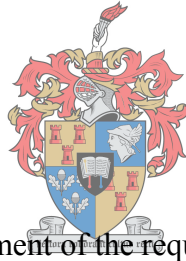# The use of ICT in the greater Gaborone area

by

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Thesis presented in fulfilment of the requirements for the degree of
Master of Philosophy (Information and Knowledge Management)
in the Faculty of Arts and Social Sciences
at Stellenbosch University

Supervisor: Prof J Kinghorn

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DECLARATION:

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Date: March 2018

OPSOMMING

Aandag aan die probleem van die 'digital divide' het verskuif van die eerste dimensie, naamlik ongelyke toegang tot Informasie en Kommunikasietegnologie (IKT), na die tweede dimensie, naamlik ongelyke vaardighede om IKT voordelig te kan gebruik. Hierdie tesis handel oor 'digital divide' in die groter Gaborone area, in besonder met betrekking tot die tweede dimensie. 'n Belangrike komponent van die studie behels 'n gevallestudie wat deur middel van 'n vraeboog uitgevoer is in Gaborone.

Hoofstuk 1 bespreek die navorsingsvraag en agtergrond

Hoofstuk 2 bied 'n uitgebreide literatuuroorsig oor die problematiek en relevant teoriee

Hoofstuk 3 sit die gevallestudie uiteen

Hoofstuk 4 bied die resultate van die gevallestudie

Hoofstuk 5 maak gevolgtrekkings en voorstelle op grond van die navorsing

SUMMARY

The focus on the digital divide has shifted from the first order focus on on the gap between those who have access to Information and Communication Technology (ICT) and those do not, to the second order question related to the skills to beneficially use ICT or not. This thesis concerns itself with the digital divide in the greater Gaborone area in Botswana, and pays particular attention to the second order question. An important component of the research is in the form of a case study which was done via survey in Gaborone.

Chapter 1 discusses the research question and background.

Chapter 2 offers an extensive literature review on digital divide and relevant theories.

Chapter 3 sets out the case study and methodology.

Chapter 4 presents the data and analysis of the survey.

Chapter 5 offers discussions and recommendations.

Acknowledgements

The single greatest cause of happiness is gratitude. Those who are truly grateful are deeply moved by the privilege of living.

I am grateful and forever humbled by her constant encouragement, her advice, for her faith, for continuously being my rock and always understanding

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I have literally taken her in her pram to review meetings and she has had endless nights with me in the study – she is the apple of my heart

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A big thank you to my editor, my statistical guide, my colleagues that I burnt the midnight lamp with.

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Abbreviations

ADSL	Asymmetric Digital Subscriber Line
BOFINET	Botswana Fibre Networks
BTV	Botswana Television
BURS	Botswana Unified Revenue Authority
CBD	Central Business District
DD	Digital Divide
DWMS	Document Management Workflow System
DIT	Diffusion of Innovation Theory
EASSy	Africa Sub-Marine Cable System
GDN	Government Data Network
GDP	Gross Domestic Product
GoB	Government of Botswana
ICT	Information and Communication Technologies
IS	Information Systems
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MDG	Millennium Development Goals
MSPs	Mobile Service Providers
OECD	Organisation for Economic Co-operation and Development
SME	Small to Medium Sized Enterprises
SATUM	Spatially Aware Technology Utilization Model
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour Model
TRA	Theory of Reasoned Action Model
UGT	Unified and Gratification Theory
UN	United Nations
UNESCA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTAUT	Unified Theory of Acceptance and Use of Technology Model
WACS	West African Cable Systems (WACS)
WAN	Wide Area Network
WSIS	World Society on Information Society
WWW	World Wide Web

Chapter 1

The Research Question

1.0 Introduction

Technological advancements and the rapid growth of the internet have revolutionised the world. Despite the advent of new technology, accessibility and availability of Information and Communication Technologies (ICT) vary across nations[1]. Underdeveloped, developed, and developing nations differ in their access to and the use of ICTs and the internet. However, all nations are focusing on establishing and developing information societies and yet are faced with another growing phenomenon – 'the digital divide'. This phenomenon is characterized as "the gap between individuals, house-holds, businesses and geographic areas at different socio-economic levels with regards to both their opportunities to access ICT and to their use of the Internet for a wide variety of activities"[2]. According to Korrup and Szydlik, digital divide indicates a social division between individuals and households from varying socioeconomic levels[3]. This social inequality has a direct impact on access and use of ICT and the internet.

Digital Divide also threatens the globalisation of ICT. This threat is particularly clear between the underdeveloped, developing and developed nations[4]. This threat has also ignited a serious debate among public policymakers. Many policymakers favour an effective approach to bridge the digital divide[5]. Governments have begun to move towards information societies in order to

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[1] Dewan S, Riggins J F. 2005. The Digital Divide: Current and Future Research Directions,1-54.

[2] OECD. 2001.*Annual Report 2002*, 8 – 17.

[3] Korupp E S, Szydlik M. 2005. Causes and Trends of the Digital Divide, 9-42.

[4] Dewan S, Riggins J F. 2005. The Digital Divide: Current and Future Research Directions,1 -54.

[5] Dewan S, Riggins J F. 2005. The Digital Divide: Current and Future Research Directions, 1 -54.

enhance the provision of services to their citizenry. The delivery of effective and efficient service has improved the overall performance of many economies. In Botswana, an assessment of the efforts and initiatives revealed that the development of an information society also exists. The Government of Botswana (GoB) has undertaken key initiatives and interventions focused on providing and enhancing the integration of technology. Botswana has placed emphasis on e-passports, tax returns, and vehicle renewals. However, more has to be done to ensure Batswana (Citizens of Botswana) and people living in Gaborone are committed to such changes. Schools have also developed curricula that emphasises the importance of ICT. Further efforts include the establishment of the Kitsong Information Centres[6]. These are one-stop service centres that provide internet, printing, photocopying, typing and faxing services in rural areas around Botswana. The GoB has also invested in underground internet cables to increase *Batswana*'s commitment to creating an information society. Further to this, they have embarked on projects to lay fibre connections to all major areas (Maun, Francistown, Ghanzi, Kasane and Palapye) in Botswana. The National Development Plans (NDP) and annual government budget have continually shown an upward increase in ICT related expenditure.

1.1 Research Problem Statement

Few studies have been conducted on the use of ICT in Botswana. Most of the research findings posit that the use of ICT in Botswana is at an early stage of diffusion. The available literature is more on the international and regional context and less about Botswana. The most current literature about Botswana is a decade old. However, the extent to which ICT is accessible and available in Botswana in general has not been exhaustively researched. One contributing factor to this could be the general assumption that sub-Saharan Africa, including Botswana, is lagging behind developed nations in terms of technological advancements. Affordability and availability of digital technologies, quality of networks, and universal access have also caused development gaps, and this has resulted in the widening of the digital divide[7]. For instance, in the urban area of Gaborone (Botswana's capital city), *Batswana*'s access to and use of ICT and the internet is reportedly significantly low[8]. The gap in the literature alluded to the above, has

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[6] Botswana Post in collaboration with the Ministry of Transport and Communications and in alignment with the National Maitlamo ICT Policy introduced Information Communication Technology processing service as part of postal integration, building relevance and business competitiveness. Some of the services provided include; typing and printing, internet browsing, photocopying and faxing.

[7] Mutula M S. 2008. Digital divide and economic development: case study of sub-Saharan Africa, 468-489

[8] Dewan S, Riggins J F .2005. The Digital Divide: Current and Future Research Directions, 1 -54

provided an opportunity for more studies that focus on Botswana and the extent of their use and access to ICT and the internet. Such studies would help to determine the extent to which digital divide exists in Gaborone, and, by extension, Botswana as a whole. This study provides an outline of the characteristics of an Information Society and how further explain the concepts of adoption and diffusion of Information Technology. Due to the lack of studies on Botswana, the researcher has relied on old information to undertake this research.

Based on the foregoing, this study specifically seeks to determine: T*he existence and impact of technology and internet use patterns on people living in Gaborone.* The following research questions are explored:

1. What are the most common forms of technology (devices) used to access internet resources by people living in Gaborone and the surrounding areas?
2. Where do *Batswana* access and use ICTs (libraries, personal phone, home, etc.)?
3. Does access to technology affect the rate or frequency at which ICTs are used by *Batswana*?
4. How often do people living in Gaborone and surrounding areas utilise the internet as a resource for information?

1.2 Objectives of the Research

The following specific objectives were formulated to address the aim of the research study:

a. To assess the nature and scope of how Batswana living in Gaborone access and use ICT and the internet based on results from a closed ended survey questionnaire**.**
b. To identify the most common forms of ICTs used by Batswana living in Gaborone.
c. To assess how the knowledge and skill levels of people in Gaborone influence the adoption and use of ICT.
d. To determine the factors that contribute to mass adoption and utilization of information technology by the residents of Gaborone in Botswana

1.3 Research Methodology

An extensive literature review was undertaken on digital divide, technology diffusion, acceptance and the usage of technology by users. The main purpose of the literature review was to identify previous studies related to the use of ICT in Botswana and explore issues such as the digital divide, diffusion of technology and the technology acceptance model. Following

a number of factors; available literature, time for completing the study and the study area, a quantitative research design was considered as suitable for this study. The target population was in different areas around the greater Gaborone.

