted for use to refer to e-health, because it covers the technological and online activities performed daily and periodically by students in the 21st century in developing countries, in this case Botswana.

Although this study focuses on only e-health which is still fragmented and a nascent sector in developing countries, the researcher appreciates that there is a new concept called “digital health” and health 4.0 which is totally different from e-health. According to Fiaidhi and Mohammed (2018), digital health provides a platform to integrate mobile health, telecare and e-health services with new digital health technologies that use sensors and data analytics operations to provide progressive healthcare services. The authors add that digital health exists in a continually developing environment where there is extreme automation (Fiaidhi & Mohammed, 2018). Additionally, digital health is based on the collection and connection of health-related data from all available sources where meaningful information is extracted to provide data to health stakeholders (Fiaidhi & Mohammed, 2018). Other authors such as Herselman, Botha, Toivanen, Myllyoja, Fogwill and Alberts (2016) posit that digital health brings changes to the existing healthcare system. These changes improve efficiency, coverage and the accuracy of healthcare services by involving artificial intelligence and automation solutions (Herselman, *et al.*, 2016). Figure 2.1 below shows in brief what digital health entails.

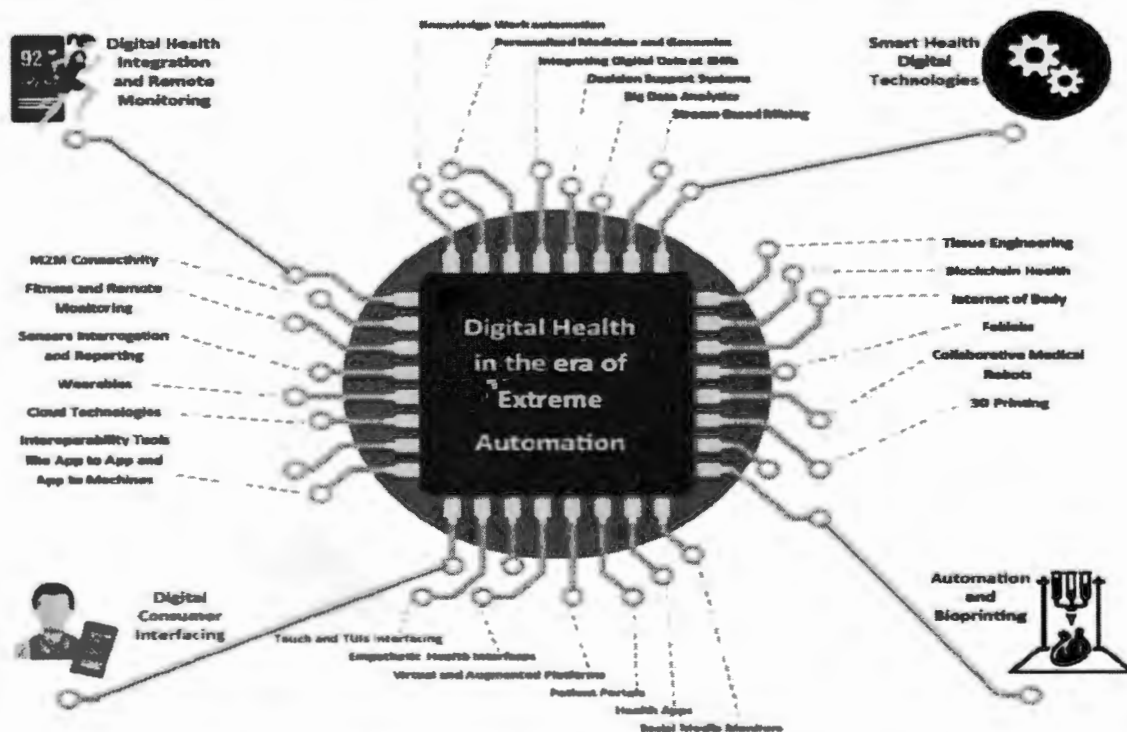


Figure 2.1: Digital health frontlines in the era of extreme automation

Source:Adopted from Fiaidhi & Mohammed (2018)

2.2.1 The impact of using e-health

This section covers the general impact of using e-health in terms of its benefits, importance and security aspects to users including higher education institution students. E-health plays a vital role in addressing the problems that are inherent in the traditional delivery of the healthcare services. The quality of data is bound to increase, errors and costs in the health sector are reduced as well as patients' safety being increased (Madanian, 2016).

Benefits and the importance of E-health

E-health plays an important role in addressing the problems inherent in the traditional delivery of the healthcare system. The 21st century presents a lot of opportunities that allows technologies and internet to drive social, private and personal health services across the globe. The quality of data is bound to increase, errors and costs in the health sector are reduced as well as patients' safety being increased (Madanian, 2016). The following are important in e-health as outlined by researchers like Madanian, (2016); Ami-Narh & Williams, (2012); Silber, (2003); Mugo & Nkuzi, (2014):

1. Enhancing patients' education and assisting healthcare providers in making better decisions by providing them with the necessary medical information via electronic media. Electronic media allow patients to seek second opinions on health issues through the use of online communities. Furthermore, the use of e-health changes the focus from specific individual records systems to knowledge on the health of a certain population and therefore helps medical practitioners make informed decisions on healthcare.
2. E-health also enables the sharing of valuable health information such as electronic healthcare records by the use of electronic mails and EHR systems. The use of EHR also supports medical practitioners' decision-making and helps improve their operating efficiency hence healthcare is improved. Furthermore, using personal health records also enables a citizen-centered healthcare approach where patients are actively involved in their own healthcare.
3. Allowing the expansion of the delivery of the limited medical resources and expertise by allowing providers to have face to face interactions. E-health makes healthcare services accessible to all regardless of the geographical location by accelerating the delivery of the healthcare service. This addresses the problem of medical practitioners being physically present to offer medical services.

In terms of the importance of e-health, the literature makes it clear that it is advantageous to use e-health as it addresses the problems that have been experienced in the healthcare system.

Privacy, security and integrity challenges in E-health

While the above-mentioned show that e-health improves the overall quality of delivering healthcare, the technology also comes with several privacy, security and integrity challenges. Limited literature specifies issues of privacy, security and integrity challenges of e-health in general (Ghazvini & Shukur, 2013; Sabnis & Charles, 2012; Meingast, Roosta & Sastry, 2006). The literature discusses some of those challenges in relation to some initiatives of e-health as discussed in the next paragraphs on this section.

The provision of healthcare electronically through the use of the internet as well as wireless transmissions poses a danger to the security and privacy of individuals (Meingast, *et al.*, 2006). The use of electronic health records, which is an e-health initiative, comes with its own challenges of privacy and confidentiality. Meingast *et al.* (2006) states that connecting personal health information to the internet exposes the data to attacks by hackers and other unauthorised people as compared to paper based medical records. In addition, sensor networks for home monitoring or telemedicine can be attacked when the data is in a wireless transmission (Meingast, *et al.*, 2006). The type of attacks that may happen include skimming and eavesdropping (Meingast, *et al.*, 2006). Ghazvini and Shukur (2013) add that policies of healthcare organizations have to be amended in order to protect electronic health records from unauthorized access. Furthermore, the authors also state that threats to electronic health records come from employees in several ways. The threats can be due to unauthorized access or lack of individual training (Sabnis & Charles, 2012). Therefore, to address this, organizations' need to focus on defining access levels for every healthcare employee and also preventing redundant access to electronic personal records (Ghazvini & Shukur, 2013). Furthermore, they stated that recruits in healthcare facilities need to be inducted on information security policies of electronic personal records on regular basis (Ghazvini & Shukur, 2013).

Although there are some security challenges to using e-health, there are some remedies to addressing them. These remedies include encryption which ensures the security of data from eavesdropping and skimming (Meingast, *et al.*, 2006). Encryption techniques can be used both in hardware and software (Meingast, *et al.*, 2006). These encryption techniques include symmetric and asymmetric key algorithms (Vaudenay, 2006). Role based access control which is the most advanced access control method can also be used to address security challenges of using e-health. Additionally, authentication mechanisms can also be used to guarantee that data is really coming from the person or entity that it is claiming to be the source (Vaudenay, 2006). These authentication algorithms include digital signatures and passwords.

2.2.2 Current types of e-health initiatives

This section discusses some of the e-health initiatives such as electronic health records and telemedicine only. The aim is to highlight different aspects of e-health systems or initiatives that public or private health organizations may adopt in serving the needs and expectations of clients such as higher education institution students in the case of this study.

Electronic health records (EHR)

According to Bantom (2016), EHRs were introduced in the 1960s. EHR is defined as a repository of patient data which is stored in a digital format (Ben-Assuli, 2015). The International Organization for Standardization (2005) also describes EHR as a patient data repository that is in digital format and can be stored, securely exchanged and accessed by several authorised users. Its primary purpose is to support the continual, efficient and quality integrated healthcare by containing reflective, simultaneous and prospective information (Hayrinen, Saranto & Nykanenb, 2008). The EHR is used by different healthcare professionals as well as administrative staff (Hayrinen, *et al.*, 2008). However, its use as per the name it is called with, extent and the type differ from country to country. In their paper, Nguyen, Bellucci and Nguyen (2014) referred to EHR as any health, medical or clinical records that is in an electronic or digital format and in the context of patient care. On the other hand, Heart, Ben-Assuli and Shabtai (2017) state that EHR save medical records in computerized storages to be used by physicians to improve the quality of healthcare and also contain costs. However, they define EHR as a system that is inter-organizational (Heart, *et al.*, 2017). With regards the definitions of EHR provided so far, it is concluded in this study that EHR are patients' medical records that are in digital format accessible and used at all times anywhere. Figure 2.2 shows some elements of EHR.



Figure 2.2: Elements of a basic electronic health record

Source: Adopted from Bantom (2016)

Telemedicine

Various definitions such as the ones outlined next have been given on what telemedicine is. Telemedicine means the exchange of medical information from site to site through the use of electronic communication in the form of videos, emails, voice, messages in order to improve the patient clinical health status (Malasanos & Ramnitz, 2013). Bwalya (2017) adds that telemedicine involves delivering healthcare services using platforms offered by technology such as mobile phones, iPads, sensors and smart devices. Furthermore, according to Ndlovu, Mauco and Littman-Quin (2017), telemedicine includes providing clinical healthcare from a distance using ICTs.

2.3 READINESS

The use and adoption of any technology involves users' readiness at all times. This section provides a detailed explanation of e-health readiness as well as higher education institution students' e-health readiness.

2.3.1 E-health readiness

According to Kgasi (2014) e-health readiness is defined as the extent of preparedness to participate and succeed in implementing e-health by healthcare institutions, users, and the healthcare system as a whole. Similarly, Ojo, Olugbara, Ditsa, Adigun and Xulu (2007) state that e-health readiness is the extent of readiness for a community to participate and succeed in adopting e-health. It is also related to the level of preparedness of technological innovation and the willingness to adapt to these new technologies. Any implementation of a new technology

brings disruptions as people have to adapt to the changes brought by the new technology innovation. With this said, the healthcare system is affected by the implementation of e-health. Hence Ojo *et al.* (2007) states that due to the anticipated resistant to accepting and adopting e-health, the e-health readiness assessment must be done.

2.3.2 Higher education institution students' e-health readiness

Section 1.3 recognises that there have been several studies focusing on the readiness of practitioners or healthcare providers and a few studies focusing on the patients' readiness to adopt e-health in developing countries. This shows there is a gap to cover higher education institution students' e-health readiness. In this study e-health readiness means the preparedness of higher education students to participate and adopt the new technological innovations brought about by the concept of e-health. The level of preparedness is confirmed by investigating the readiness factors that affect the adoption of e-health by higher education institution students. Understanding the students' e-health readiness will aid in knowing whether the students will adapt to the introduction of the technology and adopt it in their daily lives hence this research title.

2.4 HEALTHCARE

Healthcare differs around the world and it is a concern for all developing and developed countries (Bantom, 2016). Developed countries are well resourced and with good infrastructure (Bantom, 2016). In this section e-health in Africa is discussed in brief, Botswana's healthcare in general is examined as well as the current state of e-health implementation in the country.

2.4.1 E-health in Africa

There is fragmented research relating to e-health in Africa as shown by the little evidence published on activities related to e-health (Scott & Mars, 2015). In Africa, e-health focus is more on telehealth applications such as teleconsultations and telediagnosis (Scott & Mars, 2015). The reason healthcare providers in Africa adopt telemedicine is to encourage and also extend geographical access to healthcare (Lewis, Synowiec, Lagomarsino and Schweitzer, 2012). Additionally, Adeloye, Adigun, Misra and Omoregbe (2017) observe that the purpose of using telemedicine is to overcome distance challenges between doctors and patients as patients' consultations with doctors may be received remotely. Moreover, mobile health was reported to be fairly used in Africa (Adeloye, *et al.*, 2017). The reasons for the fair usage of mobile health is due to low cost of mobile phones, better adaptation to local context, ease of use, and widespread availability across many African settings (Adeloye, *et al.*, 2017).

2.4.2 Healthcare in Botswana

There is a variety of health service delivery in Botswana such as public, profit and nonprofit private and traditional medicine practices (Ministry of Health, Government of Botswana, 2010). Higher education institutions (Universities) are not left behind as they also have clinics on campuses aimed at giving health assistance to staff and students. Although that is the case, the Ministry of Health (MOH) has the sole responsibility of formulating policies, regulations, norms, standards and guidelines for the entire health services (Ministry of Health, Government of Botswana, 2010). Furthermore, the MOH is the main healthcare provider in the public sector. The government of Botswana managed to contribute 15% of its expenditure to the health sector (Ministry of Health, Government of Botswana, 2010). However, the sector is still faced by several challenges such as a shortage of qualified and trained staff, staff turnover that leads to more shortage of staff members and weak supply chain management systems that result in inadequate availability of and regular stock out of important drugs (Ministry of Health, Government of Botswana, 2010). Another challenge is that of weak health management information which leads to data collection that is untimely, analysis, the interpretation, dissemination of information and inability to attend to patients on time which leads to them spending hours in queues. The situation is worsened by the existence of parallel several databases such as the human resource, finance, information technology, and epidemiology databases. As a result of the parallel databases, monitoring and evaluation is fragmented and ultimately compromises the tracking of health outcomes and the measurement of specific interventions (Government of Botswana, Ministry of Health, 2010).

In terms of the shortage of staff, statistics show that per 10,000 (ten thousand) population there were four doctors, 26 nurses and midwives as well as two pharmacists (Government of Botswana, Ministry of Health, 2010). However, the Ministry of Health tried to intervene to meet the shortage of staff and staff turnover by using appropriate measures for division of labour (Government of Botswana, Ministry of Health, 2010). There is also training of healthcare professionals both in the country and outside the country with heavy reliance on in-the-country-training. Eight training institutions are used mainly to train nurses and there is a limited number of nurses focusing on health technologies and pharmacy. The medical school has also been established and a few graduates are now deployed to the workplaces. However, due to a limited number of native trained and skilled health professionals, the sector still employs more expatriates (Government of Botswana, Ministry of Health, 2010).

With regards to shortage of drugs there has been the Botswana national drug policy (BNDP) that was put in place in 2002 to help deal with the challenge (Government of Botswana, Ministry of Health, 2010). But there has been another major challenge in the regulation of medicines where there was staff shortage at the drugs regulatory unit responsible for registering medicines and conducting drug control activities (Government of Botswana, Ministry of Health, 2010). Adding onto it is the challenges of insufficient legislation to deal with the importation and distribution of fake medicines; the prescription and dispensing of drugs by unqualified staff contrary to provision of the drugs and related substances act of 1992 (DRSA); and inadequate regulation and control of traditional medicines. Supply chains in clinics and hospitals are also weak, thereby resulting in inconsistent availability and shortage of necessary drugs (Government of Botswana, Ministry of Health, 2010). However, there has been an ongoing reform at the central medical stores that was aimed at improving its performance and ensuring future universal access to necessary medicines.

With regards weak health management information, there is a current limitation to the use of data for purposes of planning and programme improvement, something that reduces the quality of information. There is poor compatibility and coordination of dissimilar information systems such as epidemiological, human resources, logistics, health statistics as well as finance. The present monitoring and evaluation processes is therefore disjointed hence affecting the tracking of outcomes, the impact on health status, and the programme interventions.

2.4.3 E-health in Botswana

Health information management (HIM) is regarded as weak in Botswana's public healthcare provision system (Sebina & Grand, 2017). This weak HIM also affects higher education institution students as they are also clients in the health services. The weak HIM is attributed to the fact that there is no central database, something which makes it difficult to collect, use, disseminate and share data (Government of Botswana, Ministry of Health, 2010). Furthermore, Moloi and Mutula (2007) argue that managing electronic records (e-record) in Botswana is in its initial stages and fairly new. Although the point is valid in this case, the government of Botswana continues to implement their "integrated health service plan: a strategy for changing the health sector for a healthy Botswana 2010-2020" by getting involved in several e-health systems and initiatives. These include types of e-health systems used to collect health data such as integrated patient management system (IPMS) that collects data from hospitals on patient diagnostic information, the patient management system that is used by the maternity sector in clinics as well as the district health information systems 2 (DHIS2) that is used for the

aggregation of health data from all the health facilities found within Botswana (MEASURE Evaluation, 2018). These majors aimed to facilitate data and content sharing and storage in the health sector. Private healthcare practitioners in Botswana are also not left behind in implementing e-health initiatives. Diagnofirm medical laboratories (DML) in Botswana also reported that it implements a DML mobile app which provides the status of patients' (including higher education institution students) samples as it happens (Diagnostics, 2017). With this app, doctors, referrers and patients can also view the sample action in each and every stage of processing (Diagnostics, 2017).

2.4.3.1 E-health systems and initiatives in Botswana

This section discusses several e-health systems and initiatives that have been undertaken by the Botswana government with an effort to appreciate e-health initiatives and the benefits.

Integrated Patient Management System (IPMS)

Botswana uses the IPMS to enhance the sharing of information between healthcare providers in various healthcare sites in the country (Ndlovu, et al., 2017). The IPMS houses patients' electronic records for the rest of their lives and the record can be accessed over a portal in any health facility, throughout the country as long as the patient is alive (Ndlovu, *et al.*, 2017). The IPMS therefore allows patients to seek medical help from hospital to hospital since their medical records are available for retrieval in the systems by authorised providers (Ndlovu, et al., 2017). An example of the IPMS include the medical practice management module which is used for managing human immunodeficiency virus (HIV).

Multi Drug Resistant Tuberculosis (MDR-TB) M-health Clinical Support

Facilitation of sharing knowledge between tuberculosis (TB) clinicians and medical officers is very important in managing and providing quality healthcare services to the patients. Botswana has also provided its medical practitioners with tablets loaded with multi drug resistant Tuberculosis (TB) (MDR-TB) resources (Moahi & Bwalya, 2017). The resources include guidelines for preventing, monitoring and treating Tuberculosis. However, the MDR-TB pilot study was conducted partially and never concluded or assessed due to budget constraints as well as some technical delays.

Mobile health (M-Health) pilot projects

Botswana also piloted its first mobile health projects. They include Tuberculosis (TB) Contact Tracing which replaced the paper-based TB tracing for a period of six months (Ndlovu, *et al.*, 2017). The project was done by the Ministry of Health together with the Botswana-UPenn

Partnership. The m-health projects showed a good reception and good results when evaluated as compared to the paper-based TB tracing (Ndlovu, *et al.*, 2017). On the whole, the m-health approach also had higher favourable ratings score in terms of the usefulness of the system, quality of information and interface quality.

Television White-Space (TVWS) Pilot Project

The TVWS pilot project was done to help deliver telemedicine services to clinics and health posts that are outside Botswana's capital city and other towns where there is a limited number of medical specialists (Ndlovu, *et al.*, 2017). Phase 1 of the project was launched in March 2015. Phase 2 of the project were consultations that were supported through the use of the normal skype application. To make sure that confidentiality of patients was guaranteed, patients' identifiers were not available on pictures that were discussed during the skype sessions. Phase 3 of the project that was earlier envisioned streamlined some of the clinical consultations (Ndlovu, *et al.*, 2017). This was due to the complexity of having different stakeholders at time zones that are different within a health system that was dynamic, something that affected the speed of the implementation.

Portable Eye Examination Kit (Peek) Botswana Project

The Peek Botswana started its phase 1 in July 2016. It is the Peek vision technology which provides access to eye tests that are clinically approved to people at rural areas with the aim to fight blindness in developing countries (Ndlovu, *et al.*, 2017). Furthermore, the PEEK project allows the use of cheaper devices to manage and monitor patients eye treatments. In carrying out this project, several school children were tested, and some were provided with the necessary medication and ophthalmic services (Ndlovu, *et al.*, 2017). The challenges faced when implementing this project was participants incompetency when using smartphones because most of them were first time users. Additionally, mobile data bundles were also finishing quickly, and it was difficult to get the participants on the training site on schedule.

2.5 STATUS QUO OF TECHNOLOGY DEVELOPMENT AND USAGE IN BOTSWANA

In order to undertake this study, it is important to understand the information communication and technology infrastructure and usage in Botswana. This is done by laying down the latest Botswana household access and individual use of ICTs report-2014 statistics relating to ICT usage in Botswana at large, lowering it down to focus on Gaborone where the study was conducted as well as ICT statistics of users with tertiary education.

Household access to internet, mobile cellular telephone, laptop and desktop computers

According to Statistics Botswana (2017) as per the 2014 ICT household surveys, there has been a substantial increase in households' access to ICT's from the year 2001 to 2014. Out of the 606 071 households in Botswana Table 2.1 below shows the general statistics on household access to internet, mobile cellular telephone, laptop and desktop computers.