Moreover, the perceptions of users on the use of internet and the computer were captured in a form of numerical data and various scales were used for statistical analysis. A self-administered questionnaire comprising of close-ended questions was developed and administered to the government employees, general public (customers in the internet cafes) and students. The questionnaire was made available electronically via Google docs and a physical copy was also distributed in internet cafes, schools and the relevant government offices. Only students that took computer classes as part of their curriculum responded to the questionnaire. A case study was designed in order to update as far as possible the current landscape on the use of ICTs in at least the Greater Gaborone area. This is discussed in detail in chapter 3 of this study.

1.4 Significance of the Study

The policy position adopted by the Government of Botswana (GoB) through the Maitlamo Policy (a policy document for development of ICT in Botswana) to create an information society was considered throughout this study. The findings of this study would provide useful information to GoB policymakers and managers of public ICT facilities / services in the country. This study also provides a general analysis of ICT and internet adoption, access, and utilization in Gaborone. This would assist other researchers who wish to know more on digital divide in Gaborone and subsequently to Botswana in general. The research also offers some alternative strategies and possible initiatives to help improve the utilisation of computers and internet in Gaborone and with a possibility of extending the lessons learnt to other areas in Botswana.

1.5 Assumptions and limitations of the study

The scope and parameters of this study were mainly focused on Greater Gaborone and the places around, as the capital city of Botswana. Gaborone is considered to be the most urban area in the country. The research further covered peri-urban centres such as Mochudi, Ramotswa, and Tlokweng. It further covered rural areas that are in the proximity of Gaborone such as Otse and Ranaka. All these areas are considered part of greater Gaborone. Urban, peri-urban and rural locations around Gaborone constitute approximately 24% of the entire

population. They are in the radius of 50km from the city centre.

Despite the large sample size, the research respondents did not represent the entire population of greater Gaborone and this was a challenge. This limitation makes it difficult to generalise the generalizability of the study's research findings regarding patterns of ICT access and use of the internet in Botswana. This study of people living in Gaborone and its surrounding areas may provide a limited representation of the ICT diffusion in Botswana. Another key limitation of the study is the survey's failure to account for all the factors that influence the use of ICT in Gaborone and the surrounding areas. The level of infrastructure development in the Greater Gaborone is not sophisticated. Furthermore, the literacy rate of people in peri urban and rural areas does not compare to the one Gaborone.

Lastly, the language used to collect and analyse data from the respondents was a limitation. The English language was used although a total of 29 languages are indigenous to Botswana. Many people living in Gaborone use either Setswana or English as their language of communication. The questionnaire was developed in English, and since the researcher is a Motswana, the survey questionnaire was converted from English to Setswana to ensure understanding and wide participation in the research all those. However, this limitation is more relevant and pronounced in the rural areas of Gaborone. The use of Setswana is more prevalent in areas (peri-urban and rural) that I had targeted for my research.

1.6 Delimitation and Limitations

The preliminary reason for undertaking this research was to provide an indication of the digital divide in Botswana. Due to a number of constraints (time, human resources and financial) it was not feasible to undertake the study of this magnitude. The study was thus, limited to a smaller geographic location being Gaborone and its environment. The ideal situation is to undertake the research on all the users in Gaborone and the surrounding areas. This was not possible due to limited time. Due to financial and time constraints, the study could cover all the users in Gaborone.

- The data collected was done in a limited period of time. It would have been ideal to cross check the same data after sometime with the possibility of using the same participants.
- It would have been ideal to make comparison between the schools, government departments and Internet cafes.

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- It would have been ideal to undertake a comparative analysis of the different districts in Botswana bearing in mind the population distribution and infrastructure development.

1.7 Outline of the Thesis

Chapter One: Introduction

This chapter gives a brief introduction of the study, with background notes and the problem statement. It also provides the brief aims or purpose of the study, research objectives, and research questions, as well as the significance of the study.

Chapter Two: Literature Review

It reviews the relevant literature. The concept of Information society will also be explored as a building block of the chapter. The concept of information society is also explored as the backbone of the chapter. It further examines the concept of digital divide and its relationship to the information society. The chapter further reviews the extent and development of digital divide in respect to Botswana.

Chapter three: Theories of Research

Chapter 3 deals with the research methodology, design and data collection methods. The tools of the research shall be identified and described. The research approach is described, so are data sources. The chapter also explains sampling approaches and deals with validity and reliability issues. Procedures and ethical considerations are clarified too.

Chapter four: Data Presentation

This chapter presents the study 's finding through the use of tables, graphs and figures. It highlights the variables used in the analysis and where applicable, the rationale for them.

Chapter five: Conclusion and Recommendations

This chapter provides the conclusions and recommendations. The conclusion is based on the discussions done in chapters 3 and 4.

Chapter 2
Literature Review

2.0 Introduction

On the surface, it seems that digital divide (DD) and the utilisation of internet and computers is based on unequal access to the internet infrastructure among the varying populations in different parts of Botswana. However, upon closer analysis, it shows that there exists a sharp dimension to the divide than merely a dichotomy of the 'have' and the 'have nots'. This chapter begins with a literature analysis to profile the less obvious dimensions of the divide. An overview of the emergence of the information society from the 1970s through the 2000s is also provided. The chapter also discusses technology adoption in relation to an information society. Finally, a framework used to further evaluate the use of internet and computers in Gaborone, Botswana is discussed.

2.1 Background of an Information Society

The origin and conception of the information society can be traced back as early as the second World War. Norbert Weiner, a mathematician, demonstrated interest in understanding the role of information and information processing in a society[9]. Weiner's philosophical understanding of an information society is premised on the argument that "society can only be understood through a study of the messages and communication facilities that belong to it"[10]. Information abound within the community and is generated through various activities and communication. Through communication, people within a given society use the information available to enhance social and business values, which is beneficial to the community at large.

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[9] Weiner N. 1956. The Human Use of Human Beings: Cybernetics and Society, 1 – 15

[10] Weiner N. 1956. The Human Use of Human Beings: Cybernetics and Society, 1 – 15.

In 1970, Japanese proponent of social ICT use, Yoneji Masuda's advisory work with the Japanese government characterised the role and importance of an information society as "... the realization of a society that brings about general flourishing state of human intellectual creativity, instead of affluent material consumption"[11]. Masuda's philosophical conception of an information society denotes that information is a very critical resource that could support and boost socio-economic activities in a society. This conception is supported by Deloitte's LLP report on "Value of Connectivity Economic and Social Benefits of Expanding Internet Access"[12]. The report claims that the provision of information through the internet connects people to business everywhere and opens up markets, all of which are capable of transforming the nature of an economy, while supporting economic development. Furthermore, the report also mentions that internet connectivity offers educational resources and accelerates knowledge sharing, which is useful for digital inclusion and the provision of public services. Deloitte further projects that "global connectivity will help lift millions out of poverty and drive important positive social and economic change[13].

Information has become an important resource for today's "modern" society as it shapes and determines human productivity and social capability. Webster identifies behaviour associated with the prioritisation of information as a distinguishing feature inherent within an information society[14]. He further claims that the development of computer networks, mobile networks and other advanced telecommunication devices and systems gave rise to a rapid and instant transmission, processing, and storage of information. Such developments include Wi-Fi, WiMAX, mobile smartphones, 3G and 4G mobile networks, and laptops, amongst many other technologies. One vivid demonstration of information seeking and usage is exemplified by the users who performed certain information behaviour "…*when a tsunami enveloped large parts of South East Asia on 26 December 2004, the phones went down, but e-mail and the Internet rapidly became the means to seek out lost ones…*"[15]. Another tragic event that required the use of information usage occurred on the July 2005, when the London underground train system was attacked and bombed by terrorists. Shortly thereafter, the train radio system and telecommunications went down and the internet and mobiles soon served as sources of

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[11] Weiner N. 1956. The Human Use of Human Beings, 1 – 15

[12] Delloite. 2014. Value of connectivity Economic and social benefits of expanding internet access 1-5

[13] Delloite. 2014. Value of connectivity Economic and social benefits of expanding internet access 1-5

[14] Webster F. 2014. Theories of the Information Society, 16 - 19.

[15] Webster F. 2014. Theories of the Information Society, 16 - 19.

information. These dire situations demonstrate how information has become an indispensable resource to humankind for survival and production purposes. The need for such information has led to technological advancements that enhance its transmission, storage, and processing.

Daniel Bell presents another perspective on the value of information that varies from Webster's. It describes its role and relevance to users. According to Bell, information is a very valuable resource for the production and personal decision making intentions. Without the power attributed to information, bad decisions are inevitable and can potentially result in losses for businesses or social engagement. Bell's stance on information and economic productive capacities of humankind is perceived as 'game between persons' where information is a basic yet critical resource in the entire process. During the industrialisation era, humankind used machine production, where technicalisation and mechanisation served as the key drivers of economic productivity. Over the course of time, and transitioning into the post-industrial era, the material of work has largely become information-based[16]. Building on Bell's conception of the post-industrial society, this research notes that concepts of post-industrialism are strongly related to those of an information society. The same rationality of information, the main fabric of the post-industrial and information society, are fundamental to both eras. Within the context of an information society, Bell argues that the collective technological and economic growth of a country is not only directly associated with the expansion of an individuals' access to information and knowledge, but is also influenced by other factors such as social change[17].

Webster[18] expands on Bell's reference to the role of information within technological and economic growth by identifying five key facets of an information society; inclusive of cultural, economic, occupational, spatial, and technological factors. According to Webster, information's technological facet outlines the development of information media like cables, hubs, routers, satellites, and switches, all of which are responsible for the rapid transmission of information. Information processing units include computers, digital televisions, mobile devices, and servers connected to an information transmission medium. Such developments have created super dynamic information sharing platforms like the internet which hosts the World Wide Web (WWW), a composite of information in different formats and categories. Since this information is easily accessible and sharable, Webster remarks that "…volume of

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[16] Bell D. 1976. The Coming of Post-industrial Society, 1 - 25

[17] Bell D. 1976. The Coming of Post-industrial Society, 1 - 25

[18] Webster F. 1995. Theories of the Information Society, 18-27.

technological innovations … leads to a reconstitution of the social world …" because there is massive sharing and distribution of information the world over[19].

Webster asserts that a technologically enabled information sharing environment facilitates informed economic decision making. A prominent theorist of the information economy, Marc Porat, distinguished between the two key information sectors, i.e. the informational and non-informational, then separating "non-informational elements of the economy and re-aggregating national economic statistics, conclude that, with almost half the United States Gross National Products (GNP) accounted for by…informational sectors, 'the United States is now an information-based economy'"[20]. Port supported Porat's beliefs and stated that the most significant areas of economic activity and development within an information society include information, the producers of goods and services as well as private and public bureaucracies"[21]. Typical economic information about an information society includes research and the underlying design of information for an organisation. The information is shared over different geographical organisations regarding data related to disaster affecting production or pricing of goods[22].

The economic school of thought links the contribution of ICT to the Gross Domestic Product (GDP) of a country and when possible, assesses the contributions made by the information economy[23]. As more jobs in society are skewed towards information activity rather than industrial and agricultural, this demonstrates and is more aligned with the characteristics of an information society. As argued, "Once the greater part of economic activity is taken up by information activity rather than, say, subsistence agriculture or industrial manufacture, it follows that we may speak of an information society"[24].

The cultural definition of an information society outlines the number of information outlets and publication that are in circulation at a particular period in time. Modern society is more information laden than any of its predecessors. Webster further explains the concept of occupational dimension in the creation of an information society and the existence of new

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[19] Webster F. 1995. Theories of the Information Society, 11 - 12.

[20] Webster F. 1995. Theories of the Information Society, 14 - 15.

[21] Port M U. 1978. Communication Policy in an Information Society, 32 - 33.

[22] Webster F. 1995. Theories of the Information Society, 11 - 12.

[23] Webster F. 1995. Theories of the Information Society, 18-27

[24] Webster F. 1995. Theories of the Information Society, 11 - 12.

occupations. He argues that new occupations have emerged due to the existence of massive information which is easily accessible and utilised. Occupational areas like designers, deal-makers, image creators, musicians, biotechnologists, genetic engineers and many other niche-finders have risen from the prowess of accessing, manipulating and sharing of information instantly and quickly; hence the emergence of an industry called the service sector[25].

Spatial theme is oriented towards infrastructure that has been deployed to connect different geographical locations. Communication technologies such as satellites, fibre cables, online databases, mobile application, mobile devices, and internet have removed the barriers of distance and unavailability of information. These information resources and data networks have subsequently caused profound consequences on the timely availability of information regardless of geographical location. In response, human behaviour has radically shifted regarding how people interact socially, politically and economically. A good example of this development is demonstrated by applications like WhatsApp dominates the social, economic and political the world over by providing instantaneous communication which is less expensive and covers within and outside geographical boundaries of space. Such applications have demonstrated a remarkable value and importance in political turmoil, disaster afflicted areas and many other areas of human interaction.

The information society is characterised by two key features as explained by Weiner, Bell, Masuda and Webster: Firstly, information is used as an economic resource. Organizations which make the greater use of information increase their productive efficiency, stimulate innovation and increase their effectiveness. A study by Mutula *et al*. confirm this pattern of occurrence in developed countries, including Switzerland, Finland, Sweden, Denmark, Singapore, the United States, Japan, Germany, South Korea, the Netherlands and the United Kingdom. These were the best performing countries in terms of economic development and were rated the world's top ten performing economies according to The Global Competitiveness Report 2015-2016[26]. Coincidentally these countries are also leaders in e-governance systems and score highly on the digital opportunity index, e-readiness rankings, information society indices and e-government indices.

Secondly, it is possible to identify greater utilisation of information among the general public. People use information more intensively in their daily activities. The use involves making

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[25] Webster F. 1995. Theories of the Information Society, 08 - 15

[26] Mutula S, Grand B, Zulu S, Sebina P. 2010. *Towards an Information Society in Botswana*, 86 - 90

choices between different products, exploring their entitlements to public services, and taking greater control over their own lives. They also use information to exercise their civil rights and responsibilities as they participate and engage in socio-political processes. A Deloitte report states that information availability can promote social inclusion, digital inclusion and also facilitates the provision of public services[27]. Social inclusion implies the interaction of people through groups and or individuals in political, economic, and societal processes. The use of ICT in public service delivery entails the usage of online services to disseminate information to the public be it on disaster issues, or general public administration. For instance, in Uganda, web based applications are used for birth and death registration in rural and urban centres[28].

Information systems are being developed that will greatly extend the public access to educational and cultural services. Information resources and their abundance enhance socialisation at political, cultural and economic levels. Chrisanthi and Shirin, in a critique of the information society and the digital divide argue that "… the root of counter-development obstacles to ICT, might be the extent to which the information society conveys aspirations, and privileged technologies, information and knowledge that are irrelevant to the way the majority of people in many communities in developing countries live their lives"[29]. It is on this basis that the information society created by the Botswana government with collaborating stakeholders should be evaluated to determine the resultant inequality which may be contributing to the existence of a digital divide in the country.

2.2 Dimensions of the Digital Divide

The term Digital Divide (DD), is said to have been first used in 1996 by a former U.S. Vice President Albert Gore to describe the purpose of a mobile library. Others attribute its first use by the former USA President, Bill Clinton in 1995, *Los Angeles*. Times journalists first coined the term in 1993[30.] Regardless of its origin, the term, DD was quickly absorbed into the mainstream terminology. Its popularity soon transcended into academic lexicon by the turn of the millennium. Mutula expands the definition of DD to include the gap that exists between individuals, groups or other entities that have access to use new information and

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[27] Deloitte. 2014. Value of Connectivity. Economic and Social Benefits of Expanding Internet Access, 53 -55

[28] Abdul-Aziz Ibn M, Zakaria A, Mohammed D, Abdulai A. Evaluation of the Effect of Birth and Death Registration on Health Service. 2015, pp. 32-41.

[29] Jacques, Avgerou, Chrisanthi. 2005. *Perspectives and policies on ICT in Society*, 205-218.

[30] Mutula M S. 2008. Digital divide and economic development, 470 - 472.

communication tools and those who do not[31]. For purposes of this research, the concept of digital divide should not be misunderstood as digital literacy[32]. According to the Organization for Economic Co-operation and Development (OECD), the Digital Divide is characterised by the "gap between individuals, house-holds, businesses and geographic areas at different socio-economic levels regarding both their opportunities to access Information and Communication Technologies (ICT) and, their use of the Internet for a wide variety of activities"[33]. From this perspective, the digital divide was defined and viewed in a simplistic, formalistic and idealistic manner. Earlier researchers examining the DD divide were focused on the dichotomy of the "haves and the have nots", the binary numbers of those who owned and did not own computers or had access to computers and Internet.[34] Helbig, Gil-Garcia, and Enrico support the OECD's stance and assert that the access divide simply explains the 'haves' and the 'have nots', where those who 'have' partake in ICT technologies since they have access to such technologies.[35] The focus was to distinguish those who had access to the technology and those that did not have on the basis of gender, educational background, race, economic status and other tangible and quantitative factors.

Helbig *et al*. define DD as the relationship between individuals and technology with a significant focus on ICT as technology. Historically, Mutula proclaimed that the concept of DD has come to represent a major area of research in the field of Information Systems (IS) and Information and Communication Technologies (ICT), as well as other disciplines[36]. The various forms of the digital divide are grouped as access divide, multi-dimensional divide and finally multi-perspective DD[37]. This multi-dimensional view of the DD disagrees with the OECD's simplistic explanation by stating that DD concerns issues related to social, economic and political matters. The demographic characteristics are used to qualify the level of digital divide. Such an approach is suggestive of a democratic digital divide, economic opportunity digital divide, skills divide, and social digital divide. The multi-perspective digital divide

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[31] Mutula M S. 2008. Digital divide and economic development, 470 - 472.

[32] Aina L, Oladokun O. 2011. ODL and the impact of digital divide on information access in Botswana, 157 - 177.

[33] Organisation for Economic Co-operation and Development (OECD). 2001. *Annual Report 2002*.

[34] Organisation for Economic Co-operation and Development (OECD). 2001. *Annual Report 2002*.

[35] Helbig C N, Gil-García R J, Enrico F E. 2005. *Understanding the Complexity in Electronic Government*, 1 - 11.

[36] Mutula M S. 2008. Digital divide and economic development, 470 - 472.

[37] Helbig C N, Gil-García R J, Enrico F E. 2005. *Understanding the Complexity in Electronic Government*, 1 - 11.

extends beyond Helbig' *et al*. multidimensional approach by implying that an individual holds an amalgamation of histories and social locations that constitute multiple perspectives. This implication recognises that "individuals and communities employ technologies for very specific goals, linked often to their histories and social locations"[38].