Table 2.1: Household access to internet, mobile cellular telephone, laptop and desktop computer

Source: Adopted from Statistics Botswana (2017)

Household access to	Percentage (%)
Internet	40.6
Mobile cellular telephone	94.0
Laptop	20.6
Desktop	10.9

Based on males and female headed families' criteria, male headed families had an upper hand in both the ownership of desktops and laptops, followed by female headed families. In terms of regions, the Gaborone region was the frontrunner with more households having laptops followed by the Kweneng East, South East and the Francistown regions (Statistics Botswana, 2017). However, in terms of age, most households headed by those aged 25-54 had computers whilst in terms of highest education achieved, those with tertiary education had an upper hand in the ownership of computers (Statistics Botswana, 2017).

Table 2.2: Type of internet access

Source: Adopted from Statistics Botswana (2017)

Type of internet access	Percentage (%)
Mobile internet	94.3
Fixed internet	9.8
asymmetric digital subscriber line	7.3

Table 2.2 shows that among households in Botswana, mobile internet was the most dominant as it was used by most households that had internet access. Fixed internet followed, and asymmetric digital subscriber line was last.

Table 2.3: Households' internet access by district

Source: Adopted from Statistics Botswana (2017)

District	Percentage (%)
Gaborone	24.1
Kweneng	11.4
Central Tutume	7.1

Table 2.3 shows that Gaborone had the highest proportion of households' internet access followed by Kweneng East District, and lastly Central Tutume district. Although there is apparently widespread internet use in Botswana, 360 130 households which make up 59.4% did not have internet access (Statistics Botswana, 2017). Kweneng District had 15.1% of households with no internet access followed by Gaborone with 10.4% and central Tutume was the least with 7.6%. There are several reasons as to why the households did not have internet access. The most common reason was made by 35.8% of households with no internet access (Statistics Botswana, 2017). This confirmed lack of knowledge where households stated they did not know that the internet existed and what it was. Additionally, 20.4% of the households with no internet access stated that they lacked skills whilst 18.9% stated that it was too costly to get internet equipment (Statistics Botswana, 2017). Finally, 16.3% stated that they did not need internet connection.

The use of computers by individuals

There are computer users in every district of Botswana. In 2014, there was a total 41.4% individuals who used a computer in the whole population of Botswana were aged 10 years and older (Statistics Botswana, 2017). 46.8% were males while 53.2% were females. Mostly, individuals used computers at home, making 49.0% of those who used computers (Statistics Botswana, 2017). On the other hand, the report states that only a few used them in commercial facilities. Notably the age group 15 to 44 years were the most users of computers. Although the use of computers was visible in every district, Gaborone was in the forefront in terms of having the highest number of computer users with 27.5%. Kweneng district followed with 15% and the least was Ngwaketse West and Sowa town.

Table 2.4: Frequency of computer use
Source: Adopted from Statistics Botswana (2017)

Frequency of computer use	Percentage (%)
Everyday	45
At least once a week	31.4
At least once a month	6.9
Once in a while	16.3

Table 2.4 shows the statistics on the frequency of computer use by individuals. However, Gaborone once again had the largest share of individuals who used computers, this percentage amounted to 36.7%, followed by Kweneng east with 15.6% and South east with 7.4% (Statistics Botswana, 2017). In terms of gender, females used computers than men in 2014. According to the age groups, individuals who were aged 25-34 years, 15-24 years and 35-44 years in that order dominated in the use of a computer every day or almost every day (Statistics Botswana, 2017). With regards the level of education, most individuals who used computers on a daily basis had tertiary education, followed by those with upper secondary education and those with lower secondary education were the least users of computers.

Table 2.5: Location of computer use
Source: Adopted from Statistics Botswana (2017)

Location of computer use	Percentage (%)
Home	49.1
Work	36
Place of education	34.7

Table 2.5 shows the percentage of individuals who used computers at their homes, at places of work and their places of education. Others also stated that they used computers at other people's homes as well as community and commercial facilities. Gaborone, Kweneng East and South East were the districts where most people used their computers at home. According to Statistics Botswana (2017), Gaborone had 64.2% of computer users who used them at home, 43.1% at their work, 30.8% at a place of their education, 11.0% at other people's homes, and 7.7% at commercial facilities.

Although there was widespread use of computers, not all participants used computers and individuals gave various reasons why they were not using them. These persons aged 10 years to 54 years stated lack of knowledge on computers, computer unavailability and lacking computer skills (Statistics Botswana, 2017). However, those who indicated that they were not using computers due to lack of knowledge about them were mainly those with primary or lower education followed by those with lower secondary education. With regards those with lower skills on computers, most of them were individuals with lower secondary education followed by those who had primary or lower education (Statistics Botswana, 2017).

E-skills by individuals

In all people aged 10 years and more, Statistics Botswana (2017) stated that 41.4 % had e-skills whilst the remaining 58.6% did not have them in Botswana. For those who had e-skills, females had the largest share of 57.6% whilst males had 42.4% (Statistics Botswana, 2017). However, in terms of education, tertiary educated individuals had the largest portion followed by those with primary or lower education and secondary education (Statistics Botswana, 2017).

Furthermore 75.2% of individuals were able to search for information on the internet using search engines and 53.8% were able to paste messages in online discussion forums and social network (Statistics Botswana, 2017). On the whole, Gaborone was the frontrunner in having individuals with e-skills, making 27.5% of all the citizens in Botswana (Statistics Botswana, 2017).

The use of internet by individuals

36.7 % of individuals aged 10 years and over used internet in Botswana according to the 2014 ICT household survey by Statistics Botswana (2017). In terms of gender, 51.2% were females while 48.8% were males. Gaborone as usual had the largest proportion of individual internet users amounting to 29.6%. Kweneng East and South East Districts followed Gaborone with 14.9 % and 6.9 % respectively whilst the city of Francistown had 6.0% of individual internet users (Statistics Botswana, 2017). However, individual internet users were mainly in the 15-24 years age group with a total share of 36.8% of the population. They were followed by 25-34 years with 30.8% and 35-44 years with 17.3%.

Table 2.6: Use of internet by level of education
Source: Adopted from Statistics Botswana (2017)

Use of Internet by level of education	Percentage (%)
Tertiary	48.3
Upper secondary	25.9
Lower Secondary	21.4

Table 2.6 shows that the largest proportion of individuals who were internet users were those who had tertiary education, followed by those with upper Secondary making and lastly lower secondary education. In terms of the devices that were used by individuals to access internet, 77.3% used internet through mobile cellular telephones (smart phones). Portable computers such as laptops, notebooks and tablets followed smart phones with 43%. Although the use of the internet was evident, some individuals who did not use the internet in Botswana stated the reasons as lack of knowledge of the internet which was mostly indicated by women than men, lack of skills and not seeing the need for them to use internet (Statistics Botswana, 2017).

The use of E-commerce by individuals

Statistics Botswana (2017) reports that electronic commerce (E-Commerce) or electronic business (E-Business) was still small in Botswana in 2014. This platform was used by individuals aged 10 years or more making 4.6% of the entire population. However, males dominated its use, exceeding the number of females with 53.2% and 46.8% respectively (Statistics Botswana, 2017). In terms of age, the age group that used e-commerce more was 35-44 years, followed by age group 25-34 years old and lastly the age group 45-54 years. However, in terms of the level of education, tertiary educated individuals used e-commerce the most in 2014 making 78.7% of the population. Those who stated they did not use e-commerce mentioned that they did not see the need for them to use it (Statistics Botswana, 2017).

The use of E-governance by individuals

According to Statistics Botswana (2017) the main reason stated for using e-governance by individuals was to obtain information from public authorities' websites. Of all those who used e-governance, 54.8% were males while 45.2% were females (Statistics Botswana, 2017). Gaborone was once again at the forefront with many individuals using e-governance making up 36.3% followed by Kweneng East District with 16.7%.

Table 2.7: E-governance users by age

Source: Adopted from Statistics Botswana (2017)

Age group	Percentage (%)
15-24 years	20.9
25-34 years	40.9
35-44 years	22
45-54 years	13.8

Table 2.7 shows that the age group 25-34 years made up the largest share of e-governance users followed by those from 35-44 years, 15-24 years and lastly 45-54 years age group. Furthermore, individuals with upper secondary and tertiary education made up the majority of individuals who used e-government in 2014 (Statistics Botswana, 2017). For those who did not use e-government, they indicated that they did not use it because they have not heard of e-governance and also that they did not have to submit any official forms (Statistics Botswana, 2017).

2.6 THEORETICAL FRAMEWORKS

There are different theories that could be used in investigating technology acceptance and adoption by individuals, public and non-public organisations. These theories include the unified theory of acceptance and use of technology (UTAUT) by Venkatesh, Morris, Davis and Davis (2003), the theory of planned behaviour (TPB) by Ajzen (1991) and the task-technology fit (TTF) theory by Goodhue and Thompson (1995) just to name a few. This study used a combination of the technology readiness index (TRI 2.0) by Parasuraman and Colby (2015) and technology acceptance model (TAM) by Davis (1989) as theoretical frameworks that guided the development of the conceptual framework for this study investigating the e-health readiness of higher education institution students. The models are adapted to this study where the technology readiness index 2.0 is used as a whole whilst perceived usefulness and perceived ease of use constructs of the TAM model are the only constructs adopted from TAM. The two frameworks are used because other researchers (Lin, Shih & Sher, 2007; Basgoze, 2015) have used them to derive their own frameworks in assessing readiness in their studies. Lin et al, (2007) constructed an integrated technology readiness and acceptance model (TRAM) which established consumer adoption of high technology services by associating technology readiness (TR) with the two constructs of TAM being perceived usefulness and perceived ease of use. Furthermore, Basgoze (2015) used the same TRAM for the study on M-shopping technology. Although prior studies used the TRI 1.0 in constructing an integrated TRAM, this study uses

TRI 2.0 to construct an integrated TRAM model adapted to E-health. The models are adapted to this study as shown in Figure 2.5 with the new construct e-health adoption added to the conceptual framework. The justification on what the constructs mean in this study is found in section 2.7.

2.6.1 Technology acceptance model (TAM)

Technology acceptance model (TAM) which is shown in Figure 2.3 determines whether information systems would be accepted and voluntarily used by individuals (Lin & Luarn, 2005). According to Venkatesh, Morris, Davis and Davis (2003) TAM is a model developed for use in the information systems context. It was established to foresee acceptance and consequently the usage of an information technology innovation. This model uses perceived usefulness (PU), perceived ease of use (PEU) and attitude towards using (ATU) and behavioural intention to use as factors that influence the actual use of any information system by the user (Davis, 1989).

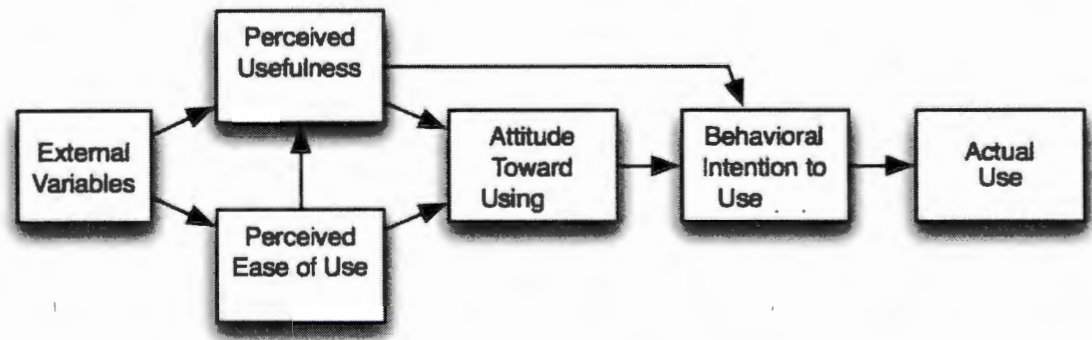


Figure 2.3: Technology Acceptance Model
Source: Adopted from Davis (1989)

2.6.2 Technology readiness index (TRI 2.0)

The technology readiness index 2.0 was developed by Parasuraman and Colby (2015) in an attempt to develop an updated and streamlined technology readiness index based on the original 36-item scale technology readiness index called the TRI 1.0. The technology-readiness construct refers to “people’s propensity to embrace and use new technologies for accomplishing goals in home life and at work” (Parasuraman, 2000 , p. 308). Basically, the construct of technology readiness means an individual’s state of mind that is caused by the enablers and inhibitors which determines an individual’s position to use any new technology. Dimensions included in the technology readiness range from optimism, innovativeness, discomfort to insecurity. Whereas optimism and innovativeness are enablers of technology

readiness, discomfort and insecurity are inhibitors to technology readiness (Parasuraman, 2000).

According to Jaarfar, Aziz, Ramayah and Saad (2007) people with a high technology readiness index believe in the benefits brought about by technology; they also feel that they are in control of technology and are lastly thoughtful leaders who have confidence in the security of using technology such as the internet. On the other hand, the four dimensions of technology readiness index are proven to be reliable if they have high α (alpha) values and they are also good in the prediction of technology related behaviour (Parasuraman, 2000). The technology readiness index is graphically shown in Figure 2.4.

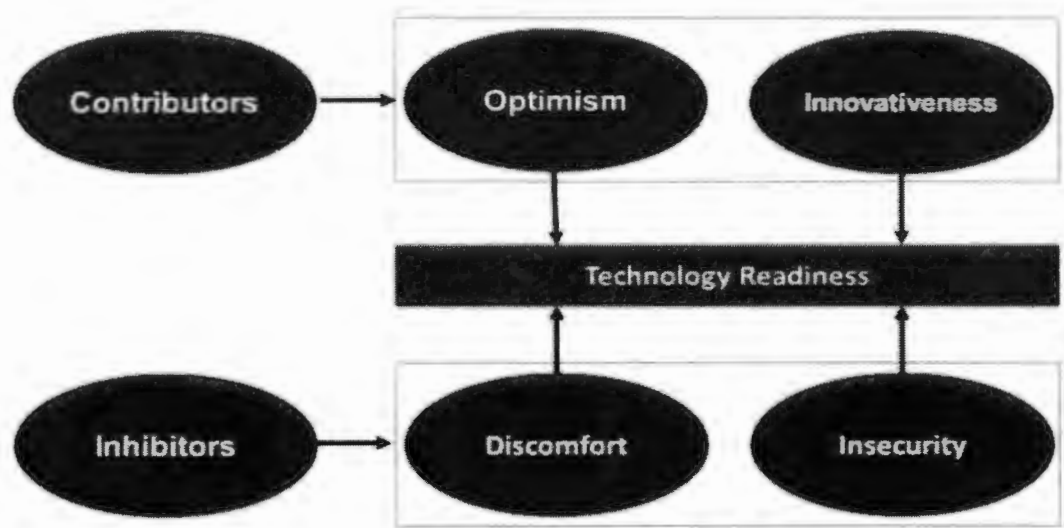


Figure 2.4: Technology readiness index

Source: Adopted from Bessadok and Abdulsalam (2016)

2.7 CONCEPTUAL FRAMEWORK OF THE STUDY

This section shows and explains how the components of the conceptual framework (Figure 2.5) are used in the study.

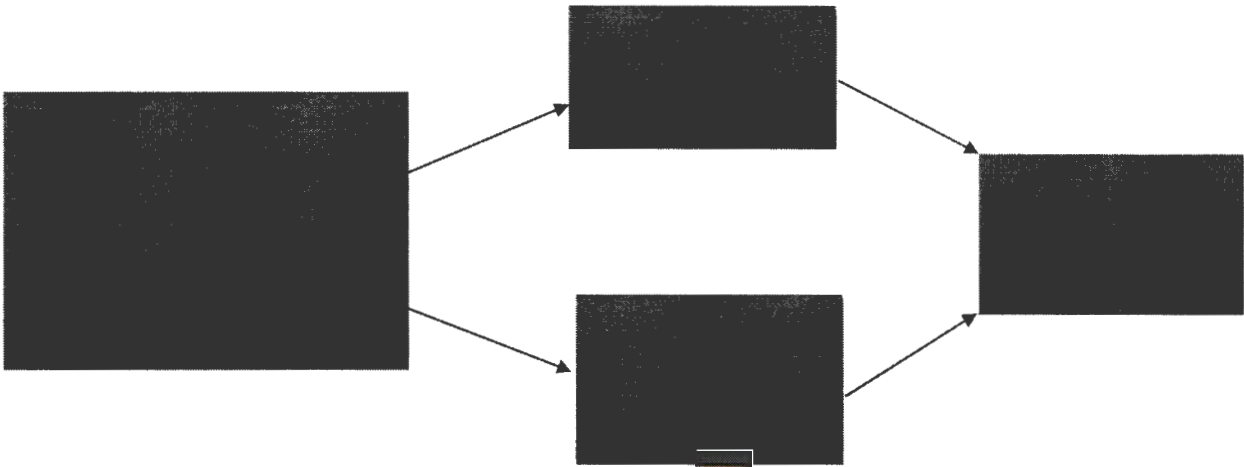


Figure 2.5: TRAM for E-health (Conceptual framework)

E- Health Adoption

In this study, e-health adoption refers to individuals embracing and using e-health in their daily lives.

E-Health Technology Readiness

In this research e-health technology readiness means the people’s tendency to embrace and use the e-health technology for accomplishing goals related to health issues in their home life and at work (Parasuraman, 2000). E-health technology readiness is influenced by the four dimensions in this study being optimism, innovativeness, discomfort and insecurity.

Optimism

Optimism refers to an individual’s positive view of technology and believing that the new technology offers increased control, flexibility and efficiency in life (Parasuraman, 2000). According to Tsikriktsis (2004) optimism is a dimension that is general in nature and captures in it specific feelings that suggest that technology is good by the users (students). On the other hand, Son and Han (2011) state that the ability to control new technologies is vital to customers who are optimistic since convenience is the most identified benefit of using any new technology. Furthermore, optimistic customers (students) have a tendency to use coping strategies that are more active hence they are less likely to worry about any negative outcomes that may surface but rather accept their situation (Son & Han, 2011). Additionally, Walczuch, Lemmink and Streukens (2007) posit that optimistic customers are most likely to be focused on positive events than their counterparts who are pessimistic hence they are able to openly confront new technologies. Son and Han (2011) conclude that customers that are highly optimistic will use new technologies frequently as well as trying to use different innovative

and basic functions. In this study, optimism means that higher education students' have a positive view of the e-health technology and believe that the technology will offer them increased control, flexibility and efficiency in their daily lives.

Innovativeness

Innovativeness means an individual's tendency to be a pioneer and a thought leader in a new technology (Parasuraman, 2000). Tsikriktsis (2004) concurs that innovativeness measures the extent to which an individual believes they are at the forefront in trying out technology-based products and services that are new, meaning that the individual is seen by others as a leader on issues relating to technology (Tsikriktsis, 2004). On the other hand, Son and Han (2011) believe that customers that are highly innovative feel comfortable when using technology and they need less proof of the outcomes of using that technology. In this study innovativeness means that with e-health technology, higher education students will have a tendency of being pioneers and leaders in using and accepting the technology of e-health in their lives.

Discomfort

Discomfort means an individual's perceived lack of control over technology and a feeling of being overwhelmed by it (Parasuraman, 2000). On the other hand, Tsikriktsik (2004) posits that discomfort is the level to which people have distrust about products and services of technology. Therefore, people have a tendency to believe that technology products and services exclude all kinds of people rather than being inclusive. Son and Han (2011) on the other hand, state that people with discomfort fear using technology products and services as they believe they lead to costs of learning and difficulty to comprehend. Furthermore, customers with high levels of discomfort see new technologies as complex and causing various reactions such as being aggravated, disappointed and being frustrated therefore they end up using technology less (Son & Han, 2011). In terms of discomfort, in this study it means higher education students having negative feelings towards the e-health technology in the sense that when they use it, they have less control over it and they become overwhelmed by the e-health technology thereby using the e-health technology less.

Insecurity

Insecurity means an individual's distrust and being sceptical about the ability of a technology to work properly (Parasuraman, 2000). On the other hand, Tsikriktsik (2004) argues that although insecurity is related to discomfort it differs in that insecurity focuses on specific technology-based transactions aspects rather than individuals lacking comfort with technology in general. Son and Han (2011) agree with the argument of Tsikriktsik (2004), however they

further argued that customers that have a sense of insecurity are uncertain and uncomfortable about new technologies. Moreover, the customers do develop suspicions of any new functions and they do reduce any trials to accept as well as using them (Son & Han, 2011). In relation to this study, insecurity means that higher education students have challenges trusting the ability of e-health to work properly, meaning that they do not trust e-health to function the way it is supposed to work. Hence, they would find it difficult to try and accept and use e-health initiatives.

E-health Perceived Ease of use

According to Davis (1989) perceived ease of use refers to the potential users' belief on the degree of effort needed in using an application. On the other hand, perceived ease of use speeds up the likelihood of user's acceptance of a technology (Chang & Kannan, 2006). In this study, perceived ease of use means higher education institutions students' perceptions on the degree of effort that is needed to use e-health. That is to say, the difficulty to use the e-health technology.

E-health Perceived Usefulness

Perceived usefulness is defined as the extent to which potential users of an application believe a certain application is likely to assist them to perform their job better (Davis, 1989). Chang and Kannan (2006) explained that when perceived usefulness is higher, consequently technology acceptance and adoption will also be higher. In relation to e-health, in this study it refers to the higher education students' perceptions of the relative advantage of e-health services as compared to the traditional ways of offering health services.

2.7.1 The relevance of the TRAM in this study

The TRAM was used in this study because it integrates two models which are TAM and TRI. This integration of the two models is demonstrated by several studies that used them and are discussed in section 2.7.2. The construct of technology readiness means an individual's state of mind that is caused by enablers and inhibitors which determines an individual's likelihood to use any new technology. On the other hand, Venkatesh, Morris, Davis and Davis (2003) believe TAM was developed for use in the information systems context as it was established to foresee acceptance and consequently the usage of an information technology. The integrated model used in this research implies that the technology readiness index is used wholly whilst perceived usefulness and perceived ease of use constructs of the TAM model are the only constructs adopted from TAM. The reason why the constructs of TRI, perceived usefulness and perceived ease of use are adopted is because TRI is an individual-specific and system-

independent construct while on the other hand perceived usefulness and perceived ease of use are system-specific constructs (Lin, Shih, Sher & Wang, 2005). Therefore, the integrated model of TRAM improves the explanation of the construct of technology readiness and the technology acceptance model in marketing settings (Lin, *et al.*, 2005). In a nutshell, the integrated model can also be tested to explain the construct of technology readiness and the technology acceptance model in health settings such as e-health technology.

TRAM helps to determine the questions to ask when evaluating factors affecting the technology readiness of higher education students to adopt or not to adopt e-health as well as to determine perceptions of higher education students on their intention to adopt e-health. The questions are asked to find out the degree to which higher education institution students consider the practicability of the use of e-health. The researcher also sought to establish the effects of TR factors on PEU and PEOU. Furthermore, the researcher also strove to come up with recommendations on factors affecting the readiness and adoption of e-health by higher education students. TRAM provides a way of understanding the above specified concerns affecting individuals use and adoption of a new technology. For this reason, TRAM was selected as a suitable theory to understand the e-health readiness of higher education students.

2.7.2 The use of TRAM in similar studies

TRAM has been used in several similar studies. This section outlines studies that used TRAM to investigate the adoption and use of technology. The study of Basgoze (2015) integrated the technology readiness (TR) into the technology acceptance model (TAM) for mobile shopping (m-shopping). In the study it was theorised that the impact of TR on mobile shopping intention was mediated by both perceptions on usefulness and ease of use. The results of the study showed that the consumer's TR influenced m-shopping. Additionally, perceived usefulness mediated the relationship between TR and m-shopping (Basgoze, 2015). Esen and Erdogmus (2014) investigated the effects of technology readiness on technology acceptance in e-HRM field. In their study they collected data from 86 human resource managers who represented the top 500 largest companies in Turkey's private sector. Their research model was based on the technology readiness by Parasuram (2000) and technology acceptance model by Davis (1989). The results showed that optimism and innovativeness positively influenced perceived usefulness and perceived ease of use. However, discomfort and insecurity had no effect on them (Esen & Erdogmus, 2014).

Another study that used TRAM was Kuo, Liu and Ma (2013) who investigated nurses' personality traits with regard to technology readiness toward mobile electronic medical record

(MEMR) acceptance. In their study 665 self-administered questionnaires were collected from a large hospital in Taiwan. The results showed that out of the four technology readiness personal traits, nurses were optimistic, innovative and secure about technology, even though they were also uncomfortable about it. The results further showed that the four technology readiness personal traits had a notable impact on MEMR perceived ease of use whilst MEMR perceived usefulness was only notably influenced by optimism (Kuo, *et al.*, 2013). An investigation by Lin and Chang (2011) assessed the role consumers' technology readiness play in the adoption of self-service technologies (SSTs). Hence their study was aimed at filling the research gap by developing and testing a model which integrated the role of technology readiness into technology acceptance model (TAM). Furthermore, the study proposed a framework that suggested the direct and moderating roles of TR in the TAM. Structural equation modelling (SEM) and hierarchical moderated regression analysis was used in the analysis of the data that was collected from customers that had SST experience. The results of their study showed that TR enhanced perceived usefulness, perceived ease of use, attitude toward use, and intention to use. Furthermore, results showed that TR weakens the positive relationship that existed between perceived ease of use and attitude toward using SSTs (Lin & Chang, 2011).

In another successful use of the TRAM, Lin *et al.* (2005) proposed an integrated model of technology readiness and technology acceptance to use for explaining consumers' intention to use online stock trading system in Taiwan. In the study, technology readiness was hypothesized and confirmed by the web-based survey data results to be a causal predecessor of both perceived usefulness and perceived ease of use, which then affected consumers' intentions to use electronic-services. Furthermore, results showed that both perceived usefulness and perceived ease of use had complete mediation effects between technology readiness and consumers' intentions to use online stock trading systems (Lin, *et al.*, 2005).

Another study that used TRAM was by Rahman, Taghizadeh, Ramayah and Alam (2017) who investigated technology acceptance among micro-entrepreneurs in marginalized social strata in Bangladesh. The aims of the study were to examine the influence technology readiness index (TRI) 2.0's four indicators of optimism, innovativeness, discomfort and insecurity had on *bKash* entrepreneurs' perceived ease of use and perceived usefulness of *bKash* technology. Furthermore, the study investigated the effect of '*bKash*' entrepreneurs' perceived ease of use and perceived usefulness on their wellbeing. 360 usable data were analysed and the results indicated that optimism and innovativeness strongly determined perceived ease of use and perceived usefulness (Rahman, *et al.*, 2017). Moreover, the study indicated that poor people

were, in a way ready, to use and accept technology which lead to a sense of well-being (Rahman, *et al.*, 2017). An investigation by Wook, Yusof and Nazri (2017) analysed the determinants that influenced the acceptance of educational data mining (EDM) technology among undergraduate students. Several hypotheses were formulated based on the determinants of technology readiness index (TRI) and technology acceptance model 3 (TAM3). Data was collected from 211 undergraduate students from six public universities in Malaysia using questionnaires. The study findings revealed that relevance for analysing, facilitating conditions, self-efficacy, perceived ease of use, perceived usefulness, optimism and discomfort influenced the acceptance of educational data mining technology amongst undergraduate students.

The similarity of the context of the studies mentioned above validates the relevance of the TRAM for this study. For this reason, the TRAM was applied as a theoretical framework and a lens through which the e-health readiness of higher education students was investigated.

2.7.3 Hypotheses

Therefore, based on section 2.7.2 discussions above, the following hypotheses are incorporated in the conceptual framework in Figure 2.6 in this study;

H1a: Higher education institution students perceive that optimism has an influence on e-health perceived ease of use.

H1b: Higher education institution students perceive that optimism has an influence on e-health perceived usefulness.

H2a: Higher education institution students perceive that innovativeness has an influence on e-health perceived ease of use.

H2b: Higher education institution students perceive that innovativeness has an influence on e-health perceived usefulness.

H3a: Higher education institution students perceive that discomfort has an influence on e-health perceived ease of use.

H3b: Higher education institution students perceive that discomfort has an influence on e-health perceived usefulness.

H4a: Higher education institution students perceive that insecurity has an influence on e-health perceived ease of use.

H4b: Higher education institution students perceive that insecurity has an influence on e-health perceived usefulness.

H5: Higher education institution students perceive that e-health usefulness has an influence on e-health adoption.

H6: Higher education institution students perceive that e-health ease of use influence e-health adoption.

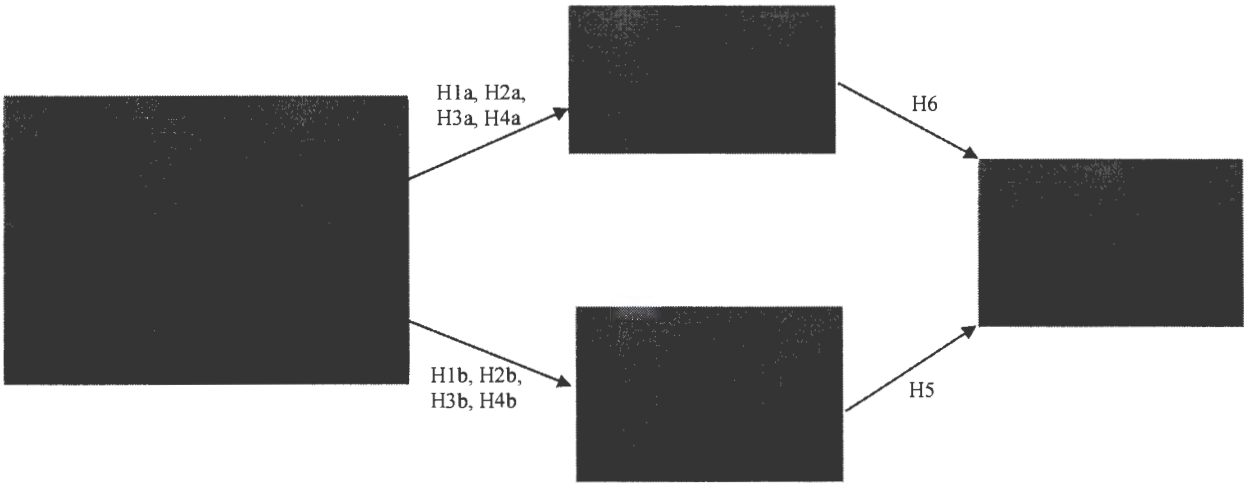


Figure 2.6: TRAM for E-health with hypotheses

2.8 CHAPTER SUMMARY

This chapter focused on several key concepts that are associated with the study. The research conceptual framework which guides the study was explained further as well as why the model was seen as the best fit for the study. Related studies that used a similar research model were also discussed. This chapter is followed by Chapter 3 which focuses on research methodology and design.

3 RESEARCH METHODOLOGY AND DESIGN: CHAPTER 3

3.1 INTRODUCTION

This study investigates the e-health readiness of higher education students. Chapter 2 presented a review of related literature and the conceptual framework for testing the e-health readiness of higher education students at the University of Botswana. According to Oates (2006), it is necessary to know and understand the underlying philosophy and paradigm guiding a research. This is done to appreciate the procedures employed, the significance and how the research quality could be evaluated. This chapter therefore outlines the processes of how the entire study was conducted. The chapter explains research design, philosophy, approach to theory development, methodological choice, strategies, time horizon, data collection, analysis techniques and procedures, ethical considerations and ends with the chapter summary.

3.2 RESEARCH DESIGN

Research is a systematic process of inquiry which involves data collection, analysis and interpretation of data thereby supporting or refuting knowledge claims such as theories (Creswell, 2003; Ellis & Levy, 2008). Kumar (2005) states that research is a process that is unbiased, objective and attempts to find answers to an enquiry that is carried out based on a framework of set of philosophies. Yin (2009) adds that when conducting research, the researcher must conceptualize and put robust strategies in place to help achieve the research goal. Figure 3.1 shows the research onion which guides the methodology of this research. Research methodology is defined as a process followed to conduct a research study (Khothari, 2005). Leedy and Ormrod (2001) states that the main aim of a research methodology is to highlight the methods and tools that are applied during the research process. The research onion was used in guiding the methodology of this study because it simplifies the structure or the process of presenting the research methodology in a dissertation (Bantom, 2016; Agu, 2016).

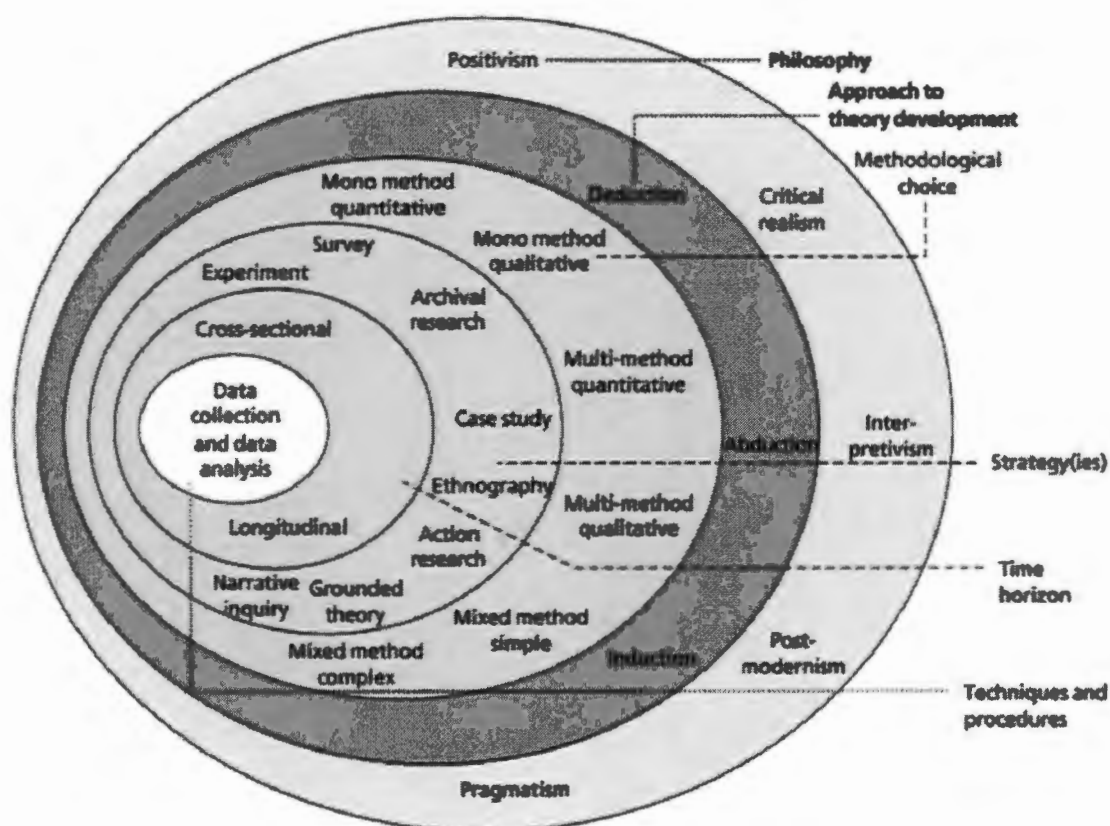


Figure 3.1: Research Onion

Source: Adopted from Saunders, Lewis and Thornhill (2016)

3.3 RESEARCH PHILOSOPHY

Saunders *et al.* (2016:124) states that research philosophy is “a system of beliefs and assumptions about the development of knowledge”. Although the development of knowledge is mentioned, it does not mean dramatic knowledge development that culminates in a new theory but could be answering a specific research problem (Saunders, *et al.*, 2016). Wahyuni (2012) posits that a research philosophy is a set of important assumptions and principles on how the world is viewed thus guiding a researcher’s behaviour.

All researches are based on an underlying philosophical paradigm (Oates, 2006). This section therefore discusses the ontological, epistemological, and axiological research assumptions given by Burrell and Morgan (1979) before starting the discussions on philosophies. This section terminates by giving and explaining the philosophy that this study follows.

3.3.1 Research assumptions

Ontology

Ontology means assumptions with regards the nature of reality (Saunders, *et al.*, 2016). Blaikie (2010) adds that it is the nature of “social” reality. Moreover, Uddin and Hamiduzzaman (2009) adds that ontology is the nature of knowledge, which is what reality looks like regardless of what is known about it. Adding onto that, Bhattacharjee (2012) refers to ontology as people’s assumptions on how they view the world. Saunders *et al.* (2016) also state that ontological assumptions shape the way an individual sees and studies their research objects. Ontology enables researchers to discover how perceptions about reality influence the way in which participants reveal scientific truths (Bracken, 2010). According to Wahyuni (2012) classification of ontology can be realism (objectivism) and nominalism (subjectivism). Ontologically, objectivism embraces realism which considers social entities as physical entities of the natural world that independently exist from how they are thought of, labelled or people’s awareness of them (Saunders, *et al.*, 2016). Additionally, O’Gorman and Macintosh (2015) state that an objective perspective can be understood as envisioning reality that is made up of solid objects which can be measurable, tested and can exist even when they have not been directly experienced or perceived. For example, in a complex setting objectivity allows people to make judgments in the court of law aiding decision making on whether one is guilty or not (O’Gorman & MacIntosh, 2015). In this study, research objectivity is based on proving a scientific reality. This study tries to prove if higher education institution students are ready to adopt e-health.

On the other hand, ontologically, subjectivism embraces nominalism (Saunders, *et al.*, 2016). Nominalism means considering the order and structures of the social phenomena studied. These phenomena are created by researchers and other social actors by using conceptual categories, language, perceptions and resulting actions (Bhattacharjee, 2012). O’Gorman and Macintosh (2015:56) posits that a “subjective perspective looks at reality as made up of the perceptions and interactions of living subjects”. This study follows an ontological assumption of objective realism in the sense that it tries to investigate e-health readiness of higher education institutions students. The study seeks to understand empirically the readiness factors affecting higher education institution students to adopt e-health technology.

Epistemology

According to Burrell and Morgan (1979) epistemology is all about assumptions of knowledge. That is what is seen as knowledge that is acceptable, valid and legitimate as well as the way

knowledge is communicated from one to another (Burrell & Morgan, 1979). Epistemology supports ontological assumptions with the most suitable ways to study a specific reality by using either objectivist or subjectivist approaches in studying social reality (Bhattacharjee, 2012). Epistemologically, objectivists try to get the truth about the social world by using facts that are observable and measurable thereby allowing generalisations to be drawn about the universal social reality (Saunders, *et al.*, 2016). Based on this ontological assumption, this study follows the objective epistemological assumption. This is because this research tries to understand facts and insights about the e-health readiness of higher education institution students at the University of Botswana.

Axiology

Saunders *et al.* (2016) explains axiology as the role played by values and ethics in the process of research. Furthermore, axiology entails the way researchers address their own values and those of their research participants (Saunders, *et al.*, 2016). These values include morals, religion and aesthetics (Wahyuni, 2012). Therefore, axiological objectivists try to have their research free of values they believe could make studies biased. Furthermore, throughout the research process objectivists make an attempt to detach themselves from their values and beliefs (Saunders, *et al.*, 2016). Axiology is important in this study because it aided the researcher to appreciate the importance of values and ethics in an investigation. The researcher followed an objectivist axiology by investigating the e-health readiness of higher education institution students in a value free manner in order to remove bias in the research data and findings.

3.3.2 Major philosophies

Although there is a research assumption, there are also 5 major philosophies followed by researchers (Saunders, *et al.*, 2016). These philosophies, which are discussed in this section in brief are positivism, interpretivism, critical realism, postmodernism and pragmatism.

According to Saunders *et al.* (2016), positivism encompasses working with a social reality that is observable to make law-like generalisations from it. Oates (2008) states that positivism is a scientific method that sees the world as structured and ordered. Moreover, Bhattacharjee (2012) states that positivism promotes a stand that knowledge creation should be only restricted to things that can be measured and observed.

Critical realism on the other hand explains what people see and also experience (Saunders, *et al.*, 2016). Interpretivism explains that humans and physical phenomena are different (Saunders, *et al.*, 2016). This difference, which is human created meanings studied by

interpretivists, is found by interviewing various participants thereby reconciling differences amongst their responses based on participants' own subjective perspectives (Bhattacharjee, 2012).

Postmodernism puts more emphasis on the roles played by language and power relations (Saunders, *et al.*, 2016). It therefore seeks to question ways of thinking that have been accepted and give voice to other views that are marginalised. Kelemen and Rumens (2008) state that pragmatism stresses that concepts are only relevant when they support an action.

Major philosophies stated above project different conceptualisations of the reality of the world. Therefore, following the major philosophies and the research assumptions in section 3.3.1, this study aligns with the positivist philosophy. Yin (2009) posits that positivism is linked to quantitative analysis where accurate and certain knowledge can be described systematically. Additionally, positivism is perceived to be similar to quantitative research as it follows the ontological and epistemological recommendations on how to carry out a study with the quantitative approach (Sarantakos, 2012). This study used a quantitative analysis where data collected from higher education institution students (University of Botswana students) were analysed quantitatively to obtain knowledge that is accurate and certain with regards to their e-health readiness.

3.4 APPROACH TO THEORY DEVELOPMENT

The three approaches to theory development as stated by Saunders *et al.* (2016) are inductive, abductive and deductive approach. In a study that uses an inductive approach, the researcher starts by collecting data in order to explore a phenomenon then a conceptual framework is generated out of the data. In contrast, the abductive approach tries to generate a new theory or modify an existing one by collecting data to explore a phenomenon then finding themes and explaining patterns. On the other hand, in a deductive approach which is followed in this study, the researcher starts with a theory that is developed from various academic literature readings (Saunders, *et al.*, 2016). Following the development of a theory, the research strategy is then designed to test the theory. Bhattacharjee (2012) posits that in a deductive approach, a hypothesis is deduced from a theory where it is operationally expressed, tested and the specific outcomes are examined then the theory is modified if necessary. This study applied a deductive approach where literature review was done in Chapter 2 and a conceptual framework for e-health was designed to test it.

3.5 METHODOLOGICAL CHOICE

Different methodological choices (research method) are used in research. They include qualitative research design, mixed method research design and quantitative research design which this study follows. Sections 3.5.1, 3.5.2 and 3.5.3 discuss these research methods.

3.5.1 Qualitative research design

Qualitative research studies use an assortment of data collection techniques and analytical procedures to aid the development of a theoretical contribution and a conceptual framework. This is done after studying participants' meanings and relationships between them. Data collection in qualitative designs is non-standardized; this is done to enable the emergence and altering of questions in an interactive and natural research process (Saunders, *et al.*, 2016). There are different types of qualitative data collection. They include mono method where a single data collection technique is used such as semi structured interviews. Furthermore, multi-method qualitative study can be used where one can decide to collect data using various qualitative data collection techniques such as in-depth interviews and diary accounts then analysing the data qualitatively.

3.5.2 Mixed method research design

Mixed methods research is a multiple methods research which combines qualitative and quantitative research techniques. In this method both qualitative and quantitative data collection techniques and analysis procedures are used in combination (Saunders, *et al.*, 2016).