Dewan also asserts that DD complicates the underlying reasons associated with the lack of ICT adoption for a variety of reasons commonly referred to as first order DD. Van Dijk conceptualises first order DD as a gap between those who have and those who do not have access to ICT[39]. According to Riggins and Dewan, at more extreme levels, is the manner in which ICT is used in varying ways that place some individuals, organisations, and countries at a disadvantage, a process readily referred to as second order digital divide[40]. One of the most significant factors that contribute to the existence of a DD measures an individual's physical access to ICTs and the Internet. Chinn and Fairlie describe the DD as inequalities between various social groups in the accessibility of digital technologies[41]. Kling identifies the digital divide with respect to (1) the physical availability of the technology and (2) social access in terms of the knowledge and skills necessary to leverage ICT to one's benefit[42]. Hargittai also uses a number of research studies to address second order DD. He reasons that as the "medium spreads to a majority of the population, it is increasingly important to look at not only who uses the Internet, but also to distinguish varying levels of online skills among individuals. Skill, in this context, is defined as *the ability to efficiently and effectively find information on the Web[43]"*.

Other aspects of the digital divide have been addressed by other researchers. For instance, Norris identifies divides at three distinct levels, including the global divide between industrialised and less developed nations, the social divide correlated with inequalities amongst the citizens within one community, and a political divide among those who are and who are not capable of using ICTs to engage and actively partake in democracy[44]. DiMaggio and Hargittai offer an extension of Norris's notion of the three levels of divide and outline five

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[38] Helbig C N, Gil-García R J, Enrico F E. 2005. *Understanding the Complexity in Electronic Government*, 1 - 11.

[39] Van Dijk J .2006. Digital divide research, achievements and shortcomings, 220 - 222.

[40] Dewan S & Riggins J F. 2005. The Digital Divide: Current and Future Research Directions. 1 -54.

[41] Chinn M D, Fairlie R W .2004. The Determinants of the Global Digital Divide, 14 – 22.

[42] Kling R.1998. Technological and Social Access on Computing, Information and Communication Technologies, 10 – 27.

[43]Hargittai, E. 2002. *Second-Level Digital Divide*, 1- 10.

[44] Norris P. 2001. Digital Divide: Information Poverty, the internet and development, 1 – 10.

aspects along which divides may exist, including the following: (a) technical means (software, hardware, connectivity quality), (b) autonomy of use (location of access, freedom to use the medium for one's preferred activities), (c) use patterns (types of uses of the Internet), (d) social support networks (availability of others that one can turn to for assistance with use, size of networks to encourage use) and (e) skill (one's ability to use the medium effectively)[45].

Castell, contrary to DiMaggio and Hargittai as well as Norris, theorises that there exist three ways that individuals are excluded digitally as a result of the DD. Those considered digitally marginalised are first excluded due to their inaccessibility to the Internet[46]. Secondly, the digitally marginalised tend to have access to the communication system, yet demonstrate a significantly low technical capacity. Lastly, some digitally marginalised individuals are connected to the Internet, but lack the knowledge or skills and know what information to seek and how it can be achieved, combine it with other information and use it to improve their lives[47]. The acquisition of knowledge and skills broadens one of the most vital forms of exclusion, cultural and education-based exclusion, following an increase in the digital world[48]". In Castell's view, access, education, and technical proficiency, and education are considered three major determinant factors for DD.

Although the conceptual framework of the DD may seem to be a self-explanatory theory, there exists an economic and social gap that is more difficult to explain between those who have access to ICT and those who do not. It is, therefore, not a matter of the 'haves' and 'have-nots' when it comes to the digital divide since the provision of access to ICTs is not sufficient in nature. Van Dijk contributes to the belief that digital inequalities decrease among connected people in developed countries[49]. Two assumptions underpin the theory of digital divide, which is often challenged when (1) the availability of ICT is not the only factor that creates a digital divide and (2) ICT is available within a given society, but the digital divide is not addressed; rather, it is able to manifest through other inequalities at varying levels of intensity and quality[50].

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[45] DiMaggio P, Hargittai E. 2001. From the 'digital divide' to 'digital inequality': Studying Internet use as penetration increases, 1- 12.

[46] Castells M .2005. O caos e o progresso. Portal do Projeto Software Livre do Brasil, 5-8.

[47] Castells M .2005. O caos e o progresso. Portal do Projeto Software Livre do Brasil. 5-8

[48] Castells M .2005. O caos e o progresso. Portal do Projeto Software Livre do Brasil. 10-15

[49] Van Dijk J. 2006. Digital divide research, achievements and shortcomings, 225 - 227.

[50] Van Dijk J. 2006. Digital divide research, achievements and shortcomings, 225 - 227.

Correa as cited in Nemer; Berwig (1997) as well as Toro and Wernerck, posit that digital inequality is inextricable from cultural, financial, and social inequality, which cannot be separated from ICTs in developing countries. Therefore, theoretically, addressing these inequalities would enable the DD to be bridged. However, scholars such as DiMaggio and Hargittai argue that simply providing access to ICTs is not sufficient[51]. They contend that a second order digital divide can only be bridged when populations of developing countries obtain the level of education needed to develop the knowledge and skills necessary to fully take advantage of the benefits associated with ICTs. Selwyn provides a theoretical framework for understanding how the DD is symptomatic of the greater social, economic, and cultural inequality by using a quantitative analysis of surveys. Recommendations are made to move past technologically deterministic thinking and the factors that contribute to the digital divide[52]. Identification, analysis, and assessment of DD, as it exists in any community, at either a local or national level, will entail data collection from populations regarding the accessibility of ICT.

2.2.1   Empirical Findings of Digital Divide

The availability of ICTs, telecommunications infrastructure, and data is indicative and predictive of the likelihood of the adoption and the extent of ICT utilization. The availability of ICT technologies and other related technologies tend to motivate and encourage the adoption and utilization of ICT technologies. The study has reviewed ICT technological set up, utilisation and installation based on geographical locations, of which includes urban, peri-urban and rural areas. Shamson and Reyes-Macasaquit proclaimed that ICT utilization is subdivided into three broad categories, inclusive of computing, communication as well as Internet enabled computing and communication[53]. Computing is defined as the use of applications to compute and solve assigned tasks. Evidence reveal that, the use of PASTEL to do accounting in an organization and the use of AUTOCAD to design and develop structural engineering plans are measured in accordance to computing. Contrary, communication is comprised of the use of facilities that enable the transfer of information by enhancing access to Wi-Fi, WiMAX, mobile phones, and telecommunication facilities and resources. The Internet specifies the use of large computer networks and applications available through the use of the World Wide Web and

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[51] DiMaggio P, Hargittai E. 2001. From the 'digital divide' to 'digital inequality', 1- 12.

[52] Selwyn N. 2002. Defining the 'Digital Divide', 47 - 49

[53] Shamsun Q N, Reyes-Macasaquit. 2002. *Digital Divide: Determinants and Policies with Special Reference to Asia*, 30 -35.

software applications such as blogging, CHAT, e-mail, Facebook and other social media platforms, forums, and WhatsApp. This research provides a comprehensive outline of ICT infrastructure set-up and services available in Botswana. An ICT policy, the national Information and Communications Technology Policy dubbed Maitlamo, was compiled to guide Botswana's ICT implementation and review[54]. This ICT policy informs the development of ICT infrastructure and its cultural, economic, political, and social transformation.

2.2.2   The ICT Situation in Botswana

The interplay between economics and development will continue to shape the world of ICT and development. The disparities between the developed and developing nations continue to occupy policy developers and planners in their daily work. Mogotlhwane *et al* remark that "Today, ICTs are generally regarded as the driving force behind the economy in every country and these include all communication devices or applications, electronic networks services including hardware applied through networks mobile phone, internet, software systems, hardware and many others". This view is further consolidated by Mutula[55] who observed that "economic development is related to digital divide. A comparison between developed countries which are characterized by low digital gaps have advanced and rich economies in contrast to developing countries which have high digital gaps and their economies are struggling".

Some researchers conducted on SMEs in Botswana and their e-readiness status with respect to ICT reveal that Some researches done on certain sectors of Botswana in the report e-readiness status for small to medium sized enterprises (SMEs) with respect to ICT sector they inform that "…*like their counterparts in most developing countries, [SMEs] had not achieved a reasonable measure of e-readiness status compared to the developed world*"[56]. This partly indicates state of DD in Botswana. Barzilai-Nahon in their article proclaims that Botswana Government has continuously invested in ICT infrastructural development, which has facilitated connectivity and the establishment of e-government service to its citizens, thus

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[54] Ministry of Transport and Communications. 2012. *Botswana National E-Government Strategy 2011-2016*, 1 - 22.

[55] Mutula M S, Brakel, V P .2006. E- Readiness of SMEs in the ICT sector in Botswana with respect to information access, 402 – 417.

[56] Mutula M S, Brakel V P. 2006. E- Readiness of SMEs in the ICT sector in Botswana with respect to information access, 402 – 417.

realising the Information Society[57]. The intention of creating the Information Society expedite service delivery at a reasonable convenient cost and in a very affordable manner and empowering citizens with knowledge to enact appropriate decisions from an informed point of view and anywhere. The government has also continued to improve and update the ICT infrastructure as evidenced by the ICT expenditure pattern noted by Mutula[58]. White et al when citing Paul (2002) cautions that *"...gaps in ICTs are not static nor are the impacts of new technologies equal: with the introduction of each new ICT technology, the global digital divide has the potential to widen. Thus, the importance of measuring the diffusion of ICT technologies remains"*[59]. In Botswana little research has been done to measure the diffusion, acceptance and utilization of ICTs and   Botswana falls in the same situation as informed by White.