3.5.3 Quantitative research design

Quantitative research, which this study follows, is associated with positivism and the deductive approach. Johnson and Christensen (2008) posit that quantitative research is for researchers who try to quantify the problem and understand its prevalence by looking at generalisable results to a larger population. Therefore, this study used quantitative research design in order to test a sample of the University of Botswana students' e-health readiness in order to get insight into the e-health readiness of the entire University of Botswana students' population. Furthermore, quantitative research studies relationships that exist between variables. These relationships are measured numerically and analysed using various graph and statistical techniques (Saunders, *et al.*, 2016). In this study, relationships between constructs in the conceptual framework were examined using correlations and regression analysis. Quantitative research may use mono-method where there is a single data collection technique such as a questionnaire (Saunders, *et al.*, 2016). Another method is multi-method where a researcher

uses more than one quantitative method, for example collecting quantitative data using both questionnaire and observation then analysing the data quantitatively. From the literature, there are many ways of executing a quantitative research; in this study, a single data collection technique (mono-method) was used by employing a survey questionnaire.

3.6 RESEARCH STRATEGY

A research strategy is a way in which a researcher navigates answering their research questions (Saunders, *et al.*, 2016). Marshall and Rossman (2011) add that a research strategy enables researchers to achieve their study goals and objectives. There are different research strategies such as experiment, survey, case study, archival and document research, ethnography, grounded theory, action research and narrative inquiry. This study adopted a survey strategy to achieve the goals of this research. In this study, data was collected from University of Botswana students to make sense of participants' views on their e-health readiness. Section 3.6.1 explains the survey strategy.

3.6.1 Survey strategy

A survey strategy is used to answer what, who, where, how much and the how many questions (Saunders, *et al.*, 2016). Therefore, it is mostly used for descriptive and exploratory research. Some of the advantages of using a survey strategy include the gathering of vast amount of data, asking several questions about a subject, allowing flexibility in the analysis of data, the use of standardized questions and low costs associated with it (Bhattacharjee, 2012; Sincero, 2012). Additionally, surveys are good in generalisations, versatility and efficiency hence their popularity in various disciplines (Johnson & Christensen, 2008). When using a survey, a researcher usually chooses respondents sample and provide each of respondents in the sample with a standard questionnaire (Babbie, 2014). Therefore, in this study a survey strategy enabled the researcher to collect a large amount of data from a sample of students at the University of Botswana using a standard survey questionnaire which is explained in section 3.8.3. The collected data was analysed using various techniques to get insights on the e-health readiness of University of Botswana students.

A survey strategy has its weaknesses. These include systematic biases such as non-response, social desirability bias, sampling bias, common method bias and recall bias (Johnson & Christensen, 2008). However, Bhattacharjee (2012) posits that there are ways in which these biases can be mitigated. These include using a questionnaire that is respondent friendly, offering incentives to respondents and ensuring respondents some high level of confidentiality and privacy. In this study, respondents' friendly questionnaires and ensuring respondents a

high level of privacy are some of the ways in which the weaknesses of a survey strategy were minimised.

3.7 TIME HORIZON

The two types of time horizon in research include cross-sectional and longitudinal (Bhattacharjee, 2012; Saunders, *et al.*, 2016). A cross-sectional research involves studying a phenomena at a particular time at once, whereas a longitudinal study involves taking a series of snapshots or investigating a phenomena over a long period of time (Ditsa, 2009; Saunders, *et al.*, 2016). Due to the nature of this study being academic research, time constraints influenced the researcher to select a cross sectional time horizon. This is due to the fact that it allows a phenomenon to be studied at a particular time once.

3.8 DATA COLLECTION

This section explains how primary and secondary data was used, how the population and sampling was done, shows the questionnaire and objectives mapping, explains how pilot testing was done as well as the administration of the research instrument.

3.8.1 Primary and secondary data

This study used both primary and secondary data collection. Secondary data about e-health and e-health readiness was gathered by reviewing the literature to understand and get knowledge about the subject studied (see chapter 2). Primary data was collected using a survey questionnaire administered to University of Botswana students.

3.8.2 Population and sampling

The target population involved in this study were the students of the University of Botswana. Because of a larger population of students at the university of Botswana (13835 students), the researcher used sampling. Sampling is explained as a statistical process that is used to get a representative subset of a population one is interested in (Bhattacharjee, 2012). Sampling assisted the researcher because surveying the whole population is not practical, budget and time constraints also did not enable researcher to sample the entire population (Saunders, *et al.*, 2016). Based on the sample size determination table (Appendix F) of Krejcie and Morgan's (1970), the sample size used for this study was 372 participants coming from various faculties in the University of Botswana.

There are two types of sampling techniques which include probability and non-probability sampling (Saunders, *et al.*, 2016). Probability sampling can be divided into simple or restricted probability sampling (Serakan & Bougie, 2013). Whereas non-probability sampling can be

divided into purposive, quota, volunteer and convenience sampling (Saunders, *et al.*, 2016). With probability sampling the chances of selecting each case from the target population is equal whereas in non-probability sampling the probability of selecting each case is unknown. The probability sampling technique, simple random sampling, is usually associated with surveys. However in this study, non-probability sampling techniques which is convenience or haphazard sampling was used as an appropriate sampling technique. Convenience sampling was used due to the fact that it allows a researcher to “collect information from members in a population who are conveniently available to provide it” (Serakan & Bougie, 2013, p. 252). Time constraints did not allow the researcher to use random sampling. Therefore, students were administered the questionnaire based on convenience of whether lecturers allowed accessibility to them after lectures. Additionally, they were also administered the questionnaire as to when the students were available and willing to partake in the study anywhere around the University of Botswana campus. Convenience sampling however leads to bias and the inability to generalize the results to the studied population (Teddlie & Yu, 2007; Serakan & Bougie, 2013). Saunders *et al.* (2016) also adds that the likelihood of the sample being a representative of the population in convenience sampling is very low and often lacks credibility. Therefore, the results obtained in this study may not be entirely generalised to the student population of university of Botswana. The sampling approach is demonstrated in Figure 3.2.

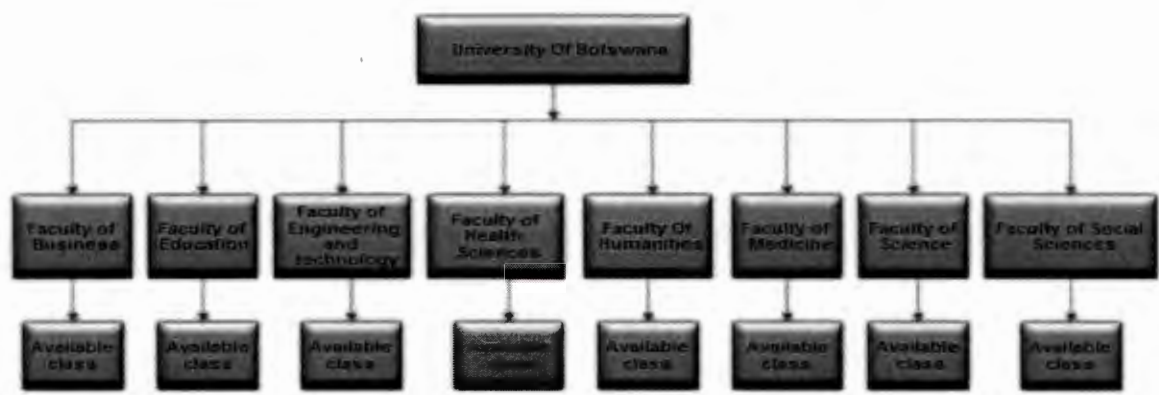


Figure 3.2: Sampling Approach

Request for permission to conduct this research was first obtained from the North-West University. Furthermore, permission to conduct research in Botswana was done by obtaining a research permit from the department of research, science and technology. A research permit to conduct research at the University of Botswana was also done through the office of research and development at the University of Botswana. Furthermore, permission to collect data from

students after lectures was also done by writing to the vice chancellors of academic and student affairs at the University of Botswana. Copies of the permits letter used are in Appendix E.

3.8.3 Questionnaire

In this study a close ended questionnaire as described by Bhattacharjee (2012) was used to collect data from students at the University of Botswana. A questionnaire is, according to Babbie (2014), a collection of questions containing various statements that are in the form of questions. A close ended questionnaire was used in this study because in more positivist-oriented studies, carefully designed and structured questionnaires are often favoured to collect information (Thomas & Hodges, 2010). Additionally, data inflow in questionnaires is faster and interview bias is also avoided (Gray, 2013). Moreover, with the use of questionnaire time and money are less consumed (Gray, 2013). The questionnaire used in this study contained questions on demographics, internet access, e-health knowledge, benefits and challenges as well as questions covering technology readiness index and some technology acceptance model constructs. To ensure a higher response rate, the questionnaire was kept short as found in Appendix A.

3.8.3.1 Measurements

In this study, there are six constructs based on the developed technology readiness and acceptance model for e-health. The questionnaire also included demographic questions and supporting questions that may give insights on the availability of internet access, e-health knowledge, benefits and the challenges of adopting e-health technology (Appendix A is attached for the full questionnaire). A 5point Likert scale was used to examine how strongly the respondents agreed with a given statement or question mostly in the section which contained questions on constructs (Serakan & Bougie, 2013). The Likert scale ranged from strongly disagree to strongly agree with the midpoint being undecided. The next headings “technology readiness index constructs”(Table 3.1), “technology acceptance model constructs”(Table 3.2) and “e-health adoption construct”(Table 3.3) shows sources of each question in a construct depending on whether the question was adapted, adopted or self-developed. Section 2.7 explained the constructs as well as their meaning as applied to this study.

Technology Readiness Index Constructs

Table 3.1: Technology Readiness Index Constructs

C1. Optimism	
Measurement	Source
New technologies such as e-health contribute to a better quality of life	Adapted for e-health from Parasuraman and Colby (2015)
Technology such as e-health gives me more freedom of mobility	Adapted for e-health from Parasuraman and Colby (2015)
Technology such as e-health gives people more control over their daily lives especially healthcare life	Adapted for e-health from Parasuraman and Colby (2015)
E-health technology makes me more productive in my personal life especially in health-related issues	Adapted for e-health from Parasuraman and Colby (2015)
E-health technology is accessible at any time because it is not limited to regular business hours	Self-Developed
C2. Innovativeness	
Measurement	Source
Other people come to me for advice on new technologies that make use of the internet such as e-health	Adapted for e-health from Parasuraman and Colby (2015)
In general, I am among the first in my circle of friends to acquire new technology that affects the delivery of healthcare when it is released	Adapted for e-health from Parasuraman and Colby (2015)
I can usually figure out new high-tech products and services such as e-health technology initiatives without help from others	Adapted for e-health from Parasuraman and Colby (2015)
I keep up with the latest technological developments in my areas of interest on issues affecting health services delivery	Adapted for e-health from Parasuraman and Colby (2015)
I usually have fewer problems than others in making technology such as e-health work for me	Self-developed
C3. Discomfort	
Measurement t	Source
When I get technical support from a provider of a high-tech product or service, I never feel as if I am being	Adopted from Parasuraman and Colby (2015)

taken advantage of by someone who knows more than I do	
Technical support lines are helpful because they explain things in terms that I understand	Adopted from Parasuraman and Colby (2015)
I think that e-health technology systems are designed for use by ordinary people	Adapted for e-health from Parasuraman and Colby (2015)
There is always a manual which is written in an understandable language for high-tech products or services like e-health initiatives	Adapted for e-health from Parasuraman and Colby (2015)
C4. Insecurity	
Measurement	Source
People are not too dependent on e-health technology initiatives to do health related things for them	Adapted for e-health from Parasuraman and Colby (2015)
Too much technology does not distract people to a point that is harmful	Adapted for e-health from Parasuraman and Colby (2015)
E-health technology initiatives does not lower the quality of relationships between patients and health service providers (i.e. does not reduce the levels of personal interaction)	Adapted for e-health from Parasuraman and Colby (2015)
I feel confident doing my health-related tasks with a place that can only be reached online	Adapted for e-health from Parasuraman and Colby (2015)
I do not worry that e-health information that I send over the Internet will be seen by other people	Self-developed

Technology Acceptance Model Constructs

Table 3.2: Technology Acceptance Model Constructs

E-Health Perceived Usefulness	
Measurement	Source
I think that using e-health would enable me to accomplish my tasks more quickly	Adapted for e-Health from Davis (1989)
I think that using e-health would make it easier for me to carry out my health-related tasks, for example, communication with healthcare providers	Adapted for e-Health from Davis (1989)

Using e-health gives me more control over my health-related issues	Adapted for e-Health from Davis (1989)
E-health addresses my health-related needs	Adapted for e-Health from Davis (1989)
Using e-health reduces the time I spend at the medical center, clinic or hospital	Adapted for e-Health from Davis (1989)
Overall, I think that using e-health is advantageous over the traditional way of offering health services	Adapted for e-Health from Davis (1989)
E-Health Perceived Ease of Use	
Measurement	Source
I think that learning to use e-health would be easy	Adapted for e-Health from Davis (1989)
I think that it is easy to use e-health to accomplish my health tasks	Adapted for e-Health from Davis (1989)
I think that I will not get confused when I use e-health services	Adapted for e-Health from Davis (1989)
Interacting with e-health services will not be frustrating	Adapted for e-Health from Davis (1989)
I would often not need to consult someone when using e-health services	Adapted for e-Health from Davis (1989)
Interacting with e-health technology would not require a lot of my mental effort	Adapted for e-Health from Davis (1989)
I think using e-health will not be costly	Self-developed

E-Health Adoption Construct

Table 3.3: E-health Adoption Construct

E-Health Adoption	
Measurement	Source
I will use e-health initiatives on a regular basis	Self-developed
I will strongly recommend others to use e-health initiatives	Self-developed
In overall, all things considered I am willing to adopt e-health	Self-developed

3.8.4 Pilot testing

A pilot test was administered to 30 participants to test the survey questionnaire and to assess its data gathering quality (Creswell, 2014). In the process of testing the research questionnaire

some questions were found irrelevant to the study hence they were removed, and some were modified to make more sense to the participants.

3.8.5 Administration of the research instrument

After access was granted, the questionnaire was then presented to the students. Upon the presentation of the questionnaire to the respondents, there was an information sheet which invited the participants to take part in the study. The information sheet explained briefly what the survey aimed to achieve and explained in brief what e-health meant. Respondents were also guaranteed that their responses were anonymous and that they would be treated with confidentiality. The information sheet also had a section where participants signed for consent that they agreed to take part in the survey. The questionnaire was administered personally, at the same time with the information sheet attached. The reason for administering the questionnaire personally was to collect the completed responses within a short period of time (Serakan & Bougie, 2013).

3.9 ANALYSIS TECHNIQUES AND PROCEDURES

This section discusses the data analysis procedures used in this study.

3.9.1 Data analysis procedures

In this study, the data collected was coded and analysed using the Statistical Package for Social Science (SPSS) and Microsoft Excel. Each questionnaire was checked thoroughly to see whether it qualified to be used in the study and empty questionnaires were removed. 385 questionnaires were handed out to the students but only 372 qualified for analysis. The questionnaires that qualified to be used for analysis were then sorted according to the faculty the respondent belonged to. Then each questionnaire was then given a unique identifier so that if anything happens the researcher could always go back to the specific questionnaire. The data collected was then coded in the form of numbers in SPSS for analysis (Bhattacharjee, 2012).

3.9.1.1 Validity and reliability

It is important to check for validity and reliability of the research instrument. Bhattacharjee (2012) explains that validity is the degree to which a measure represents adequately the construct it is supposed to measure whereas reliability on the other hand is the extent to which measures of a construct are consistent and hangs together as a set (Serakan & Bougie, 2013).

Validity

Content validity means the extent to which the measurement device provides enough coverage of the investigative questions (Saunders *et al.*, 2016). It was used to measure the validity of the research questionnaire. In this study, different people were given the questionnaire to check if questions in the questionnaire were essential, useful but not essential or not necessary at all.

Reliability

Cronbach’s alpha was also used in this study to test the internal consistency of the constructs in the questionnaire. Cronbach’s alpha values above 0.70 indicates that the questions combined in a construct measures the same thing (Saunders, *et al.*, 2016). Therefore, in this study, only constructs with alpha values above 0.70 were accepted otherwise questions lowering the constructs alpha values were removed as it indicated that the question was not measuring what other questions in the constructs measured.

This study tested the reliability of the questionnaire and it was found to be alpha of 0.882 as shown by Table 3.4. The reliability analysis statistics of this research questionnaire is therefore good as it is above 0.70.

Table 3.4: Reliability analysis of the research questionnaire

Reliability Statistics	
Cronbach's Alpha	N of Items
.882	65

Table 3.5 shows the reliability analysis of the constructs which are all above the accepted level of 0.70. However, with the case of insecurity, the alpha value was lower than 0.70 when computed with the 5 items. To raise the alpha value, the statement “people are not too dependent on e-health technology initiatives to do health related things for them” was removed and the new Cronbach’s alpha value based on the 4 items than the original 5 items was re-computed. This was done based on Serakan and Bougie (2013) argument that items can be removed to raise the alpha value if it is low although this can affect the validity of a measure.

Table 3.5: Reliability analysis of the conceptual framework constructs

Construct	Cronbach's Alpha	N of items	N of Items deleted
Optimism (OPT)	0.804	5	0
Innovativeness (INN)	0.837	5	0
Discomfort (DIS)	0.716	4	0
Insecurity (INS)	0.706	4	1
E-health Perceived Usefulness (EPU)	0.819	6	0
E-health Perceived Ease of Use (EPEU)	0.782	7	0
E-health Adoption (EA)	0.819	3	0

3.9.1.2 Descriptive and inferential statistics

In this study, descriptive and inferential statistics were used to analyse the data. Descriptive statistics “describe a body of data” (Leedy & Ormrod, 2010, p. 265). On the other hand, inferential statistics allow a researcher to make inferences about a large population from small samples. It has two main functions of estimating a population parameter from a random sample and to test statistically based hypotheses (Leedy & Ormrod, 2010).

Correlations

Pearson’s coefficient correlation was used to see the relationship that existed between different variables in the study (Leedy & Ormrod, 2010). A number close to +1 indicates a strong positive correlation whilst a number close to -1 indicates a strong negative correlation. However, correlation in the 0.40 and 0.50 indicate a moderate correlation whilst the ones below 0.40 indicate a weak correlation between two variables (Leedy & Ormrod, 2010).

Regression analysis

In this study, multiple regression analysis was used to test the hypotheses to see if one independent variable affected one dependent variable (Serakan & Bougie, 2013). An independent variable is a variable that the researcher manipulates because it is a possible cause of something while a dependent variable is a variable that is influenced by the independent variable (Leedy & Ormrod, 2010). The coefficient of determination R^2 provides the goodness of fit of a regression model. R^2 is a percentage of the variance in the dependent variable that is explained by variation in the independent variable (Serakan & Bougie, 2013). When R^2 is 1 the regression model fits the data perfectly and when R^2 is 0 none of the variation to the dependent variable cannot be attributed to the variation in the independent variable (Serakan & Bougie, 2013). For example, if R^2 is 0.619 it means that almost 62% of the variation in the dependent variable is explained by the variation in the independent variable. The hypotheses were

accepted at a significance value below 0.05 and those above significance value 0.05 were rejected.

3.10 ETHICAL CONSIDERATIONS

This study followed the ethical guidelines as per the standards of North-West University's Ethics Committee. The ethical clearance number NWU- 000535-18-S4 was issued to the researcher. A research permit in Appendix C was obtained from the Ministry of tertiary education, research, science and technology in Botswana to allow the researcher to be able to conduct research in Botswana. A research permit found in Appendix D was also obtained from the University of Botswana office of research and development to conduct research within the university premises. A letter in Appendix E was then sent to the deputy vice chancellors of academic affairs and student affairs to request for permission to get student to answer the questionnaire. Prior to answering the research questionnaire, students were given a consent form explaining what the questionnaire is about. Voluntary participation, anonymity and confidentiality were also guaranteed to the respondents using the consent form.

3.11 CHAPTER SUMMARY

This chapter outlined the processes of how the entire study was conducted. This was done by explaining the study's research design with regards to the different research assumption and how they applied to this study. Quantitative methodological choice was discussed as well as the survey strategy which was used to gather data in a scross sectional time horizon. Primary and secondary data collection, convenience sampling, analysis techniques and procedures such as pilot testing, reliability and validity and ethical considerations followed in this research were explained as to how they were used on this study. The next chapter present the results.

4 RESULTS: CHAPTER 4

4.1 INTRODUCTION

This chapter discusses quantitative data by using descriptive analysis as well as correlations. The hypotheses were also tested by using multiple regression analysis to get their level of significance. According to Saunders *et al.* (2009) data analysis makes data valuable rather than having raw data with no meaning. This chapter specifically discusses descriptive statistics relating to demographic data such as gender, age, faculty and level of study. The section proceeds to discuss how the descriptive statistics on supporting questions that are based on internet access, e-health knowledge, benefits and challenges. The chapter examines the inter-item correlations between the conceptual framework constructs as well as the inter-item correlations between demographics and the conceptual framework constructs. Additionally, the chapter interprets the regression analysis performed on the hypotheses developed in Chapter 2.

4.2 DESCRIPTIVE STATISTICS AND FREQUENCIES

This section discusses the descriptive statistics and frequencies. The sample size for this study is 372 (N=372).

4.2.1 Demographic statistics

This section discusses section A of the questionnaire which is the demographics. The demographics statistics in this study included gender, age, faculty and level of study.

Gender

Figure 4.1 shows that out of the 372 respondents, 55% were females and 45% were males. This means that in this study there are more females who responded to the questionnaire than males.

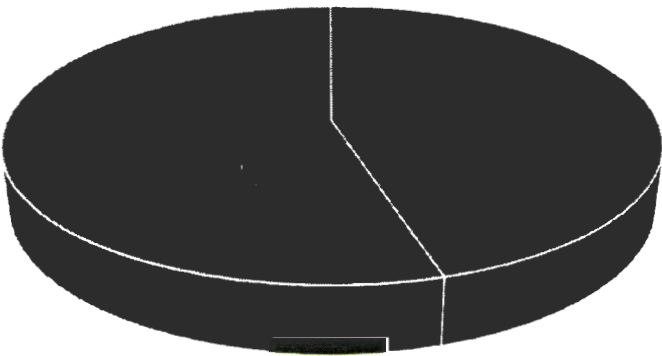


Figure 4.1: Gender

Age

Figure 4.2 shows that in this study 65% of the respondents were in the age group 17-21, followed by the age group 22-26 with 29%, then 27-31 with 4% and 32 years and above recording 1% of the participants. Those who did not state their age group amounted to 1% of the respondents. These findings mean that this study has more students who were young and in the age of 17-21 and that the study’s least number of respondents are those aged 32 onwards.

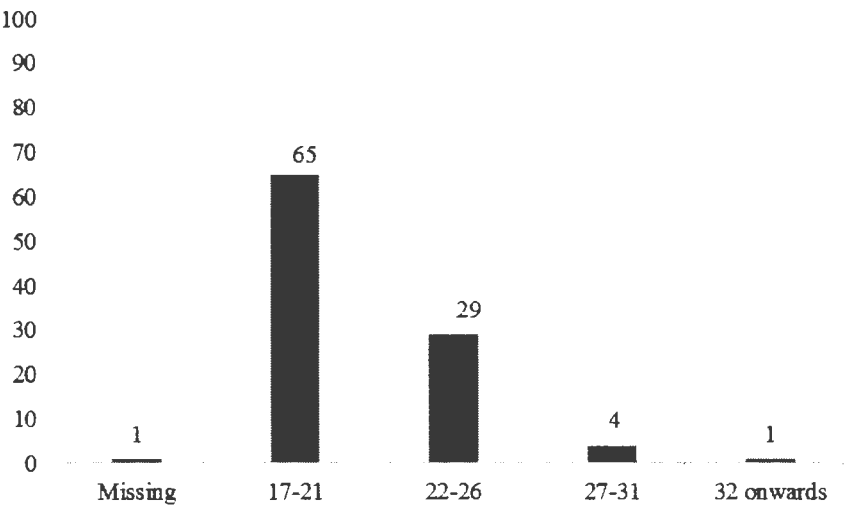


Figure 4.2: Age

Faculty

In this study Figure 4.3 shows that the Faculty of Science had the most respondents with 32%, followed by Social Sciences with 19%. Faculty of Business contributed 12% respondents, then Education had 10%, whilst both Medicine and Engineering and Technology polled 9% of the respondents. Humanities on the other hand had 5% of the respondents’ whilst Health Sciences contributed 3% of the respondents. 1% of the respondents did not specify their faculty. These findings indicate that in this study, most respondents were from the faculty of Social Sciences whereas the least respondents were from the Faculty of Health Sciences.

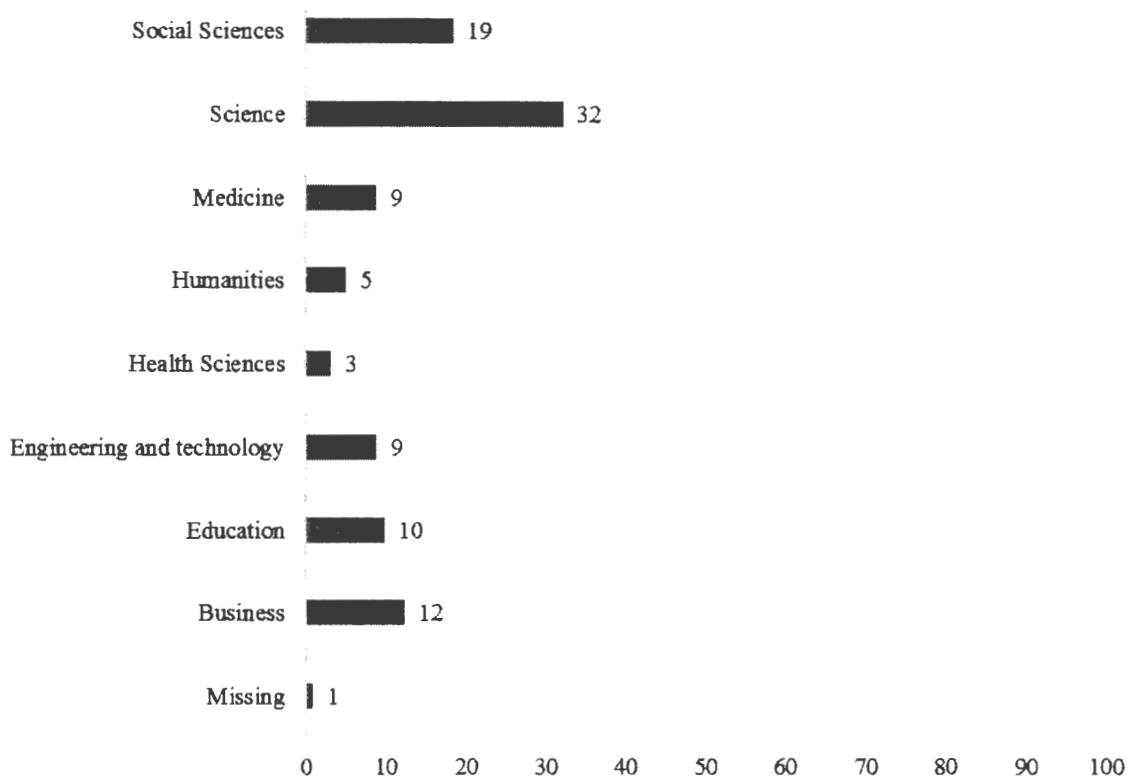


Figure 4.3: Faculty

Level of study

In terms of the level of study, Figure 4.4 shows that 2nd years were at the forefront with 33% in terms of numbers of respondents. 1st years followed with 21%, then 4th years had a total of 20%. 19% were 3rd years, followed by postgraduates with 5% and 5th years with a total of 1%. Respondents who did not state their level of study amounted to 1%. These findings indicate that in this study most respondents were students in their 2nd year and the least respondents were students in their 5th year.

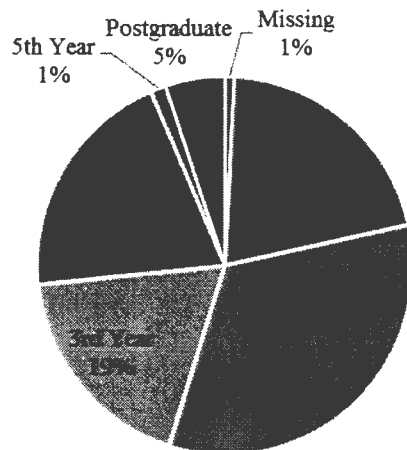


Figure 4.4: Level of study

4.2.2 Internet access, e-health knowledge, benefits and challenges

This section discusses section B of the questionnaire which covers questions on internet access and e-health knowledge, benefits and challenges. These questions play a role of leading or supporting questions in this study as they provide insights on additional factors that may affect the e-health readiness of higher education institution students at the University of Botswana.

4.2.2.1 Internet access and e-health knowledge

According to Table 4.1 there were no missing values in both questions “do you have regular access to the internet” and “do you know something about e-health”. However, it is visible that more respondents agreed that they have regular internet access shown by the mean of 3.98. On the other hand, a mean of 2.39 shows that most respondents disagreed to knowing something about e-health. The mode of 5 shows that most respondents chose “strongly agree” with regards the question of having regular internet access whilst a mode of 2 shows that most respondents chose 2 thus disagreeing with the question of having knowledge about e-health.

Table 4.1: Internet Access and E-health Knowledge Statistics

Statistics			
		Do You Have Regular Access To The Internet?	Do You Know Something About e-health?
N	Valid	372	372
	Missing	0	0
Mean		3.98	2.39
Mode		5	2

Figure 4.5 shows a further breakdown of the responses to the question “do you have regular access to the internet”. 41% of the respondents strongly agreed that they have regular internet access, 37% agreed and 8% were undecided. 8% of the respondents on the other hand disagreed to having regular internet access whilst 5% strongly disagreed to having regular internet access. 1% of the respondents did not respond to this question. These findings indicate that in this study, most respondents agreed that they had regular access to the internet.

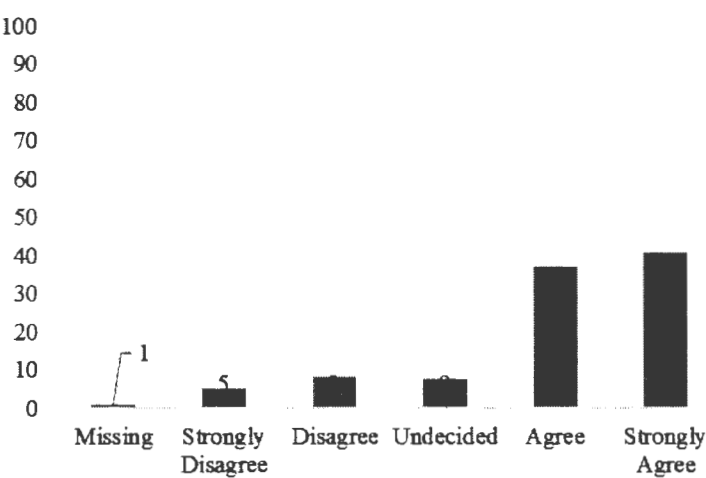


Figure 4.5: Do you have regular access to the internet?

Figure 4.6 also shows a further breakdown of the responses to the question “Do you know something about e-health”. There was 30% of the respondents who strongly disagreed to knowing something about e-health, 30% disagreed and 15% were undecided. Another 20% on the other hand agreed that they know something about e-health, whilst 5% strongly agreed to knowing something about e-health. Only 1% of the respondents did not respond to this question. These findings indicate that in this study, most respondent disagreed to knowing something about e-health. This meaning that most students of the University of Botswana do not know anything about e-health.

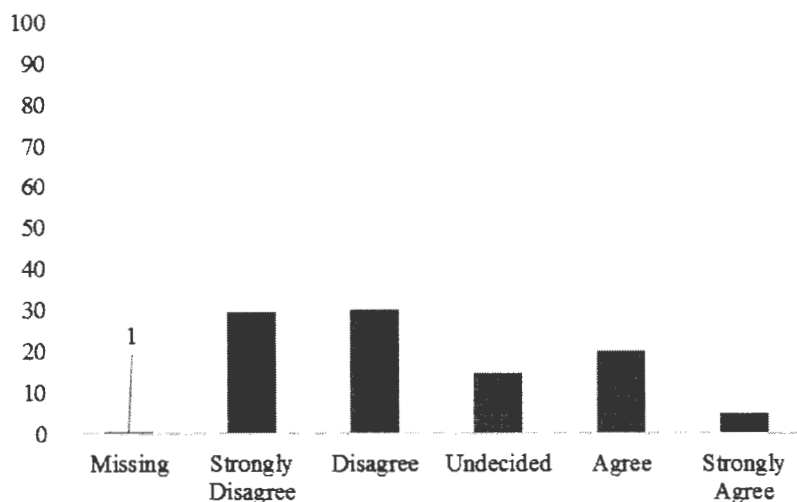


Figure 4.6: Do you know something about e-health?

4.2.2.2 Are you aware of the following e-health initiatives

Figure 4.7 shows the summary of statistics relating to the question “Are you aware of the following e-health initiatives”. In the chart, the statistics of each e-health initiative are given according to the order of responses with the first column being “Yes”, followed by “No” and lastly “Missing”. In terms of awareness of e-health initiatives, online support groups or virtual communities received the most responses with 44% respondents stating that they were aware of it, followed by home online health information websites with 41% respondents saying they were aware of it. 37% respondents also stated they were aware of mobile health or m-health applications whilst 36% indicated that they were not aware of any of the stated e-health initiatives. Furthermore, 27% respondents agreed that they were aware of home monitoring systems whilst 25% states they were aware of shared electronic health records. 24% respondents also stated they were aware of automated online therapy and telemedicine or advanced telehealth applications received 22% responses alluding to being aware of it. Interactive electronic health records however received the least respondents in term of awareness, the responses amounted to 19%.

54% respondents responded with a “no” to being aware of online support groups or virtual communities. Additionally, 57% also responded to not being aware of home online health information websites whilst 61% responded to not being aware of mobile health or m-health applications. 61% responded with a “no” to the statement “none of the above”. This meant that the respondents were aware of some of or all the e-health initiatives. 70% respondents also

responded with a “no” to being aware of home monitoring systems, a further 74% respondents gave a “no” for being aware of shared electronic health records, 74% respondents also gave a ‘no” for automated online therapy. Additionally, 76% respondents gave a “no” for telemedicine or advanced telehealth applications and lastly, interactive electronic health records recorded 79% respondents giving “no” as an answer to knowing the e-health initiative.

In terms of recording missing values, online support groups or virtual communities recorded 2%, home online health information websites 2%, mobile health or m-health applications 2%, both none of the above and home monitoring systems 3%, shared electronic health records 1%, automated online therapy 2%, telemedicine or advanced telehealth applications and interactive electronic health records both got 2% missing values.

These findings indicate that in this study the most e-health initiative that students are aware of is online support groups or virtual communities whereas the least e-health initiative the students are aware of is interactive electronic health records.

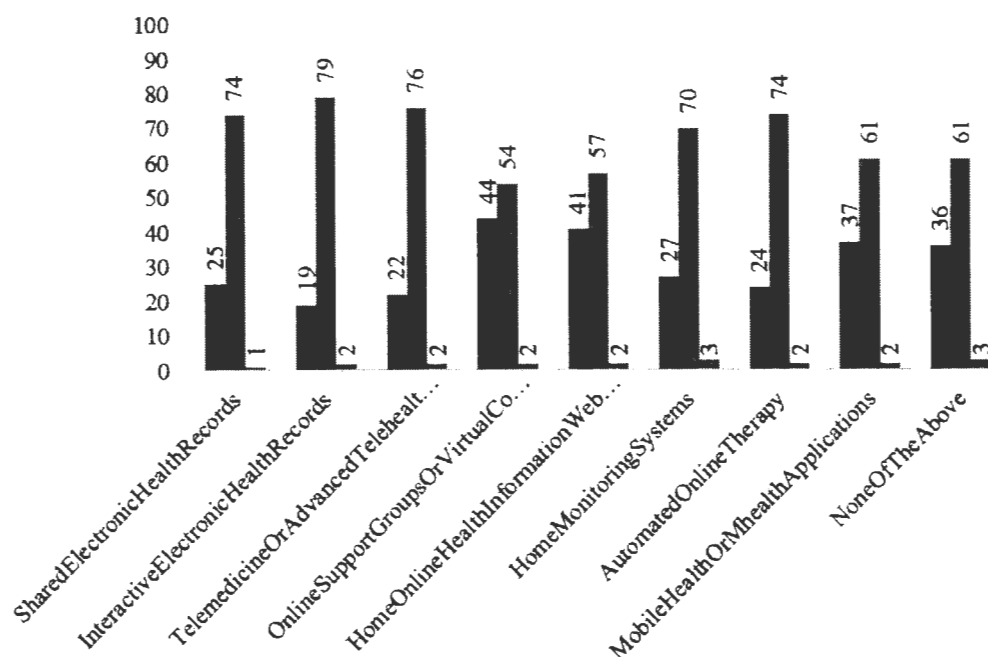


Figure 4.7: Are you aware of the following e-health initiatives?

4.2.2.3 What are the benefits of adopting e-health initiatives

Figure 4.8 shows the summary of statistics relating to the question “what are the benefits of adopting e-health initiatives”. In the chart, the statistics of each e-health initiative benefit are given according to the order of responses with the first column being “Yes”, followed by “No” and lastly “Missing”. In terms of the benefits of adopting e-health initiatives, the statement “it

enhances patients' health education" received the highest number of 61% respondents saying "yes" to it. It was followed by "it allows easy sharing of valuable health information" with 60% respondents agreeing to it. 58% respondents also stated "e-health initiatives assist better decision making to healthcare providers by availing necessary information" whilst 56% indicated "e-health initiatives allow patients to be actively involved in their own healthcare". Furthermore 55% respondents agreed e-health initiatives allow the expansion of delivery of limited medical resources whilst 44% states confirmed that e-health initiatives reduce costs in the entire healthcare, on patients and health service providers, making this statement receiving the least number of respondents agreeing to it. 24% respondents stated that this question was not applicable to them.

7% respondents on the other hand responded with a "No" to the statement that e-health initiatives enhance patients' health education. Additionally, 8% also responded with a "no" to e-health initiatives allowing easy sharing of valuable health information whilst 9% responded with a "no" to e-health initiatives assisting in better decision making to healthcare providers by availing necessary information. 11% responded with a "no" to the statement that e-health initiatives benefit that it allows patients' to be actively involved in their own healthcare. 10% respondents also responded with a "no" to the e-health initiative benefit that it allows the expansion of delivery of limited medical resources. A further 23% respondents responded with a "no" response to the e-health initiative benefit that it reduces costs in the entire healthcare, on patients and health service providers. 69% respondents responded with a "no" to not applicable, this meaning that they responded to the question as it applied to them.

In terms of recording missing values, this question received a significant number of missing values. The benefit that e-health initiatives enhances patients health education got 32% missing values, it allows easy sharing of valuable health information also recorded 32%, it assists better decision making to healthcare providers by availing necessary information 33%, it allows patients to be actively involved in their own healthcare 33%, it allows the expansion of delivery of limited medical resources received 35% missing values whilst it reduces costs in the entire healthcare, on patients and health service providers received 33% missing values and not applicable received 7% missing values.

These findings indicate that in this study the most e-health benefit that students of the University of Botswana agreed that "it enhances patients' health education" whereas the least e-health benefit the students of the university of Botswana agreed to was that "e-health initiatives reduce costs in the entire healthcare, on patients and health service providers".

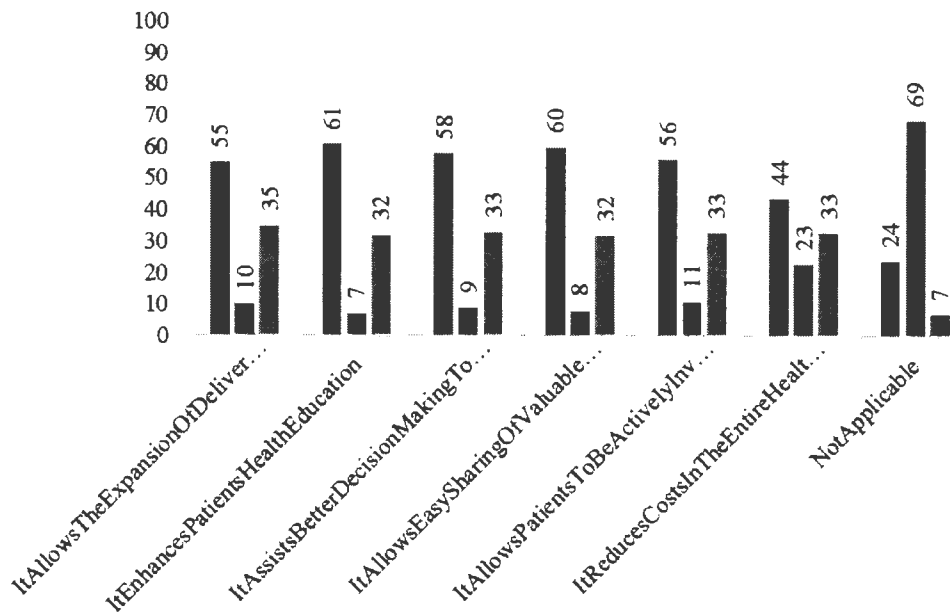


Figure 4.8: What are the benefits of adopting e-health initiatives?

4.2.2.4 The following challenges make it hard for me to adopt e-health

Figure 4.9 shows the summary of statistics relating to the question “the following challenges make it hard for me to adopt e-health”. In the bar chart, the statistics of each challenge to adopting e-health are given according to the order of responses with the first column being “Yes”, followed by “No” and lastly “Missing”. In terms of the challenges making it hard for respondents to adopt e-health, the statement little or lack of knowledge about e-health received the highest number of 63% respondents saying “yes” to it. It was followed by government not supporting the implementation of e-health initiatives with 47% respondents agreeing to it. 43% respondents also stated limited internet access as a challenge to adopting e-health whilst 42% indicated security issues related to the use of e-health initiatives as a challenge. Furthermore 33% respondents stated that no internet access is a challenge to them adopting e-health initiatives whilst 26% stated that lack of smart devices such as laptops, desktops, smartphone or tablet was a challenge to them adopting e-health initiatives. 21% respondents indicated that religious, cultural or personal beliefs towards e-health was a challenge that made it hard for them to adopt e-health making this statement receiving the least number of respondents agreeing to it. 15% respondents stated that this question was not applicable to them.

17% respondents on the other hand responded with a “no” to the statement that little or lack of knowledge about e-health makes it hard for them to adopt e-health. Additionally, 23% also responded with a “no” to government not supporting the implementation of e-health initiatives

as a challenge that make it hard to adopt e-health whilst 31% responded with a “no” to limited internet access being a challenge that made them not to adopt e-health. 30% also responded with a “no” to the statement that security issues related to the use of e-health initiatives make it hard for them to adopt e-health. 39% respondents also responded with a “no” to the statement that no internet access makes it hard for them to adopt e-health. A further 46% respondents responded with a “no” to the statement that lack of smart devices such as laptops desktops smartphone tablet makes it hard for them to adopt e-health. 50% respondents also responded with a “no” to the statement that religious, cultural or personal believes towards e-health makes it hard for them to adopt e-health initiatives. 75% respondents responded with a “no” to not applicable, meaning that they responded to the question as it applied to them.