To date, the Government of Botswana (GoB) through guidance of the Maitlamo Policy, the Vision 2016 and also Science and Technology Policy has managed to achieve the following ICT developments: Relax the control and permeate flexibility in the telecommunication sector such that implementation and utilization has witnessed establishment of integrated network platforms, deploying the most efficient advanced technologies that carry all forms of communication, including fixed and mobile voice and data originating from many different providers[60]. The GoB has further liberalised the telecommunication industry by allowing two additional players - Mascom and Orange in the industry. Currently, there are three mobile service providers; Mascom, Orange and latest entrant – BeMobile.

The ICT infrastructural committed by the country is illustrated by a number of major projects. The electrification programme has been extended to peri-urban and remote rural villages. The hundred village electrification project was designed by GoB to ensure that all villages and major settlements areas have access to electricity. Five radio and three television stations are available and a growing number of private networks are in place such as the Government Data Network (GDN), a police private network, Botswana TV network and mobile communications networks[61]. Internet access by the public and internet cafes in urban areas are available and are managed by several ISPs. The rapidly growing mobile user base is estimated at more than 1.5 million. The establishment and implementation of Fibre-optic Networks and Linkages to

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[57] Barzilai-Nahon K. 2006. Gaps and Bits: Conceptualizing Measurements for Digital Divide/s. 269–278.

[58] Mutula M S. 2008. Digital divide and economic development: case study of sub-Saharan Africa,468-489

[59]White D S, Gunasekaran A, Shea T P, Ariguzo G C. 2011. *Mapping the global digital divide*, 207-219.

[60]Mutula S M.2008. Digital divide and economic development, 468-489

[61]Mutula, M, S. 2008.Digital divide and economic development,468-489

Submarine Cable Systems has provided improvements in bandwidth and access to the internet. The undersea West African Cable Systems (WACS) and Africa Sub-marine Cable System (EASSy) has provided Botswana with an opportunity to tap into a bigger internet bandwidth[62].

Botswana's local post offices are fitted with adequate and appropriate ICT infrastructure to support service delivery of electronic mail service, fax, electronic money transfer, emailing and internet services. These developments are some of the efforts being made by the government to make sure that citizens at rural areas utilise ICT. Through the Kitsong Information Centre project, the post office services were modernised to be an all-encompassing information services centres. Post offices are currently used to serve a number of retired workers and pensioners to receive their monthly stipends / salaries[63]. The services at post office have also been extended to vehicle registration and licence renewal fees which can be paid physically or through online platforms.

In the last ten years, the GoB has recently launched e-governance service, to ensure that its citizens are provided with information to facilitate public participation in national developments. Such services include e-school, e-justice, e-health, e- transport and e-agriculture[64]. Through the E-Government Strategy document, the President of Botswana articulates the stand position of the State by stating that "In order to efficiently and effectively deliver services to the people, Government has embarked upon the automation and integration of processes through the e-government programme". As part of the commitment to the delivery of the policy pronouncements, a number of ministries have implemented a number of initiatives anchored on e-platforms.

At the Ministry of Agriculture, video films are provided through television broadcasts (BTV) DVDs and e-learning platform to reach to potential farmers, training them on farming and arable agriculture skills so that they can improve yields[65]. Other ICT infrastructures on the ground include fixed telephone line operator, three mobile service providers and more than 20 ISPs. There are several fibre-optic networks which constitute the public data network and is owned by parastatals BTV, Botswana Power Corporation (BPC) and Botswana Railways

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[62]National Development Plan: Midterm Review of NDP 10.

[63]Mogotlhwane, M T, Talib M, Mokwena M. 2011. *Reduction of Poverty Using ICT in SADC Region*, 54-65

[64]Ministry of Transport and Communications. 2012. *Botswana National E-Government Strategy*, 1 – 22.

[65]Mogotlhwane MT, Talib M, Mokwena M. 2011.*Reduction of Poverty Using ICT in SADC Region*, 54-65

(BR)[66]. The GoB owns a state-of-the-art ICT infrastructure that includes the following: A Campus Local Area Network (LAN), Wireless Metropolitan Area Network (MAN) and Wide Area Network (WAN) that connect all government departments across the country where there is availability of power, telephones and LAN in place. Lastly, the GoB also has a telephone and internet connectivity network that links government offices that have access to the electricity power grid[67].

Technology, itself, does not bear any fruits for the people unless it has been transformed into an innovation. Innovations and diffusions are regarded as primary economic and social processes which involve many other actors and behaviours besides those directly involved in the creation of technology itself. The success and failures of each technology are centred on the successful adoption or rejection by citizenry of a particular society or country. The implementation of the state of the art technologies may not have any bearing if the citizens are not able to access to the technology, utilise it, or they do not have no requisite skills to utilise such technologies provided by the government or any institution. Thus, as much the GoB has invested in these ICT technologies, the questions of whether there has been a successful diffusion of technology remain to be answered.

Research in the area of technical innovation and diffusion of innovations seeks to isolate the characteristics of individuals, communities, and societies within the context of technological innovation. It also seeks to measure the diffusion of a particular innovation through the various strata of society over time. By studying the diffusion of innovations within a community, a 1995 study by Rogers illuminates how ICT adoption is actually a social movement. Rogers proposes a number of key issues of influence in the diffusion and adoption of innovation: the concept of innovation, its diffusion over time, personal influence and opinion leadership, the adoption process, the roles of the innovator and other adopter categories, and the role of the social system[68].

2.2.3   Computing Facilities

The current areas spelt out for ICT development in Botswana include government online, (e-Government), e-Legislation, e-Education, e-Health, e-Commerce, e-Agriculture and e-

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[66] Mogotlhwane MT, Talib M, Mokwena M. 2011.*Reduction of Poverty Using ICT in SADC Region*, 54-65

[67] Mogotlhwane MT, Talib M, Mokwena M. 2011. *Reduction of Poverty Using ICT in SADC Region*, 54-65

[68] Rogers EM.1995. *Diffusion of Innovations*, 1 – 236.

Tourism. The e-Government has been prioritized as the prime transformation strategy which aims to enhance the utilisation of ICTs over internet; the WWW by offering government services online. A report by the Ministry of Transport and Communication mandated to oversee the ICT transformation states that the e-Government is supposed to "...help raise public sector service quality to higher levels, allowing citizens to access government information and services (anywhere, anytime)". The e-Government has now 20 years of e-Government implementation and has seen the implementation of quite a number of e-Government services deployed[69].

2.2.4   Computerised Government Operations

To date, the GoB, as the main driver and implementing agent of ICT, has accomplished a number of electronic government applications which are meant to provide and assist public administration. The Attorney General Chambers implemented a computerised case management system for case registration and tracking of case files. The High Court in Lobatse, Southern Botswana, has implemented a court case monitoring system which monitors case proceedings from start to end. The Ministry of Health implemented an Integrated Patient Management System which offers centralised location of patient data which can be accessed by hospitals and clinics all over the country. The system also provides patient registration, laboratory services, prescription and ward management. The Ministry of Home Affairs launched a computerised civil and national registration system to issue birth, death certificates, passports, resident and work permits and national identification (*Omang*). The Ministry of Local Government launched the human resource management system for tracking all civil servant's records, retirements, appointments staff development and many other issues. The social benefit and reconciliation system was launched for the registration of the needy, orphans, old age and pensioners.

 In 2009, the GoB conducted a 'Customer Survey Satisfaction' with an intention to seek customer satisfaction on deployed e-Government services. The survey yielded partly low level satisfaction of 27%. This shows that the end users may not be happy with e-Government services based on numerous factors such as utilisation, access, skill to use, which are all indicators of DD. The majority of the e-Government systems that have been developed by the government have not been extended directly to the citizens. The systems still require users to

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[69] Ministry of Transport and Communications. 2012. *Botswana National E-Government Strategy 2011-2016*, 1-22.

visit the government offices to use the systems. The systems are still not full accessible outside the respective government department offices.

2.2.5   Fixed and Mobile Broadband Communication

Telecommunication facilities are defined as key elements that facilitate information transmission. Botswana Telecommunication Authority (BTA) administers and coordinates the implementation of all telecommunication operations and facilities in Botswana. While Botswana Telecommunications Corporation (BTC) operates and provides the broadband connection and fixed connections.

Botswana Fibre Networks (BOFINET) has been mandated to administer the two undersea fibre optic cable systems. The East Africa Submarine System (EASSy) was developed to provide high-quality and high-capacity fibre networks to interconnect African countries among themselves, and with the rest of the world. The West African Cable System (WACS) complements the capacity acquired in EASSy by providing additional capacity and alternative connectivity to Europe.

Be-Mobile is public company with some state shares and provides mobile broadband connection mobile network services. Its operations are complimented by two privately owned companies; Mascom and Orange Botswana, which also provide mobile broadband and mobile internetwork connection to the entire country. Table 2.1 shows the mobile service provider customer coverage for the entire country. Mascom and Be-Mobile have the lion's share of the mobile service business, both for mobile broadband and internetwork connection, followed by Orange Botswana.