In terms of recording missing values, this question also received a significant number of missing values. The statement that little or lack of knowledge about e-health makes it hard to adopt e-health got 20% missing values, government not supporting the implementation of e-health initiatives recorded 30%, limited internet access 26%, security issues related to the use of e-health initiatives, no internet access and lack of smart devices such as laptops, desktops, smartphone and tablet recorded all recorded 28% missing values. Religious, cultural or personal beliefs towards e-health received 29% missing values and not applicable received 10% missing values.

These findings indicate that in this study the most challenge that make it hard for students at the University of Botswana to adopt e-health is “little or lack of knowledge about e-health” whereas the least challenge that make it hard for students at the university of Botswana to adopt e-health is “religious, cultural or personal believes towards e-health”.

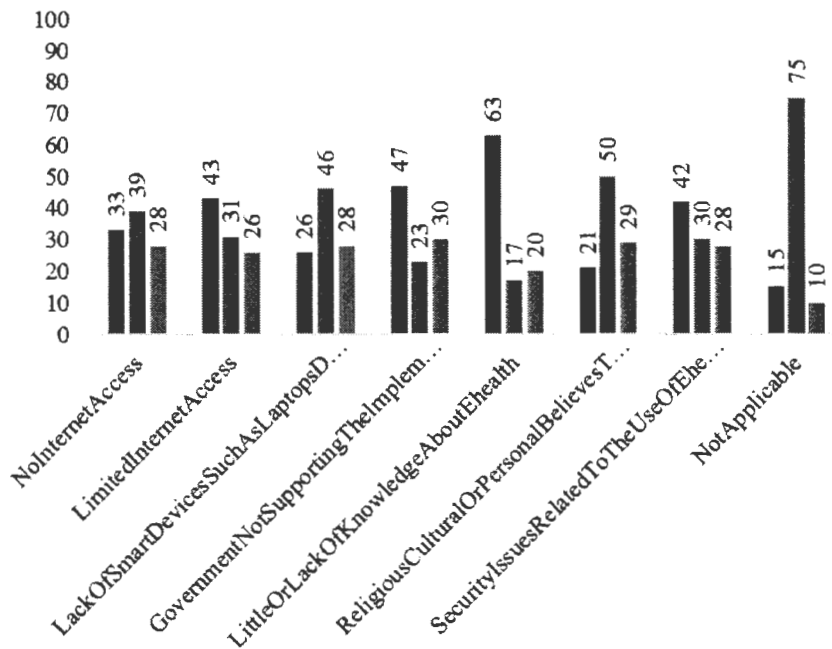


Figure 4.9: The following challenges make it hard for me to adopt e-health

4.3 E-HEALTH TECHNOLOGY READINESS, E-HEALTH PERCEIVED USEFUL, E-HEALTH PERCEIVED EASE OF USE AND E-HEALTH ADOPTION

This section discusses the results of the main constructs of the technology readiness and acceptance model for e-health. Correlations and regression are also addressed.

4.3.1 Correlations

This section discusses the inter-item correlations between the conceptual framework constructs (Table 4.2) and inter-item correlations between demographics and the conceptual framework constructs (Table 4.3). The correlations were measured at 0.05 and 0.01 level of significance and based on the literature discussion of correlations by Leedy and Ormrod (2010) in section 3.9.1.2.

4.3.1.1 Inter-item correlations between the conceptual framework constructs

Table 4.2 shows that there is a weak positive correlation of 0.263^{**}, 0.388^{**} and 0.127^{*} between optimism and the three constructs of innovation, discomfort, insecurity. On the other hand, there was a moderate positive correlation of 0.486^{**}, 0.437^{**} and 0.483^{**} between optimism and the three constructs of e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

A weak positive correlation of 0.348^{**}, 0.214^{**}, 0.278^{**}, 0.339^{**} and 0.280^{**} was between innovativeness and the four constructs of discomfort, insecurity, e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

A weak positive correlation of 0.231^{**} was observed between discomfort and insecurity. On the other hand, a moderate positive correlation of 0.452^{**}, 0.525^{**} and 0.459^{**} was also found between discomfort and e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

A weak positive correlation of 0.197^{**}, 0.337^{**} and 0.250^{**} was also found between insecurity and the three constructs of e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

There was a moderate positive correlation of 0.507^{**} between e-health perceived usefulness and e-health perceive ease of use. On the other hand, there was a strong positive correlation of 0.612^{**} between e-health perceived usefulness and e-health adoption. Finally, a strong positive correlation of 0.601^{**} was found between e-health perceived ease of use and e-health adoption. These findings of the correlations mean that in this study, over 99% of the time there is a weak positive relationship existing between optimism and the two constructs of innovation and discomfort. However, over 95% of the time a weak positive relationship exists between optimism and insecurity. Additionally, over 99% of the time there is a moderate positive relationship existing between optimism and the three constructs of e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

However, in terms of innovativeness and other constructs, in this study, over 99% of the time there is a weak positive relationship existing between innovativeness and the four constructs of discomfort, insecurity, e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

In terms of discomfort and other constructs, in this study the findings reveal that over 99% of the time there is a weak positive relationship existing between discomfort and insecurity. On the other hand, over 99% of the time there is a moderate positive relationship existing between discomfort and the constructs of e-health perceived usefulness, e-health perceive ease of use and e-health adoption.

With regards insecurity and other constructs, in this study the findings reveal that over 99% of the time there is a weak positive relationship existing between insecurity and the three constructs of e-health perceived usefulness, e-health perceive ease of use and e-health adoption. The findings of this study further reveal that over 99% of the time there is a moderate positive relationship existing between e-health perceived usefulness and e-health perceive ease of use.

However, over 99% of the time there is a strong positive relationship existing between e-health perceived usefulness and e-health adoption. Additionally, the findings reveal that over 99% of the time there is a strong positive relationship existing between e-health perceived ease of use and e-health adoption.

Table 4.2: Inter-item correlations of the conceptual framework constructs

		Correlations						
		OPT	INN	DIS	INS	EPU	EPEU	EA
OPT	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	372						
INN	Pearson Correlation	.263**	1					
	Sig. (2-tailed)	.000						
	N	372	372					
DIS	Pearson Correlation	.388**	.348**	1				
	Sig. (2-tailed)	.000	.000					
	N	372	372	372				
INS	Pearson Correlation	.127*	.214**	.231**	1			
	Sig. (2-tailed)	.014	.000	.000				
	N	372	372	372	372			
EPU	Pearson Correlation	.486**	.278**	.452**	.197**	1		
	Sig. (2-tailed)	.000	.000	.000	.000			
	N	372	372	372	372	372		
EPEU	Pearson Correlation	.437**	.339**	.525**	.337**	.507**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000		
	N	372	372	372	372	372	372	
EA	Pearson Correlation	.483**	.280**	.459**	.250**	.612**	.601**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	372	372	372	372	372	372	372

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

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

4.3.1.2 Inter-item correlations between age, level of study and the conceptual framework constructs

Table 4.3 shows that with regards age and the three constructs of optimism, discomfort and e-health perceived there is no significant correlation found. However, there is a weak positive correlation of 0.138**, 0.210**, 0.126* and 0.103* between age and the four constructs of innovativeness, insecurity, e-health perceive ease of use and e-health adoption.

Level of study showed no significant correlation with any of the conceptual framework constructs.

With regards age, in this study the findings mean that there is no significant relationship existing between age and the three constructs of optimism, discomfort and e-health perceived usefulness. However, the correlations also meant that in this study over 99% of the time there is a weak positive relationship between age and the two constructs of innovativeness and insecurity. Additionally, the findings mean that in this study, over 95% of the time there is a weak positive relationship between age and the two constructs of e-health perceive ease of use and e-health adoption. The findings further reveal that in this study, there is no significant relationship between levels of study with any of the constructs in of the conceptual framework.

Table 4.3: Inter-Item Correlations between Age, Level of Study and Conceptual framework Constructs

		Correlations						
		OPT	INN	DIS	INS	EPU	EPEU	EA
Age	Pearson Correlation	.076	.138 ^{**}	.052	.210 ^{**}	.084	.126 [*]	.103 [*]
	Sig. (2-tailed)	.145	.008	.322	.000	.104	.015	.048
	N	372	372	372	372	372	372	372
Level Of Study	Pearson Correlation	.041	.061	-.042	.087	-.005	.033	.032
	Sig. (2-tailed)	.426	.242	.416	.095	.918	.529	.539
	N	372	372	372	372	372	372	372

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

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

4.3.2 Regression analysis

This section tests and discusses the hypotheses developed in section 2.7.2 as per the literature discussion on regression analysis in section 3.9.1.2.

4.3.2.1 Regression analysis for H1a, H2a, H3a and H4a

Table 4.4 shows the model summary for H1a, H2a, H3a and H4a. The R^2 of the model is 0.395 meaning that in this study 39.5% of the variation on the dependent variable e-health perceived ease of use is explained by the variation in the independent variables: insecurity, optimism, innovativeness and discomfort. The model is also significant because of its p-value of 0.000.

Table 4.4: Model Summary 1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.629 ^a	.395	.389	.55577	.395	59.980	4	367	.000

a. Predictors: (Constant), Insecurity, Optimism, Innovativeness, Discomfort

Table 4.5 shows the regression analysis between the dependent variable e-health perceived ease of use and the independent variables optimism, innovativeness, discomfort and insecurity. All the hypotheses H1a, H2a, H3a and H4a are accepted as they have p-values below 0.05. These findings mean that in this study optimism, innovativeness, discomfort and insecurity influences e-health perceived ease of use.

Table 4.5: Regression Analysis 1

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results
	B	Std. Error	Beta			
1 (Constant)	.888	.161		5.497	.000	
Optimism	.218	.039	.249	5.600	.000	Accepted
Innovativeness	.083	.033	.111	2.506	.013	Accepted
Discomfort	.310	.042	.343	7.394	.000	Accepted
Insecurity	.170	.035	.203	4.806	.000	Accepted

a. Dependent Variable: E-Health Perceived Ease Of Use

4.3.2.2 Regression analysis for H1b, H2b, H3b and H4b

Table 4.6 shows the model summary for H1b, H2b, H3b and H4b. The R² of the model is 0.322 meaning that 32.2% of the variation on the dependent variable e-health perceived usefulness is explained by the variation in the independent variables: insecurity, optimism, innovativeness and discomfort. The model is also significant because of its p-value of 0.000.

Table 4.6: Model Summary 2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.574 ^a	.329	.322	.62132	.329	44.986	4	367	.000

a. Predictors: (Constant), Insecurity, Optimism, Innovativeness, Discomfort

Table 4.7 shows the regression analysis between the dependent variable e-health perceived usefulness and the independent variables optimism, innovativeness, discomfort and insecurity. Hypotheses H1b and H3b are accepted because they had p-values below 0.05 whilst hypotheses H2b and H4b were rejected as they had p-values above 0.05.

These findings mean that in this study optimism and discomfort influences e-health perceived usefulness whereas innovativeness and insecurity do not influence e-health perceived usefulness.

Table 4.7: Regression Analysis 2

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results
	B	Std. Error	Beta			
1 (Constant)	1.258	.181		6.967	.000	
Optimism	.326	.044	.351	7.491	.000	Accepted
Innovativeness	.059	.037	.075	1.599	.111	Rejected
Discomfort	.262	.047	.273	5.577	.000	Accepted
Insecurity	.065	.040	.073	1.642	.101	Rejected

a. Dependent Variable: E-Health Perceived Usefulness

4.3.2.3 Regression analysis for H5 and H6

Table 4.8 shows the model summary for H5 and H6. The R² of the model is 0.488 meaning that 48.8% of the variation on the dependent variable e-health adoption is explained by the variation in the independent variables e-health perceived usefulness and e-health perceived ease of use. The model is also significant because of its p-value of 0.000.

Table 4.8: Model Summary 3

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.699 ^a	.488	.486	.57908	.488	176.152	2	369	.000

a. Predictors: (Constant), E-Health Perceived Ease Of Use, E-Health Perceived Usefulness

Table 4.9 shows the regression analysis between the dependent variable e-health adoption and the independent variables e-health perceived usefulness and e-health perceived ease of use. Both hypotheses H5 and H6 are accepted because they had p-values below 0.05. These findings mean that in this study e-health perceived usefulness and e-health perceived ease of use influence e-health adoption.

Table 4.9: Regression Analysis 3

Model	Coefficients ^a					
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results
	B	Std. Error	Beta			
1 (Constant)	.566	.165		3.423	.001	
E-Health Perceived Usefulness	.442	.046	.413	9.565	.000	Accepted
E-Health Perceived Ease Of Use	.445	.049	.392	9.063	.000	Accepted

a. Dependent Variable: E-Health Adoption

4.4 CHAPTER SUMMARY

This chapter presented the results of the study which was analysed through SPSS. As this study employed quantitative research methods, the data collected was analysed using SPSS. Statistics relating to demographics, internet access, e-health knowledge, benefits and challenges, correlations and regression were also done and explained in the specific context of this study. The next chapter interprets and evaluates the study findings as well as making final conclusions.

5 DISCUSSION, INTERPRETATION, CONCLUSION AND RECOMMENDATIONS: CHAPTER 5

5.1 INTRODUCTION

The main objective of this study was to investigate readiness factors that affect the adoption of e-health by higher education institution students based on the case of University of Botswana students. This chapter summarises the research process culminating in the attainment of the goals set at the beginning. In this chapter focus is on the overview, discussion and interpretation of findings as well as the evaluation of the study. In the overview section, a summary of what each of the previous chapters covered is given. In the discussion and interpretation of findings section, findings are discussed in relation to the study's research objectives. Furthermore, the study's contributions to the body of knowledge, challenges and limitations to the scope of the research are also highlighted. At the end of this chapter, the study submits recommendations based on limitations.

5.2 OVERVIEW OF THE STUDY

In this section a brief overview is provided in terms of the specific areas covered in the chapters. Chapter 1 introduced this study by giving an overview of e-health. The background on e-health in Botswana was given. The problem that informed this study was also highlighted. The research main objectives and sub-objectives of this study were also highlighted. This chapter concluded with an outline of the whole study by explaining on what each chapter covers.

Chapter 2 focused on literature relating to the study. The review assessed and explained the concept of e-health, gave the impact of e-health in terms of its benefits and challenges. A few current e-health initiatives were also discussed. Readiness in general and in relation to this study was discussed. Healthcare in terms of e-health in Africa and specifically in Botswana was also discussed. The status quo of technology development and usage in Botswana was highlighted. Theoretical frameworks used in information systems which were also underpinning theories in this study were examined. These theories include the technology acceptance model as well as the technology readiness index. The conceptual framework of the study which is the technology readiness and acceptance model for e-health (Figure 2.5) was also discussed. The relevance of the theoretical framework in this study was evaluated. Furthermore, the use of a similar framework on other studies was discussed from which the hypotheses of this study tested in chapter 4 was developed based on together with the technology readiness and acceptance model for e-health.

Chapter 3 discussed the research methodology followed in this study. In the design of the research, Saunders *et al.* (2016) research onion was followed to explain the research methodology. The chapter explained the research philosophy in terms of research assumptions, research paradigms and went on to highlight major philosophies used in research and explained the positivism philosophy which this study followed. The chapter also explained approaches to theory development and highlighted the deductive approach used in the study. Methodological choices were also discussed as well as the quantitative research design that the study followed. Research strategies were also discussed as well as the survey research strategy that the study used. Furthermore, the time horizon and the data collection methods which included the sampling and the questionnaire design were explained. The chapter ended by giving the analysis techniques and procedures used by the study and explained the ethical considerations followed in the execution of the study.

Chapter 4 went on to discuss the results of the data that was collected from the participants. In this chapter, demographic descriptive statistics were given as well as descriptive statistics on supporting questions of the questionnaire. Correlations of the model construct were calculated as well as the regression analysis which tested the study hypotheses developed in Chapter 2.

Chapter 5 discusses interpretation of the findings in relation to the achievement of the main objective and sub-objectives as well as the study's contribution to the information systems body of knowledge. At the end, the chapter highlights the limitations and gives direction for future research.

5.3 DISCUSSION AND INTERPRETATION OF FINDINGS

This section discusses and interprets findings in relation to the research objectives set. The primary objective that guided the entire research process of this study was to investigate readiness factors that affect the adoption of e-health by higher education institution students.

5.3.1 Discussion and implications of the findings in relation to sub-objective 1

The first sub-objective was: *To investigate technology readiness factors affecting e-health adoption among students in higher education institutions*

To answer this sub-objective several research articles were reviewed with regards how technology readiness factors influence e-health perceived usefulness and perceived ease of use in section 2.6.1. Regression analysis was done in section 4.3.2.1 and 4.3.2.2 as well as correlations in section 4.3.1 to assist in answering this sub-objective.

H1a: Higher education institution students perceive that optimism has an influence on e-health perceived ease of use – **Accepted**

The results of this study confirmed that students perceive that optimism has an influence on e-health perceived ease of use. These results may also have been influenced by the fact that there is a moderate positive relationship existing between optimism and e-health perceived ease of use in terms of correlations between these two constructs. The results of this study correspond with the findings by Esen & Erdogmus, (2014); Rahman, *et al.* (2017) that optimism influences perceived ease of use. Furthermore, the findings match the findings of Kuo, *et al.* (2013) where he identifies that optimism had a notable impact on perceived ease of use.

H2a: Higher education institution students perceive that innovativeness has an influence on e-health perceived ease of use – **Accepted**

The results of this study found that students perceive that innovativeness has an influence on e-health perceived ease of use. These results may also have been influenced by the fact that there is a weak positive relationship existing between innovativeness and e-health perceived ease of use in terms of correlations between these two constructs. The results of this study correspond with the findings by Esen & Erdogmus, (2014); Rahman, *et al.* (2017) that innovativeness influences perceived ease of use. Furthermore, the findings confirm the findings of Kuo, *et al.* (2013) that innovativeness had a notable impact on perceived ease of use.

H3a: Higher education institution students perceive that discomfort has an influence on e-health perceived ease of use – **Accepted**

The results of this study found that students perceive that discomfort has an influence on e-health perceived ease of use. These results may also have been influenced by the fact that there is a moderate positive relationship existing between discomfort e-health perceived ease of use in terms of correlations between these two constructs. The results of this study agree with the findings of Kuo, *et al.* (2013) who identify that discomfort had a notable impact on perceived ease of use. On the other hand, the findings of this study disagree with Esen & Erdogmus, (2014); Rahman, *et al.* (2017) findings that discomfort does not have an effect on perceived ease of use.

H4a: Higher education institution students perceive that insecurity has an influence on e-health perceived ease of use – **Accepted**

The results of this study found that students perceive that insecurity has an influence on e-health perceived ease of use. These results may also have been influenced by the fact that there

is a weak positive relationship existing between insecurity e-health perceive ease of use in terms of correlations between these two constructs. The results of this study validate the findings of Kuo, *et al.* (2013) wherein insecurity had a notable impact on perceived ease of use. On the other hand, the findings of this study disagree with Esen & Erdogmus, (2014); Rahman, *et al.* (2017) findings that insecurity does not have an effect on perceived ease of use.

H1b: Higher education institution students perceive that optimism has an influence on e-health perceived usefulness – **Accepted**

The results of this study found that students perceive that optimism has an influence on e-health perceived usefulness. These results may also have been influenced by the fact that there is a moderate positive relationship existing between optimism and e-health perceived usefulness in terms of correlations between these two constructs. The results of this study agree with the findings of Kuo, *et al.* (2013); Esen & Erdogmus, (2014); Rahman, *et al.* (2017) who also reached the conclusion that optimism had a notable impact on perceived usefulness.

H2b: Higher education institution students perceive that innovativeness has an influence on e-health perceived usefulness – **Rejected**

The results of this study found that students perceive that innovativeness does not have an influence on e-health perceived usefulness. These results may also have been influenced by the fact that there is a weak positive relationship existing between innovativeness and e-health perceived usefulness in terms of correlations between these two constructs. The results of this study agree with the findings of Kuo, *et al.* (2013) that innovativeness does not have any impact on perceived usefulness. However, it differs with Esen & Erdogmus, (2014); Rahman, *et al.* (2017) that innovativeness had a notable impact on perceived usefulness.

H3b: Higher education institution students perceive that discomfort has an influence on e-health perceived usefulness – **Accepted**

The results of this study found that students perceive that discomfort has an influence on e-health perceived usefulness. These results may also have been influenced by the fact that there is a moderate positive relationship existing between discomfort and e-health perceived usefulness in terms of correlations between these two constructs. The results of this study disagree with the findings of Kuo *et al.* (2013); Esen & Erdogmus, (2014); Rahman, *et al.* (2017) that discomfort does not have a notable impact on perceived usefulness.

H4b: Higher education institution students perceive that insecurity when has an influence on e-health perceived usefulness – **Rejected**

The results of this study found that students perceive that insecurity has no influence on e-health perceived usefulness. These results may also have been influenced by the fact that there is a weak positive relationship existing between insecurity and e-health perceived usefulness in terms of correlations between these two constructs. The results of this study agree with the findings of Kuo, *et al.* (2013); Esen & Erdogmus, (2014); Rahman, *et al.* (2017) that insecurity does not have a notable impact on perceived usefulness.

From these discussions above, the sub-objective “*To investigate technology readiness factors affecting e-health adoption among students in higher education institutions*” is answered by the fact that in this study perceptions of University of Botswana students show that optimism, innovativeness, discomfort and insecurity influence e-health perceived ease of use. However, only optimism and discomfort influence perceived usefulness whereas innovativeness and insecurity did not influence perceived usefulness as the hypotheses were rejected. This means that in this study the University of Botswana students’ perceptions on optimism, innovativeness, discomfort and insecurity towards e-health technology influence their perceptions towards the ease of use of e-health. Additionally, perceptions of students on optimism and discomfort towards e-health technology influences the way they perceive the usefulness of e-health. However, the perceptions of the University of Botswana students on the innovativeness and insecurities towards e-health does not influence the way they perceive the usefulness of e-health.

5.3.2 Discussion and implications of the findings in relation to sub-objective 2

The second sub-objective was: *To investigate perceived usefulness as a factor that affect e-health adoption by students in higher education institutions.*

To answer this sub-objective several studies and research articles were reviewed with regards the way e-health perceived usefulness influence e-health adoption in section 2.6.1. Regression analysis was done in section 4.3.2.3 as well as correlations in section 4.3.1 to assist in answering this sub-objective.

H5: Higher education institution students perceive that e-health usefulness has an influence on e-health adoption – Accepted

The results of this study found that students perceive that e-health usefulness has an influence on e-health adoption. These results may also have been influenced by the fact that there is a strong positive relationship existing between e-health perceived usefulness and e-health adoption in terms of correlations between these two constructs. The results of this study

similarly agree with the findings of Wook, *et al.* (2017) that perceived usefulness influences the acceptance of a technology although this study focused on adoption of a technology.

From these discussions above, the sub-objective “*To investigate perceived usefulness as a factor that affect e-health adoption by students in higher education institutions*” is answered by the fact that in this study perceptions of University of Botswana students show that e-health perceived usefulness has an influence on e-health adoption.

5.3.3 Discussion and implication of the findings in relation to sub-objective 3

The third sub-objective was: *To investigate perceived ease of use as a factor that affect e-health adoption by students in higher education institutions.*

To answer this sub-objective, several literatures were reviewed with regards to the way e-health perceived ease of use influence e-health adoption in section 2.6.1. Regression analysis was done in section 4.3.2.3 as well as correlations in section 4.3.1 to assist in answering this sub-objective.

H6: Higher education institution students perceive that e-health ease of use influence e-health adoption – **Accepted**

The results of this study found that students perceive that e-health ease of use has an influence on e-health adoption. These results may also have been influenced by the fact that there is a strong positive relationship existing between e-health perceived ease of use and e-health adoption in terms of correlations between these two constructs. The results of this study similarly agree with the findings of Wook, *et al.* (2017) that perceived ease of use influences the acceptance of a technology although this study focused on adoption of a technology.

From these discussions above, the sub-objective “*To investigate perceived usefulness as a factor that affect e-health adoption by students in higher education institutions*” is answered by the fact that in this study perceptions of university of Botswana students show that e-health ease of use has an influence on e-health adoption.

5.3.4 Discussion and implication of the findings in relation to sub-objective 4

The fourth sub-objective was: *To develop and validate a conceptual framework for e-health adoption by higher education institution students*

To answer this sub-objective several studies were reviewed with regards theoretical frameworks used in the field of information systems in Chapter 2. Section 2.7 of this study developed a technology readiness and acceptance model for e-health by integrating the

technology readiness index and technology acceptance model. This conceptual framework was evaluated and validated through the development of hypotheses which were tested by regression analysis in section 4.3.2. The factors identified in this conceptual framework were optimism, innovativeness, discomfort, insecurity, e-health perceived usefulness, e-health perceived usefulness and e-health adoption.

5.3.5 Discussion and implications of the findings in relation to the main objective

The main objective of this study was *to investigate readiness factors that affect adoption of e-health by higher education institution students*. In order to answer this main objective, several sub-objectives discussed above in sections 5.3.1 to 5.3.4 were addressed. Moreover, some supporting questions that gave insights on additional readiness factors affecting the adoption of e-health by higher education institution students are discussed next.

Regular access to the internet and e-health awareness

Section 4.2.2.1 showed that in this study most students had regular internet access even though most of the students also stated that they did not know anything about e-health.

Awareness of e-health initiatives

In terms of awareness of e-health initiatives section 4.2.2.2 the results show that the most known e-health initiative (online support groups or virtual communities) by university of Botswana students received 44% positive (yes) responses. This means that more than 50% of the university of Botswana students are not aware of the rest of the e-health initiatives.

Benefits of e-health initiatives

With regards the benefits of e-health initiatives, section 4.2.2.3 showed that more than 55% of the university of Botswana students agreed to all the other benefits of e-health such as “it enhances patients’ health education, it allows easy sharing of valuable health information, it assists better decision-making to healthcare providers by availing necessary information ,e-health initiatives allow patients to be actively involved in their own healthcare and that e-health initiatives allows the expansion of delivery of limited medical resources”. These findings on the benefits of e-health initiatives confirm the benefits stated by Madanian, (2016); Ami-Narh & Williams, (2012); Silber, (2003); Mugo & Nkuzi, (2014).

An exception was that 44% of students agreed that e-health initiatives reduce costs in the entire healthcare, for patients and health service providers. This means that most of the students at the University of Botswana do not believe that e-health initiatives reduce costs in the entire healthcare, for patients and health service providers. Most students disagree that e-health does

not reduce costs in the entire healthcare in contrast to the argument by Madanian (2016) that e-health reduces costs in the health sector.

Challenges that make it hard to adopt e-health

With regards the challenges that make it hard for university of Botswana students to adopt e-health, section 4.2.2.4 showed that little or lack of knowledge about e-health received the highest percentage of 63%. This essentially means that more students at the University of Botswana had little or lack knowledge about e-health. However less than 50% of the students showed that some other challenges do not make it hard for them to adopt e-health. Although that is the case, government not supporting the implementation of e-health initiatives, limited internet access and security issues related to the use of e-health initiatives were among the top 4 challenges as indicated by the students. The security issues related to e-health challenge as stated by students in the University of Botswana confirm Meingast, *et al.* (2006) argument that the internet and wireless transmission of information pose a danger of security.

Demographics and conceptual framework constructs

With regards the discussion findings in section 4.3.1.2 in this research, on age, the findings mean that the age of university of Botswana students has no relationship with the way they are optimistic, their discomfort and the way they perceive the usefulness of e-health technology. However, the age of the students has a weak positive relationship with their innovativeness, insecurities, ease of use and adoption towards the e-health technology.

The findings further reveal that in this study, there is no relationship between the university of Botswana students' level of study with any of the constructs in the conceptual framework.

From these discussions above, the main objective "*to investigate readiness factors that affect adoption of e-health by higher education institution students*" is answered by the discussion above. A conceptual framework for e-health was developed and validated by testing of the hypotheses. Only a few of the hypotheses were accepted as influencing the readiness and adoption of e-health in this study. This is also shown in sections 5.3.1, 5.3.2 and 5.3.3. Furthermore, knowledge on e-health was identified as a factor that affects e-health adoption at the University of Botswana although most students said they had regular access to the internet. Moreover, awareness is also a factor that may influence the e-health readiness and adoption of higher education institution students because many students at the University of Botswana were not aware of most e-health initiatives. Additionally, students find most e-health initiatives beneficial hence this may influence their readiness to adopt e-health. However, with regards

the benefits of e-health, in terms of how e-health reduce costs in the entire healthcare sector, students should also be shown and explained this benefit such that their chances of adopting e-health is increased. With regards the challenges in adopting e-health, little or lack of knowledge about e-health, limited internet access and security issues related to the use of e-health initiatives are amongst some of the notable challenges that should be addressed so that students can adopt e-health. With regards demographics and constructs relationships, the age of the students has a weak positive relationship with their innovativeness, insecurities, ease of use and adoption towards the e-health technology.

5.4 CONTRIBUTION TO THE BODY OF KNOWLEDGE

The focus of this study was to investigate the e-health readiness of higher education institution students. In the body of information systems, the results obtained from this study could be used as a point of reference by other researchers as limited research has been done on the e-health readiness of end users of healthcare services. The conceptual framework (technology readiness and acceptance model for e-health) developed and validated could be extended or reused by other researchers to aid in the development of other frameworks that tests the readiness of e-health technology. However, practically, governments, private sector hospitals and other decision-making bodies may use the results of this study to understand the factors that influence the e-health readiness of higher education institution students as the end users of healthcare services. This will also help in making strategic plans and decisions.

5.5 LIMITATIONS OF THE STUDY

There are some limitations that must be acknowledged in this study. First the study was conducted using a survey questionnaire administered the University of Botswana students using convenience sampling. Therefore, generalizations may not be made to the entire student population in Botswana and the entire University of Botswana population. Additionally, more students who participated were between the ages of 17-21, meaning other age groups of students in higher levels of study were under-represented. The study was also carried out on a cross sectional (Ajisafe, 2012) basis due to limited availability of time, therefore this is a limitation on its own since respondents' behaviour was not observed over a period of time. Other forms of validity such as face validity, construct validity and criterion validity were not done in this study making hence they are a limitation to this study. This study also did not discuss the technical, infrastructural or managerial requirements for the effective implementation of an e-health programme.

5.6 RECOMMENDATIONS AND FUTURE WORK

In future, similar studies may use a combination of quantitative and qualitative methods to investigate the e-health readiness of higher education institution students. Other sampling techniques other than convenience sampling could be used in carrying a similar study. Other sets of respondents from other universities or institutions may also be investigated if they are ready to adopt e-health. Furthermore, other studies can discuss the technical, infrastructural or managerial requirements for the effective implementation of an e-health programme.

5.7 CONCLUSION

To enhance the understanding of the e-health readiness of higher education institution students, this study developed an integrated conceptual framework for e-health (technology readiness and acceptance model) which was tested by hypotheses. For this study, it is concluded that optimism, innovativeness, discomfort and insecurity influence e-health perceived ease of use. However, only optimism and discomfort influence e-health perceived usefulness whereas innovativeness and insecurity did not influence e-health perceived usefulness. Additionally, e-health perceived usefulness and e-health perceived ease of use have an influence on e-health adoption.

Demographics such as age and level of study together with supporting questions also gave some insights in this study. The age of students has a weak positive relationship with innovativeness, insecurity, e-health perceived ease of use and adoption of e-health technology. Students' awareness of e-health is also a factor that affects the e-health readiness and adoption of higher education institution students as most of them were not aware of the e-health initiatives. In terms of the benefits of e-health, fewer students agreed that e-health initiatives reduce costs in the entire healthcare, for patients and health service providers. Lastly, one notable challenge of adopting e-health was "little or lack of knowledge about e-health".

REFERENCES

- Abdullrahim, A. & De Coster, R., 2016. *A Framework of E-Health Systems Adoption and Telemedicine Readiness in Developing Countries*. International Conference on Information Society(i-Society).
- Adeloye, D., Adigun, T., Misra, S. & Omoregbe, N., 2017. Assessing the Coverage of E-Health Services in Sub-Saharan Africa. *Methods of Information in Medicine*, 56(03), pp. 189-199.
- Agu, T. N., 2016. The adaptation of Bring Your Own Device as a Green Information Technology Practice at the North-West University. Mafikeng: North-West University.
- Ajiboye, J. O. & Tella, A., 2007. University undergraduate Students' Seeking Behaviour: Implications For Quality In Higher Education In Africa. *The Turkish Online Journal of Educational Technology*, 6(1), pp. 40-52.
- Ami-Narh, J. T. & Williams, P. A. H., 2012. A revised UTAUT model to investigate E-health acceptance of health professionals in Africa. *Journal of Emerging Trends in Computing and Information Sciences*, 3(10), pp. 1383-1391.
- Babbie, E., 2014. *The basics of social research*. 6th ed. Belmont, Calif: Wadsworth: Cengage Learning.
- Bantom, S. A., 2016. Accessibility to patients' own health information: A case in rural Eastern Cape, South Africa. Cape Town: Cape Peninsula University of Technology.
- Basgoze, P., 2015. Integration of Technology Readiness (TR) into the Technology Acceptance Model (TAM) For M-Shopping. *International Journal of Scientific Research and Innovative Technology*, 2(3), pp. 26-35.
- Ben-Assuli, O., 2015. Electronic health records, adoption, quality of care, legal and privacy issues and their implementation in emergency departments. *Health Policy*, Volume 119, p. 287–297.
- Bessadok, A. & Abdulsalam, A., 2016. Mining Student's Belief Based on E-learning System Readiness. *International Journal of Education and Information Technologies*, Volume 10, pp. 6-13.
- Bhattacharjee, A., 2012. *Social Science Research: Principles, Methods, and Practices*. 2nd ed. Tampa: Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

- Bracken, S., 2010. Discussing the Importance of Ontology and Epistemology Awareness in Practitioner Research. *Worcester Journal of learning and teaching*, Issue 4.
- Burrell, G. & Morgan, G., 1979. *Sociological Paradigms and Organisational Analysis: Elementd of the Sociology of Corporate life*. 1st ed. Heinemann Educational Books.
- Bwalya, K. J., 2017. Next Wave of Tele-Medicine: Virtual Presence of Medical Personnel. In: K. H. Moahi, K. J. Bwalya & P. M. I. Sebina, eds. *Health Information Systems and the Advancement of Medical Practice in Developing Countries*. Hershey: IGI Global, pp. 168-180.
- Chang, A.-M. & Kannan, P. K., 2006. *Employee Technology Readiness and Adoption of Wireless Technology and Services*. s.l., 39th Hawaii International Conference on System Sciences.
- Chattopadhyay, S., Li, J., Land, L. & Ray, P., 2008. *A Framework for Assessing ICT Preparedness for e-Health Implementations*. s.l., 10th IEEE International Conference on e-Health Networking, Applications and Service (HEALTHCOM 2008).
- Coleman, A., Herselman, M. . E. & Potass, D., 2012. *E-Health Readiness Assessment for E-Health Framework for Africa: A Case Study of Hospitals in South Africa*. Malaga, Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, pp. 162-169.
- Creswell, J. W., 2014. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4th ed. Carlifornia: SAGE.
- Davis, F. D., 1989. Perceived Usefulness, Perceived Ease Of Use, and User Acceptance Of Information Technology. *MIS Quartely*, 13(3), pp. 319-339.
- De Rosis, S. & Barsanti, S., 2016. Patient satisfaction, e-health and the evolution of the patient-general practitioner relationship: Evidence from Italian survey. *Health Policy*, 120(11), pp. 1279-1292.
- Diagnostics, 2017. iBreast Exam. *Botswana's Premier Health Journal*, Issue 16, pp. 1-15.
- Dintoe, S. S., 2017. Technology Adoption at the University of Botswana. *The Morning Watch: Educational and Social Analysis*, 44(1-2).
- Ditsa, G., 2009. IS User Behaviour Testing Using Triandis' Theoretical Framework: An Explanatory Research Design. *International Journal of Global Business*, 2(2), pp. 30-40.

Esen, M. & Erdogmus, N., 2014. The Effects Of Technology Readiness On Technology Acceptance In E-HRM: Mediating Role Of Perceived Usefulness. *Bilgi Ekonomisi ve Yönetimi Dergisi*, 9(1).

Faber, S., van Geenhuizen, M. & de Reuver, M., 2017. eHealth adoption factors in medical hospitals: A focus on the Netherlands. *International Journal of Medical Informatics*, Volume 100, pp. 77-89.

Fiaidhi, J. & Mohammed, S., 2018. Digital Health in the Era of Extreme Automation. *IT Professional*, 20(3), pp. 90-95.

Ghazvini, A. & Shukur, Z., 2013. *Security Challenges and Success Factors of Electronic Healthcare System*. s.l., The 4th International Conference on Electrical Engineering and Informatics (ICEEI 2013).

Government of Botswana, Ministry of Health, 2010. *Integrated health service plan: A strategy for changing the health sector for a healthy Botswana 2010-2020*, Gaborone: Government of Botswana, Ministry of Health.

Government of Botswana, 2004. *Maitlamo: Botswana's National ICT Policy*, Gaborone: Government of Botswana.

Gray, D. E., 2013. *Doing Research in the Real World*. 3rd ed. London: Sage Publications.

Hayrinen, K., Saranto, K. & Nykanen, P., 2008. Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International journal of medical informatics*, Volume 77, p. 291–304.

Healy, J., 2008. *Implementing e-Health in Developing Countries Guidance and Principles*, Geneva: International Telecommunication Union (ITU).

Heart, T., Ben-Assuli, O. & Shabtai, I., 2017. A review of PHR, EMR and EHR integration: A more personalized healthcare and public health policy. *Health Policy and Technology*, Volume 6, p. 20–25.

Heart, T. & Kalderon, E., 2013. Older adults: Are they ready to adopt health-related ICT?. *International Journal of Medical Informatics*, Volume 82, p. e209–e231.

Hellberg, S. & Johansson, P., 2017. eHealth strategies and platforms – The issue of health equity in Sweden. *Health Policy and Technology*, Volume 6, pp. 26-32.

Herselman, M. et al., 2016. *A Digital Health Innovation Ecosystem for South Africa*. In IST-Africa Week Conference, 2016 (pp. 1-11), IEEE.

Hoque, R. M., Bao, Y. & Sorwar, G., 2016. Investigating factors influencing the adoption of e-Health in developing countries: A patient's perspective. *Informatics for Health and Social Care*, pp. 1-17.

Johnson, B. & Christensen, L., 2008. *Educational research: Quantitative, qualitative, and mixed approaches*. s.l.:SAGE.

Kampmeijer, R. et al., 2016. The use of e-health and m-health tools in health promotion and primary prevention among older adults: A systematic literature review. *BMC Health Services Research*, 16(290), pp. 467-479.

Kgasi, M. R., 2014. Assessment of e-health readiness in rural South Africa. Pretoria: Tshwane University Of Technology.

Kgasi, M. R. & Kalema, B. M., 2014. Assessment E-health Readiness for Rural South African Areas. *Journal of Industrial and Intelligent Information* , 2(2), pp. 131-135.

Khatun, F. et al., 2016. Community readiness for adopting in rural Bangladesh: A qualitative exploration. *International Journal of Medical Informatics*, Volume 93, p. 49–56.

Khatun, F. et al., 2015. Determinants of readiness to adopt mHealth in a rural community of Bangladesh. *International Journal of Medical Informatics*, Volume 84, p. 847–856.

Khothari, C., 2005. *Research Methodology Methods and Techniques*. India: New Age Publications.

Kiberu, V. M., 2016. *E-Health Readiness Assessment in Uganda: Integration of Telemedicine services into Public Healthcare System*. s.l., IEEE Computer Society.

Kuo, K. M., Liu, C. F. & Ma, C. C., 2013. An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *Medical Informatics and Decision Making*, 13(1), p. 88.

Leedy, P. D. & Ormrod, J. E., 2010. *Practical Research: Planning and Design*. 9th ed. Boston: Pearson Education International.

Lee, J. et al., 2005. *The Adoption Gap: Health Information Technology In Small Physician Practices*. s.l., The People toPeople Health Foundation.

- Lekopanye, C. M. & Mogwe, A., 2014. Information Communication Technology Adoption in Higher Education Sector of Botswana: A Case of Botho University. *International Journal of Advanced Computer Science and Applications*, 5(8), pp. 145-148.
- Li, J., Ray, P., Seale, H. & MacIntyre, R., 2012. *An E-Health Readiness Framework For Public Health Services-Pandemic Perspective*. s.l., In System Science (HICSS), 2012 45th Hawaii International Conference, IEEE, pp. 2800-2809.
- Lin, C., Shih, H. & Sher, P. J., 2007. Integrating Technology Readiness into Technology Acceptance: The TRAM Model. *Psychology & Marketing*, 24(7), p. 641–657.
- Lin, C., Shih, H., Sher, P. J. & Wang, Y., 2005. *Consumer Adoption of e-Service: Integrating Technology Readiness with the Technology Acceptance Model*. s.l., In Technology management: A unifying discipline for melting the boundaries (pp. 483-488). IEEE..
- Lin, H.-H. & Luarn, P., 2005. Toward an understanding of the behavioural intention to use mobile banking. *Computers in Human Behavior*, Volume 21, p. 873–891.
- Lin, J. S. C. & Chang, H. C., 2011. The role of technology readiness in self-service technology acceptance. *Managing Service Quality: An International Journal*, 21(4), pp. 424-444.
- Madanian, S., 2016. *The Use of E-Health Technology in Healthcare Environment: The Role of RFID Technology*. Isfahan, 10th International on e-commerce with focus on e-Tourism.
- Malasanos, T. & Ramnitz, M. S., 2013. Diabetes Clinic at a Distance: Telemedicine Bridges the Gap. *Diabetes Spectrum*, 26(4), pp. 226-231.
- Matusitz, J. & Breen, G.-M., 2007. E-Health: A New Kind of Telemedicine. *Social Work in Public Health*, 23(1), pp. 95-113.
- MEASURE Evaluation, 2018. *MEASURE Evaluation Organisation*. [Online] Available at: <https://www.measureevaluation.org/his-strengthening-resource-center/country-profiles/botswana> [Accessed 22 05 2018].
- Meingast, M., Roosta, T. & Sastry, S., 2006. *Security and Privacy Issues with Health Care Information Technology*. s.l., In Engineering in Medicine and Biology Society, 2006. EMBS'06. 28th Annual International Conference of the IEEE (pp. 5453-5458). IEEE..

Minichiello, V. et al., 2013. E-health: potential benefits and challenges in providing and accessing sexual health services. *BMC Public Health*, 13(1), p. 790.

Ministry Of Health, Government Of Botswana, 2010. *Integrated Health Service Plan: A Strategy for Changing the Health Sector For Healthy Botswana 2010-2020*, Gaborone: Ministry Of Health, Government Of Botswana.