Table 2.1: Mobile service provider Botswana population coverage[70]

	Mascom	Orange	beMobile
Population coverage	95%	85%	95%

In terms of broadband coverage and utilisation, there is a remarked decrease in the use of this facility mainly because of the costly pricing structure which is costly. Table 2.2 shows the utilisation based on fixed lines, population, and penetration. Broadband connection is defined as the use of landline for phones, FAX, ADSL MODEMs for internet access. Based on Table 2.3, it is clear that broadband penetration has remained static from 1997 to 2012. This

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[70]Central Statistics Office. 2012. *ICT Statistics Report*, 4 -11.

stagnation shows the underutilisation and there could be a number of driving factors for this state of affairs. In contrast, there has been a massive and huge penetration of mobile broadband connection and mobile internet penetration services in the same period. The penetration of these services rose from 0.2% in 1998 to 150.1% in 2012. This penetration represents a multiple mobile SIM card ownership by citizens and residents of Botswana. A 2012 report by IRA shows that 80% of the population with age of 15 years plus owns a mobile phone[71].

Table 2.2: Fixed broadband penetration in Botswana[72]

	Fixed lines	Population	Penetration
1997	72 189	1 661 000	4%
1998	85 592	1 696 000	5%
1999	102 016	1 728 000	6%
2000	123 819	1 758 000	7%
2001	135 900	1 784 000	8%
2002	148 155	1 808 000	8%
2003	131 699	1 830 000	7%
2004	131 774	1 852 000	7%
2005	136 463	1 876 000	7%
2006	135 505	1 901 000	7%
2007	140 951	1 928 000	7%
2008	142 282	1 955 000	7%
2009	136 593	1 982 000	7%
2010	137 422	2 007 000	7%
2011	148 098	2 031 000	7%
2012	160 488	2 053 000	8%

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[71] Botswana Communications Regulatory Authority (BOCRA). 2012. *BTA directs public telecommunications operators to reduce prices*, 5-15.

[72] Central Statistics Office. 2012. *ICT Statistics Report*, 4 -11.

Table 2.3: Mobile broadband penetration in Botswana[73]

	Mobile SIMs	Population	Penetration
1998	3 301	1 696 000	0.2%
1999	23 062	1 728 000	1.3%
2000	106 029	1 758 000	6.0%
2001	222 190	1 784 000	12.5%
2002	332 264	1 808 000	18.4%
2003	444 978	1 830 000	24.3%
2004	522 840	1 852 000	28.2%
2005	563 782	1 876 000	30.1%
2006	1 088 238	1 901 000	57.2%
2007	1 425 584	1 928 000	73.9%
2008	1 722 486	1 955 000	88.1%
2009	2 339 029	1 982 000	118.0%
2010	2 644 282	2 007 000	131.8%
2011	2 797 056	2 031 000	137.7%
2012	3 081 726	2 053 000	150.1%

A comparison of fixed broadband and mobile broadband utilisation and penetration year 2011 and 2012 show frequency distribution as indicated in Table 2.4.

Table 2.4: Fixed and mobile broadband internet penetration[74]

		Fixed ADSL internet	Mobile internet	Population	Fixed internet penetration	Mobile internet penetration
2011	Q4	15 707	238 942	2 031 000	0.8%	11.8%
2012	Q3	18 166	339 926	2 053 000	0.9%	16.6%

The usage of mobile internet and services is high compared to the use of fixed broadband connection. This is attributed to the fact that as fixed broadband connection and access time take time is cumbersome and is very expensive. The use of mobile service is the most appealing because of the ubiquity of the service, convenience to access and the repairs are done online. Thus, its relatively cheap compared to the broadband connection.

2.2.6   Rural Telecommunications Development

Rural telecommunications infrastructure in Botswana has been separated and is spearheaded

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[73] Central Statistics Office. 2012. *ICT Statistics Report*, 4 -11.

[74] Central Statistics Office. 2012. *ICT Statistics Report*, 4 -11.

through a strategic plan called "Nteletsa I and II" Programmes[75]. Nteletsa I and II are Rural Telecommunications Development Programme aimed at providing communities with access to telecommunications services[76]. These include voice, data and internet services. The aim of the programmes is to provide mobile data, voice and multimedia data communication services to the rural areas. Nteletsa I was implemented by Be-Mobile and provides voice or telephony communication. Currently, Nteletsa II is being implemented through private mobiles services providers, Mascom and Orange Botswana to provide mobile data, voice and multimedia data communication service and is still ongoing in the designated 197 villages[77].

2.2.7   Internet - Fixed and Mobile Broadband Utilisation

The utilisation of internet services and mobile broadband was reported in a survey conducted by Botswana Communications Regulatory Authority (BOCRA) in Botswana[78]. Figure 2.1 illustrates mobile phone utilisation and its specific uses. Most mobile phone users use(d) the phone for voice communication purposes, followed by accessing the internet for social media or downloading data.

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[75] Mutula S, Grand B, Zulu S, Sebina P. 2010. *Towards an Information Society in Botswana: ICT4D Country Report,* 84-86.

[76] http://www.gov.bw/en/Ministries--Authorities/Ministries/Ministry-of-Transport-and-Communications/Tools--Services/Services--Forms/Nteletsa-II-Project-

[77] Mutula S, Grand B, Zulu S, Sebina P. 2010. Towards an Information Society in Botswana: ICT4D Country Report, 84-86.

[78] Botswana Communications Regulatory Authority (BOCRA). 2012. *BTA directs public telecommunications operators to reduce prices*, 5-15.

Figure 2.1: Mobile phone utilization in Botswana[79]
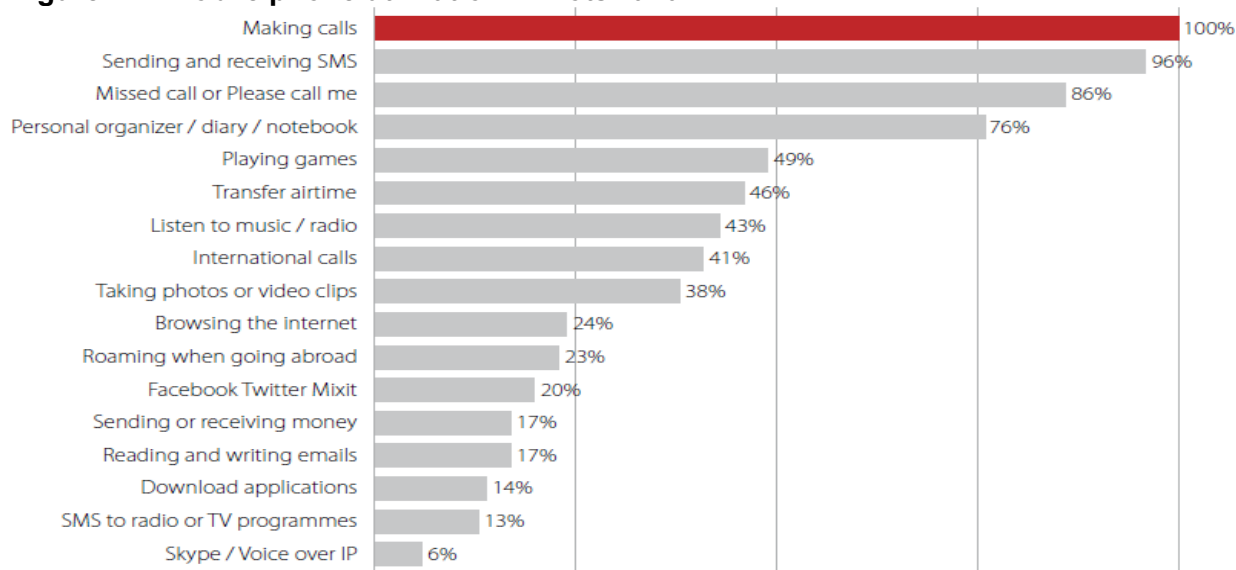
Stork *et al*. reports that in Botswana, there has been a general increase in household interconnection for fixed and mobile broadband. Mobile broadband attained the highest penetration than fixed broadband as shown in Table 2.5[80].

Table 2.5: Internet connection per household in Botswana[81]

	Dial-up-modem or ISDN	ADSL	Mobile Internet (mobile phone or dongle)
Botswana	15.3%	4.9%	95.9%

Stork *et al* also surveyed of individual's access to internet and the devices used to access the internet and place of access[82]. Two specific periods 2007-2008 and 2011-2012, were used for comparison purposes. The statistics obtained are shown in Table 2.6. There has been an increase of *Batswana* accessing internet by 23.20%. The survey also indicates that more people were accessing the internet using mobile devices than fixed broadband.

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[79] Botswana Communications Regulatory Authority (BOCRA). 2012. *BTA directs public telecommunications operators to reduce prices*, 5-15.

[80] Stork C, Calandro E, and Gamage R. 2012. *The Future of Broadband in Africa*, 1-22.

[81] Stork C, Calandro E, and Gamage R. 2012. *The Future of Broadband in Africa*, 1-22.

[82] Stork C, Calandro E, and Gamage R. 2012. *The Future of Broadband in Africa*, 1-22.

Table 2.6: Individual access to internet and device and place of access[83]

Individuals Using Internet (15yrs +)			Where Internet was first Used		Internet Last Used in 12months				
2007/8	2011/12	Diff	Computer	Mobile Phone	Mobile Phone	Work Place	School/ College	Other Places	Internet Cafe
5.80%	29.00%	23.20%	70.60%	29.40%	64.10%	51.10%	32.20%	43.70%	58.30%

2.3 Theories Underpinning the Research Study

Various theories support the theoretical underpinning of this research study. Specifically, this research will employ the Use and Gratifications Theory (UGT), the Unified Theory of Acceptance and Use of Technology Model (UTAUT), and the Diffusion of Innovation Theory (DIT) to examine the existence and impact of technology and internet use patterns of *Batswana*. As the study's theoretical framework, these theories are used to identify and evaluate the use of ICT. ICT use in Botswana is influenced by a number of key factors, including the user's skills, access and affordability. The availability of ICT infrastructure and ICT-based technologies, national policies that govern ICT use at an institutional level, the cost associated with such technologies and an individual's ability to use ICT technologies present a number of ongoing challenges in Botswana. These theories are used to measure the use of the Internet and ICT by the people living in Gaborone.

2.3.1 Uses and Gratifications Theory and Botswana

The UGT has been used in a number of studies that examine the ways in which people use ICTs and other new technologies. According to the UGT, internet-based studies explore the perception of consumers of technological media and the informed decisions made to determine the type of media, its content, and respective uses[84]. Bucy, Gantz, and Wang described the following key assumptions of the UGT:

> "(a) that the audience for news and other genres of media content is active and goal directed; (b) that media are an important source of need gratification whose fulfilment lies with audience choices; and (c) that media compete with other sources of need satisfaction"[85]

This theory posits that the gratification an individual seeks to receive from technological media

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[83] Stork C, Calandro E, and Gamage R. 2012. *The Future of Broadband in Africa*, 1-22.

[84] Kaye B K. 2007. 'Blog use motivations: An exploratory study', *Blogging, Citizenship, and the Future of Media*, 129.

[85] Bucy E P, Gantz W, Wang Z. 2007. 'Media Technology and the 24-Hour News Cycle', 149.

is correlated with the individual's belief as to what such a medium can provide upon evaluation of its content.

The UGT is used as the theoretical framework to highlight the use of ICT amongst the people living in Botswana. Haythornthwaite[86] and Howard, Rainie, and Jones[87] conducted studies, which report how individuals use the Internet and its underlying resources such as e-mail and searching the web at home and in the workplace. Other studies note the importance of where ICTs as used in the public sphere such as cybercafés[88]. Researchers have investigated Internet use and associated trends in Internet use by Congolese refugees attending tertiary educational institutions throughout *Cape Town, SA*[89], students in Ghanaian universities as well as Internet use in Botswana and Tanzania[90]

The diffusion of information technology is also examined in Botswana[91]. Research studies have examined key points of access for Internet use among university students in Botswana. The findings revealed that cybercafés are of increased popularity as these public spheres enhance the provision of an array of services with a heightened degree of convenience. While analysing the utilisation of Internet services in Botswana, Sairosse and Mutula proclaim that

"Cybercafés are becoming preferred Internet access points because most of them open for long hours, charge reasonably, provide assistance to users, have diverse services and are generally convenient and flexible places for searching the Internet. Students studying in various universities through distance education, for example, find using cybercafés to access course syllabuses and material convenient".

In Botswana, cybercafés serve as the common location university students use to access the Internet[92]. Studies conducted in Ghana and Nigeria suggest different types of activities students like to engage in due to the advent of new media technologies. Both university students and teachers in Ghana and Nigeria reported limited goals regarding access to and use of the

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[86] Haythornthwaite C. 2001. *Introduction: The Internet in Everyday Life, American Behavioral Scientists*, 363.

[87] Howard P E N, Rainie L, Jones S. 2001. *Days and Nights on the Internet*, 383.

[88] Dahlberg L. 2007. *The Internet, Deliberative Democracy, and Power: Radicalizing the Public Sphere*, 47.

[89] Wasserman H, Kabeya-Mwepu P. 2005. *Creating Connections: Exploring the Intermediary Use of ICTs by Congolese Refugees at Tertiary Educational Institutions in Cape Town,* 94.

[90] Sairosse T M, Mutula S M. 2004. *Use of Cyber Cafés: Study of Gaborone City, Botswana. Program, Electronic Library and Information Systems*, 60.

[91] Jain P, Mutula S M 2001. *Diffusing Information Technology in Botswana: A Framework for Vision 2016, Information Development*, 234.

[92] Sairosse T M, Mutula S M. 2004. *Use of Cyber Cafés: Study of Gaborone City, Botswana. Program, Electronic Library and Information Systems*, 60

Internet.[93] In line with Oyelaran-Oyeyinka and Adeya's study on the use of Internet among Nigerian and Kenyan university teachers, results reveal that a relatively small number of the respondents used the Internet for electronic commerce[94]. This showed that university students in Nigeria and Kenya made limited use of the Internet and its underlying resources.

The findings demonstrate that different students have various uses for new technologies as indicated by the responses from undergraduate student populations at few major universities throughout Africa including the University of Ghana, University of Lagos, and Nnamdi Azikiwe University both in Nigeria. The use of new technologies by students at Nnamdi Azikiwe University located in Nigeria vary from the use of new technologies at the University of Ghana and the University of Lagos[95]. This study examined how the utilisation of new technologies affected both performance from an academic perspective and social behaviour among Nnamdi Azikiwe University students[96]. Significance is placed on the most common forms of technologies used. In this study, the utilisation of mobile technology, such as mobile phones, have proven to be detrimental to Nnamdi Azikiwe University students despite its intended benefits. Mobile phones allows these university students to browse the Internet all night, which serves as a source of empowerment[97].

The use of the Internet, via mobile phones, is deemed the most widely used technology by university students. Such technologies are correlated with sparking a paradigm shift that has greatly enhanced learning. The diverse uses that university students commonly attribute to mobile phones suggest that mobile phones are a popular form of technological media used across cultures[98]. Mobile phone technology has experienced tremendous growth throughout the world. In Africa alone, reports suggest a growth rate of more than 500% over the past decade. Previous research studies by Kwansah-Aidoo and Obijiofor[99] and Obijiofor[100] reveal that a

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[93] Obijiofor L. 2009. *Perceptions and Use of Internet and Email Technologies by Nigerian University Undergraduate Students,74-88*

[94] Oyelaran-Oyeyinka, B, Adeya C N. 2004. *Internet Access in Africa: Empirical Evidence from Kenya and Nigeria,* 74. 88

[95] Omenugha K A. 2009. *Nigerian Students Use of Information and Communication Technology*, 11.

[96] Omenugha K A. 2009. *Nigerian Students Use of Information and Communication Technology*, 11

[97] Omenugha K A. 2009. *Nigerian Students Use of Information and Communication Technology*, 11.

[98] Omenugha K A. 2009. *Nigerian Students Use of Information and Communication Technology*, 11.

[99] Kwansah-Aidoo K, Obijiofor L. 2006. *Patterns of Internet Use Among University Students in Ghana, African Development:* 367.

[100] Obijiofor L. 2009. *Perceptions and Use of Internet and Email Technologies by Nigerian University Undergraduate Students*, Accra. 367

significant number of university students at the University of Lagos and the University of Ghana respectively accessed and used the Internet for email communication through their mobile phones. However, students attending Nnamdi Azikiwe University used the Internet for more attractive purposes such as the ability to meet, communicate, and interactively engage with peers and other important individuals through Facebook[101]. Students were attracted to social media platforms, which provided platforms to communicate with their counterparts in other universities regionally and internationally.

According to a 2014 survey on ICT Household in Botswana, the use of ICTs was examined and assessed among individuals, who were 10 years of age and older[102]. The survey also addressed digital divide inclusive of inequalities in access to ICT as well as the use of such technologies alongside demographic characteristics inherent across various groups of individuals. The survey results revealed that approximately 40.6% of all households in Botswana had access to the Internet[103]. Gaborone demonstrated the highest percentage with households with access to the Internet (24.1), when compared to other areas with a lower proportion of households with access to the Internet such as Kweneng West District (11.4%) and Ngwaketse District (7.1%)[104]. These are also very poor districts.

Varying reasons are attributed to a decreased access to the Internet represented by a lower proportion of households not connected to the Internet. Of a total of 606,071 households, 360,130 households in Botswana, equivalent to 59.4%, did not have access to the Internet.[105] The most significant reason for the lack of access to the Internet stems from a lack of knowledge about the Internet services (as shown in Figure 2.2).

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[101] Obijiofor L. 2009. *Perceptions and Use of Internet and Email Technologies by Nigerian University Undergraduate Students,365 - 370.*

[102] Isaacs S. 2007. *ICT in Education in Botswana: Survey of ICT and Education in Africa: Botswana Country Report*, 9.

[103] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 12.

[104] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 13.

[105] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 13.