Ministry of Health, Government of Botswana, 2010. *Intergrated Health Service Plan: A Strategy for Changing the Health Sector For Healthy Botswana 2010-2020*, Gaborone: Government of Botswana.

Moahi, K. H. & Bwalya, K. J., 2017. Knowledge Sharing for Healthcare and Medicine in Developing Countries: Opportunities, Issues, and Experiences. In: K. H. Moahi, K. J. Bwalya & P. M. I. Sebina, eds. *Health Information Systems and the Advancement of Medical Practice in Developing Countries*. Hershey: IGI Global, pp. 60-77.

Mugo, D. M. & Nzuki, D., 2014. Determinants of Electronic Health in Developing Countries. *International Journal of Arts and Commerce*, 3(3), pp. 49-60.

Ndlovu, K., Mauco, K. L. & Littman-Quinn, R., 2017. Telemedicine in Low Resource Settings: A Case for Botswana. In: K. H. Moahi, K. J. Bwalya & P. M. I. Sebina, eds. *Health Information Systems and the Advancement of Medical Practice in Developing Countries*. Hershey: IGI Global, pp. 129-148.

Nguyen, L., Bellucci, E. & Nguyen, L. T., 2014. Electronic health records implementation: An evaluation of information system impact and contingency factors. *international journal of medical informatics*, Volume 83, p. 779–796.

Nkwe, N., 2011. State of Information Technology Auditing in Botswana. *Asian Journal of Finance & Accounting*, 3(1), pp. 125-137.

Nkwe, N., 2012. E-Government: Challenges and Opportunities in Botswana. *International Journal of Humanities and Social Science*, 2(17), pp. 39-48.

Ntseme, O. J., Nametsagang, A. & Chukwuere, J. E., 2016. Risks and Benefits From Using Mobile Banking In An Emerging Country. *Risk Governance & Control: Financial Markets & Institutions*, 6(4), pp. 355-364.

O’Gorman, K. & MacIntosh, R., 2015. *Research Methods for Business & Management : A guide to writing your dissertation*. 2nd ed. Oxford: Goodfellow Publishers.

O’Leary , R., 2010. Guerrilla Employees: Should Managers Nurture, Tolerate, or Terminate Them?. *Public Administration Review*, 70(1), pp. 8-19.

Oates, B. J., 2006. *Researching Information Systems and Computing*. 1st ed. London: SAGE Publications.

Ojo, S. O. et al., 2007. *Formal Model for e-Healthcare Readiness Assessment in Developing Country Context*. Dubai, 4th International Conference in Innovations in Information Technology, 2007. IIT '07.IEEE.

Parasuraman, A., 2000. Technology Readiness Index (TRI) : A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Service Research*, 2(4), pp. 307-320.

Parasuraman, A. & Colby, C. L., 2015. An Updated and Streamlined Technology Readiness Index: TRI 2.0. *Journal of Service Research*, 18(1), pp. 59-74.

Patnaik, S. & Patnaik, A. N., 2015. E-Health For All - Is India Ready?. *National Journal of Community Medicine*, 6(4), pp. 633-638.

Rahman, S. A., Taghizadeh, S. K., Ramayah, T. & Alam, M. M. D., 2017. Technology acceptance among micro-entrepreneurs in marginalized social strata: The case of social innovation in Bangladesh. *Technological Forecasting & Social Change*, Volume 118, p. 236–245.

Rezai-Rad, M., Vaezi, R. & Nattagh, F., 2012. E-Health Readiness Assessment Framework in Iran. *Iranian Journal Public Health*, 41(10), pp. 43-51.

Sabnis, S. & Charles, D., 2012. Opportunities and Challenges: Security in eHealth. *Bell Labs Technical Journal*, 17(3), p. 105–112.

Saleh, S., Khodor, R., Alameddine, M. & Baroud, M., 2016. Readiness of healthcare providers for eHealth: The case from primary healthcare centers in Lebanon. *BMC Health Services Research*, 16(644), pp. 1-11.

Sarantakos, S., 2012. *Social research*. 4th ed. London: Macmillan International Higher Education.

Saunders, M., Lewis, P. & Thornhill, A., 2009. *Research methods for business students*. 5th ed. Harlow: Pearson Education Limited.

- Saunders, M., Lewis, P. & Thornhill, A., 2016. *Research Methods For Business Students*. 7th ed. Harlow: Pearson.
- Scott, R. E. & Mars, M., 2015. Telehealth in the developing world: Current status and future prospects. *Smart Homecare Technology and TeleHealth*, Volume 3, pp. 25-37.
- Sebina, P. M. I. M. & Grand, B., 2017. Records Management and Open Data in Healthcare Provision in Africa: Reflections and Lessons for Botswana. In: K. H. Moahi, K. J. Bwalya & P. M. I. Sebina, eds. *Health Information Systems and the Advancement of Medical Practice in Developing Countries*. Hershey: IGI Global, pp. 1-13.
- Serakan, U. & Bougie, R., 2013. *Research Methods for Business: A Skill-Building Approach*. 6th ed. West Sussex: Wiley and sons.
- Silber, D., 2003. *The Case For EHealth*. s.l., European Institute of Public Administration.
- Sincero, S. M., 2012. *Surveys and Questionnaires-Guide*. s.l.:s.n.
- Singh, Y. K., 2006. *Fundamental Of Research Methodology And Statistics*. New-Delhi: New Age International.
- Son, M. & Han, K., 2011. Beyond the technology adoption: Technology readiness effects on post-adoption behavior. *Journal of Business Research*, Volume 64, p. 1178–1182.
- Statistics Botswana, 2017. *Botswana Household Access & Individual Use Of Information & Communication Technologies Report-2014*, Gaborone: Statistics Botswana.
- Teddle, C. & Yu, F., 2007. Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research*, 1(1), pp. 77-100.
- The Enterprice of Healthcare Magazine, 2010. *e-Health, The Enterprice Of HealthCare*. [Online]
Available at: <http://ehealth.eletsonline.com/2010/04/paperless-hospital-in-africa-offers-prototype-for-new-model-of-care/>
[Accessed 19 June 2017].
- Thomas, D. R. & Hodges, I. D., 2010. *Designing and managing your research project: Core skills for social and health research*. s.l.:Sage Publications.
- Tsikriktsis, N., 2004. A Technology Readiness-Based Taxonomy of Customers: A Replication and Extension. *Journal of Service Research*, 7(1), pp. 42-52.

Vaudenay, S., 2006. *A Classical Introduction to Cryptography: Applications for Communications Security*. s.l.:Springer.

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), pp. 425-478.

Wahyuni, D., 2012. The Research Design Maze: Understanding Paradigms, Cases, Methods and Methodologies. *Journal of Applied Management Accounting Research*, 10(1), pp. 69-80.

Weeks, R., 2012. *University Of Pretoria*. [Online] Available at: <http://www.up.ac.za/media/shared/Legacy/sitefiles/file/44/1026/2163/8121/innovate7/healthcaremanagementanehealthperspective.pdf> [Accessed 20 June 2017].

Wook, M., Yusof, Z. M. & Nazri, M. Z. A., 2017. Educational data mining acceptance among undergraduate students. *Education and Information Technologies*, 22(3), pp. 1195-1216.

World Health Organization Regional Office for Africa, 2014. *World Health Organization Regional Office for Africa*. [Online] Available at: http://www.aho.afro.who.int/profiles_information/index.php/Botswana:Health_information_research_evidence_and_knowledge [Accessed 16 June 2017].

Xiang, J. & Stanley, S. J., 2017. From online to offline: Exploring the role of e-health consumption, patient involvement, and patient-centered communication on perceptions of health care quality. *Computers in Human Behavior*, Volume 70, pp. 446-452.

Yusif, S. & Soar, J., 2014. Preparedness for e-Health in developing countries: the case of Ghana. *Journal of Health Informatics in Developing Countries*, 8(2), pp. 18-37.

APPENDIX A

FOR OFFICE USE ONLY BY RESEARCHER: RESPONDENTS NO: _____

INFORMATION SHEET FOR

Investigating e-health readiness of higher education institution students

Researcher: Onneile Juliet Ntseme

Email: jntseme@yahoo.com

Cell: (+267) 71586856

Supervisor: Dr. J Chukwuere

Co-Supervisor: Prof. O Jokonya

Dear prospective participant,

I am a masters student in the department of Information systems at North-West University. As part of my degree I am required to carry a research study. My Study involves investigating e-health readiness of higher education institution students. Therefore, you are invited to participate in my study by completing a questionnaire.

According to Madanian (2016) **Electronic health (e-health)** includes a variety of technologies such as telemedicine, mobile health, big data, electronic health records (EHR) and auto identification. Moreover e-health goes more to offer health services by providing home online health information websites, home monitoring systems, automated online therapy, shared electronic records, interactive EHR, healthcare systems portals, tailored health education programs and advanced telehealth applications (Madianian, 2016).

Although we wish to get response from you, you may voluntarily choose not to take part in the survey by returning the blank questionnaire to the researcher. If you are willing to participate in this study, please indicate by signing for your consent. Your response to the questionnaire will be kept confidential. The survey will take approximately 10-15 minutes to complete.

Your response to the questionnaire is highly appreciated.

Your initials _____

Date _____

RESEARCH QUESTIONNAIRE

Section A

This section intends to identify the Demographic Information (DI) of the Students

Please tick (✓) the relevant box according to your choice:

Demographic details

Q1. Gender

a. Male [] b. Female []

Q2. Age

a. 17-21 [] b. 22-26 [] c. 27-31 [] d. At least 32 []

Q3. Faculty

a. Business [] b. Education [] c. Engineering and technology [] d. Health sciences []
e. Humanities [] f. Medicine [] g. Science [] h. Social Sciences []

Q4. Level of Study

a. 1st Year [] b. 2nd Year [] c. 3rd Year [] d. 4th Year [] e. Postgraduate []

Section B: Internet access, E-Health knowledge, benefits and challenges

Q5. Do you have *regular* access to the internet?

a. Strongly Disagree [] b. Disagree [] c. Undecided [] d. Agree [] e. Strongly Agree []

Q6. Do you know something about e-health?

a. Strongly Disagree [] b. Disagree [] c. Undecided [] d. Agree [] e. Strongly Agree []

Q7. Are you aware of the following E-Health Initiatives?

	Yes	No
a. Shared electronic health records		
b. Interactive electronic health records		
c. Telemedicine / Advanced telehealth applications		
d. Online support groups / Virtual communities		
e. Home online health information websites		
f. Home monitoring systems		
g. Automated online therapy		
h. Mobile health / m-health applications		
i. None of the above		

Q8. What are the benefits of adopting e-health initiatives?

	Yes	No
a. It allows the expansion of delivery of limited medical resources		
b. It enhances patients' health education		
c. It assists better decision making to health care providers by availing necessary information		
d. It allows easy sharing of valuable health information		
e. It allows patients to be actively involved in their own healthcare		
f. It reduces costs in the entire healthcare, on patients and health service providers		
g. Not applicable		

Q9. The following challenges make it hard for me to adopt e-health.

	Yes	No
a. No internet access		
b. Limited internet access		
c. Lack of smart devices such as a laptop/desktop, smartphone, tablet		
d. Government not supporting the implementation of e-health initiatives		
e. Little or lack of knowledge about e-health		
f. Religious, cultural or personal believes towards e-health		
g. Security issues related to the use of e-health initiatives		
h. Not applicable		

The following sections intend to identify your opinion regarding factors influencing e-health technology readiness, e-health perceived usefulness and e-health perceived ease of use.

For sections C-F indicate whether you Strongly Disagree, Disagree, are Undecided, Agree or Strongly Agree to the statements given below. **Please tick the relevant answer (✓)**

SECTION C: E-health Technology Readiness

C1. Optimism						
Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q10.	New technologies such as e-health contribute to a better quality of life					
Q11.	Technology such as e-health gives me more freedom of mobility					
Q12.	Technology such as e-health gives people more control over their daily lives especially health care life					
Q13.	E-health technology makes me more productive in my personal life especially in health-related issues					

Q14.	E-health technology is accessible at any time because it is not limited to regular business hours					
C2. Innovativeness						
Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q15.	Other people come to me for advice on new technologies that make use of the internet such as e-health					
Q16.	In general, I am among the first in my circle of friends to acquire new technology that affects the delivery of health care when it is released					
Q17.	I can usually figure out new high-tech products and services such as e-health technology initiatives without help from others					
Q18.	I keep up with the latest technological developments in my areas of interest on issues affecting health services delivery					
Q19.	I usually have fewer problems than others in making technology such as e-health work for me					
C3. Discomfort						
Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q20.	When I get technical support from a provider of a high-tech product or service, I never feel as if I am being taken advantage of by someone who knows more than I do					
Q21.	Technical support lines are helpful because they explain things in terms that I understand					
Q22.	I think that e-health technology systems are designed for use by ordinary people					
Q23.	There is always a manual which is written in an understandable language for high-tech products or services like e-health initiatives					
C4. Insecurity						
Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q24.	People are not too dependent on e-health technology initiatives to do health related things for them					
Q25.	Too much technology does not distract people to a point that is harmful					

Q26.	E-health technology initiatives does not lower the quality of relationships between patients and health service providers (i.e. does not reduce the levels of personal interaction)					
Q27.	I feel confident doing my health-related tasks with a place that can only be reached online					
Q28.	I do not worry that e-health information that I send over the Internet will be seen by other people					

Section D: E-Health Perceived Usefulness

Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q29.	I think that using e-health would enable me to accomplish my tasks more quickly					
Q30.	I think that using e-health would make it easier for me to carry out my health-related tasks, for example, communication with health care providers					
Q31.	Using e-health gives me more control over my health-related issues					
Q32.	E-health addresses my health-related needs					
Q33.	Using e-health reduces the time I spend at the medical center, clinic or hospital					
Q34.	Overall, I think that using e-health is advantageous over the traditional way of offering health services					

Section E: E-Health Perceived Ease of Use

Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q35.	I think that learning to use e-health would be easy					
Q36.	I think that it is easy to use e-health to accomplish my health tasks					
Q37.	I think that I will not get confused when I use e-health services					
Q38.	Interacting with e-health services will not be frustrating					
Q39.	I would often not need to consult someone when using e-health services					

Q40.	Interacting with e-health technology would not require a lot of my mental effort					
Q41.	I think using e-health will not be costly					

Section F: E-Health Adoption

Item	Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q42.	I will use e-health initiatives on a regular basis					
Q43.	I will strongly recommend others to use e-health initiatives					
Q44.	In overall, all things considered I am willing to adopt e-health					

THANK YOU FOR PARTICIPATING

APPENDIX B



Office: 0183892451

FACULTY OF EDUCATION

Cell: 0729116600

Date: 12th December, 2018

TO WHOM IT MAY CONCERN

CERTIFICATE OF EDITING

I, Muchativugwa Liberty Hove, confirm and certify that I have read and edited the entire dissertation **INVESTIGATING E-HEALTH READINESS OF HIGHER EDUCATION INSTITUTION STUDENTS** by Onneile Juliet Ntseme, [orcid.org 0000-0002-4472-1315](https://orcid.org/0000-0002-4472-1315), submitted in partial fulfillment of the requirements for the degree *Master of Commerce in Computer Science and Information Systems* at the North-West University.

Onneile Juliet Ntseme was supervised by Professor Osden Jokonya and Dr Joshua E Chukwuere of the North-West University.

I hold a PhD in English Language and Literature in English and am qualified to edit such a thesis for cohesion and coherence. The views expressed herein, however, remain those of the researcher/s.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Dr M.L. Hove'.

Dr M.L.Hove (PhD, MA, PGDE, PGCE, BA Honours – English)



APPENDIX C

Telephone : 3655400 / 3655483
Fax : 3914271
E-mail: botsamote@gov.bw



Block 6, Government Enclave, Headquarters
Private Bag 00517 Gaborone

MINISTRY OF TERTIARY EDUCATION, RESEARCH, SCIENCE AND TECHNOLOGY

REF: MOTE 1/18/6 V (31)

13th September 2018

Ms. Onneile Juliet Ntseme
P O Box 40082
Gaborone

Dear Madam,

RE: APPLICATION FOR RESEARCH PERMIT-
"INVESTIGATING E-HEALTH READINESS OF HIGHER EDUCATION
INSTITUTION STUDENTS"

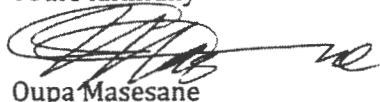
Reference is made to your application on the above captioned matter.

Your application for Research Permit for the proposed research titled **"INVESTIGATING E-HEALTH READINESS OF HIGHER EDUCATION INSTITUTION STUDENTS"**. The permit is valid for two (2) years. You are kindly advised to peruse section 4.4 to 5.0 of the 'Guidelines for Application for Research Permit' in Botswana.

Any changes in the proposed research should be communicated, without fail, to the Permanent Secretary, Ministry of Tertiary Education Research Science and Technology citing above reference.

By copy of this letter, the Director of Research Science and Technology is advised to take note of this development and ensure that deliverables to government are timely met.

Yours faithfully

A handwritten signature in black ink, appearing to read 'Oupa Masesane'.

Oupa Masesane
For/Permanent Secretary

cc: Director of Research Science and Technology



Achieving Prosperity for All

OUR VISION
"A Knowledge based Society Enabling Prosperity for all"
Collaboration Co- production Consuming
TOLL FREE: 0800-600-185



APPENDIX D



Office of the Deputy Vice Chancellor (Academic Affairs)

Office of Research and Development

Corner of Notwane
and Mubuto Road,
Gaborone, Botswana

Pvt Bag 00708
Gaborone, Botswana

Tel: [267] 355 2900
Fax: [267] 396 7573
E-mail: research@mopli.ub.bw

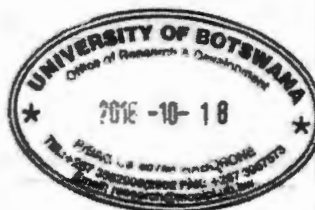
Ref: UBR/RES/IRB/SOC/GRAD/163

18th October 2018

To The Vice Chancellor, Academic affairs

Cc: The Vice Chancellor, Student affairs

University of Botswana



RE: PERMISSION TO CONDUCT RESEARCH IN THE UNIVERSITY OF BOTSWANA

Project Title: INVESTIGATING E-HEALTH READINESS OF HIGHER EDUCATION INSTITUTION STUDENTS

Researcher(s): Onaele Juliet Ntseme

Since it is a requirement that everyone undertaking research in Botswana should obtain a Research Permit from the relevant arm of Government, The Office of Research and Development at the University of Botswana (UB) has been tasked with the responsibility of overseeing research at UB including facilitating the issuance of Research permits for all UB Researchers inclusive of students and staff.

The Office of Research and Development reviewed and approved the above application for a study titled "Investigating E-Health Readiness of Higher Education Institution Students" on an expedited basis.

Therefore, approval has been granted for the above study to be conducted at the University of Botswana. Before proceeding with the study, the researcher is required to ensure the following:

- The study will only be conducted within the confines of UB following the approved proposal version.
- No investigations will be conducted outside UB as part of the study before permission is sought from UB authorities as necessary.
- **APPROVAL DATE** : 18th October, 2018
- **EXPIRATION DATE** : 19th October, 2019

www.ub.bw

After this date, this project may only continue upon renewal. For purposes of renewal, a progress report should be submitted to ORD one month before the expiration date.

- **MODIFICATIONS:** Prior approval is required before implementing any significant changes to the protocol.
- **TERMINATION OF STUDY:** On termination of this study, a report has to be submitted to ORD.

QUESTIONS: Please contact ORD Tel: (+267) 355 2911 or email on marv.kasule@mopipi.ub.bw contact information is also available at our website: www.ub.bw

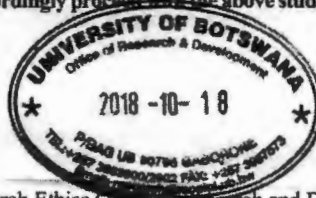
The researcher may accordingly proceed with the above study after fulfilling the above requirements.

Sincerely



Dr. M. Kasule

Assistant Director Research Ethics Office of Research and Development



APPENDIX E

Find from ORO if
this sheet should have
UB ethical clearance.

APPROVED

10/10/18

Permission given

19/10/18

Onneile Juliet Ntseme

P O Box 40082

Gaborone

jntseme@yahoo.com

+267 71 586 856

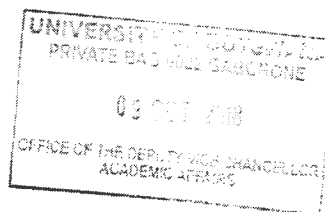
9th October 2018

Deputy Vice Chancellor Academic Affairs

University of Botswana

4775 Notwane Rd.

Gaborone, Botswana



Dear Sir/Madam

Re: Request for Permission to Administer A Survey Questionnaire After Lecture Hours

Reference is made to the above captioned matter.

My name is Onneile Juliet Ntseme, I am a registered master's student at North-West University (South Africa), in the department of information systems. As a requirement for my degree I am undertaking a research on "Investigating e-health readiness of higher education institution students". As part of my research I am supposed to administer a survey questionnaire to students registered at the University of Botswana at the end of a lecture. Therefore, I am requesting for permission to do so.

Attached is the research permit from the Ministry of Tertiary Education, Research, Science and Technology as well as a letter sent to Institutional research to request for data.

Yours faithfully


Onneile Juliet Ntseme

cc: Deputy Vice Chancellor Student Affairs

APPENDIX F

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.— N is population size. S is sample size.

APPENDIX G

Note: Still waiting for ethical clearance certificate (Ethical clearance number: NWU- 000535-18-S40 from Prof Babs.