Figure 2.2: **Reasons households have decreased access to the internet**[106]
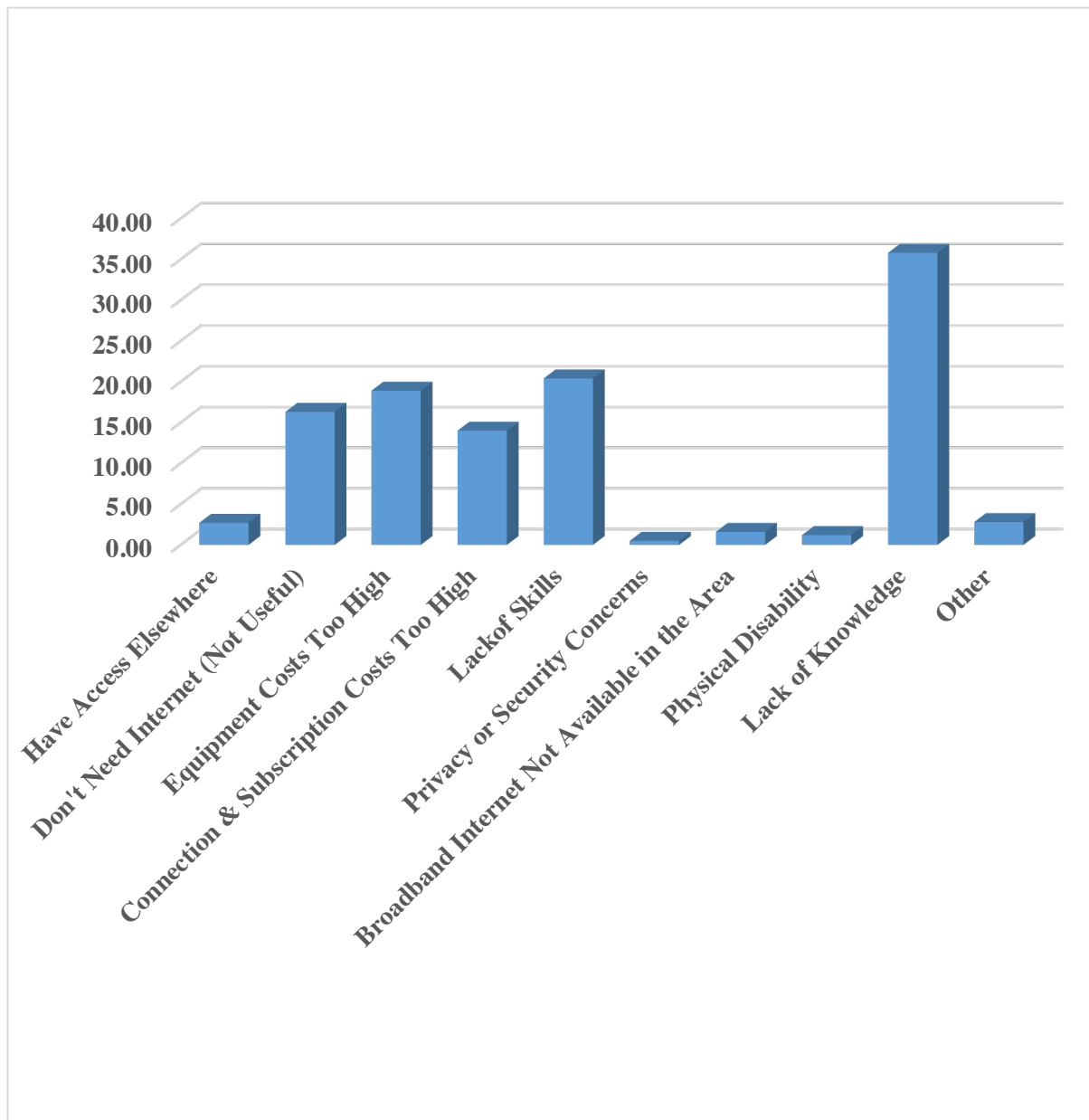
Approximately, 35.8% of households did not know what the Internet was all about or was not familiar with its existence[107]. The next common reason for the lack of Internet connection by Botswana households was attributed to a lack of skills (20.4%)[108]. Less commonly reported reasons for a households failure to use the Internet were the increased cost of internet

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[106] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 13.

[107] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 13.

[108] Isaacs, S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 13.

equipment (18.9%), the Internet was not needed and deemed non-useful (16.3%)[109].

Of all the areas in Botswana that were surveyed in the study, Gaborone reported the largest number (29.6%) of individual internet users[110]. The survey also reported that the majority of individual internet user in Botswana were employees who were paid cash. More specifically, services and sales workers accounted for roughly 11.6% of internet users followed by less common employed groups[111]. Additional findings show that approximately 10.9% of professionals, as well as 7.1% of associate professionals and technicians, were also individual internet users[112].

The frequency of individual Internet use (as depicted in Figure 2.3) demonstrates the frequency at which internet was used by individual users throughout Gaborone. Frequency of Internet use ranged from the everyday use or almost every day use to a minimum of once per week to a minimum of once a month (yet not every week) and finally to once in a while[113].

Figure 2.3: Frequency of internet use by individual users[114]

In 2014, a majority of individual users (55.3%) used the Internet every day or almost every day[115]. Individual internet users who utilised the Internet a minimum of once per week yet not

[109] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 9.

[110] Isaacs, S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 22.

[111] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 22.

[112] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 22.

[113] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 22.

[114] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 22.

[115] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country*

every day accounted for approximately 25.7% of all the Internet users[116]. Other individuals used the internet at least once monthly (7.5%) while others used it less frequently, once in a while (11.5%)[117].Survey findings also showed locations in which *Batswana* commonly used the Internet ranging from some of the most prevalent locations to the least prevalent ones (as shown in Figure 2.4).

Figure 2.4: Locations in Botswana where the internet was commonly used
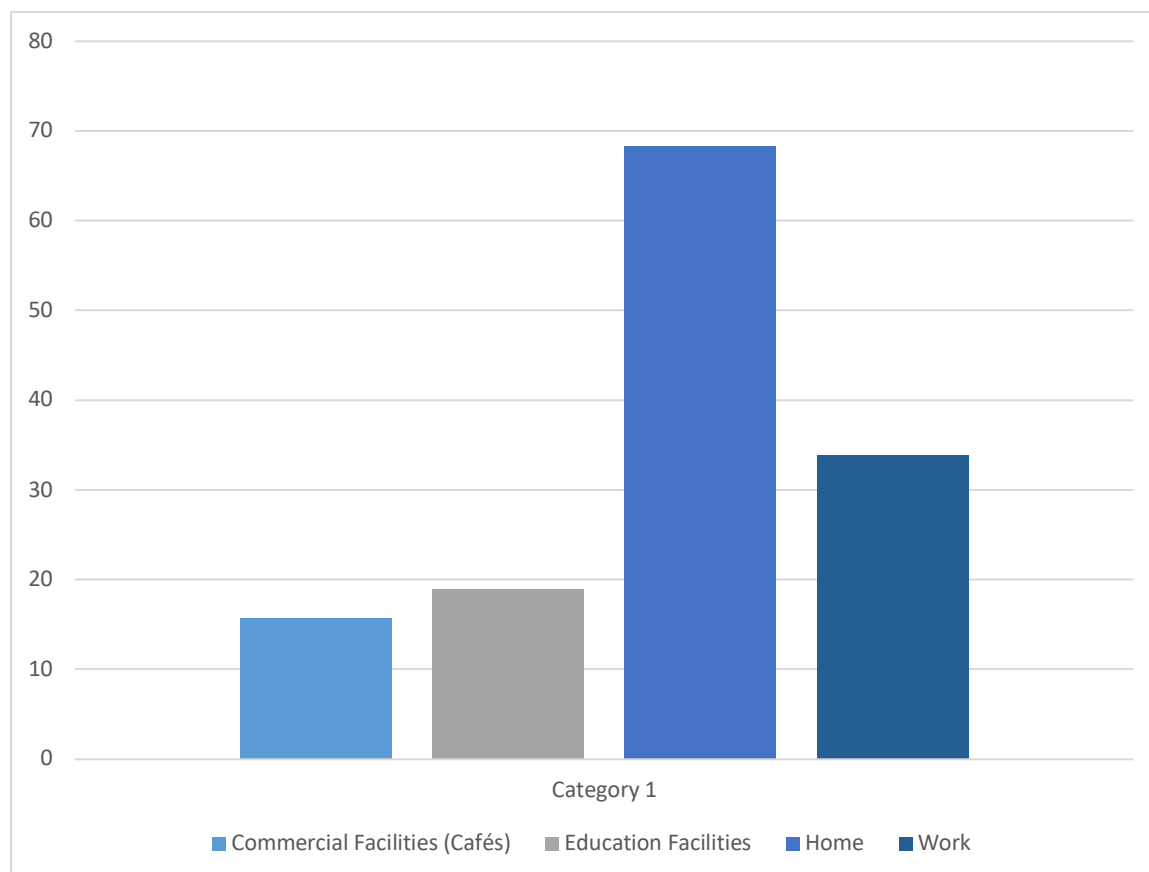
Locations, including home, work, education facilities, and commercial facilities such as cafés, accounted for 68.3%, 33.9%, 19.0%, and 15.7% of individual Internet users in Gaborone, respectively[118].

Report, 23.

[116] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 23.

[117] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 23.

[118] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country*

In Botswana, several forms of technological devices are used. The most common used to access the Internet are mobile cellular telephones such as smart phones.[119] Hence, approximately 77.3% respondents reported using smart phones to access Internet[120]. The second most common form of technology used by about 43.0% of individuals include portable computers such as tablets, laptops, or notebooks[121]. The use of technological devices varies according to the age of individual users. Individuals between the ages of 10 and 54 years old primarily used smart phones to access the Internet, while elder individuals 55 to 74 year-olds preferred to use portable computers.

Individual Internet users access and use the Internet for different reasons. In accordance with the results gathered from the 2014 ICT Survey, Internet users engaged and participated in various web-based activities. The most common activity which individual users accessed the Internet was social networks. Results revealed that about 78.4% of individual Internet user engaged in social networks[122]. The next most common form of Internet-based activities used by Batswana included downloading and reading of online informational resources. The findings demonstrate that approximately 56.6% of all Internet users in Gaborone, downloaded and read electronic books as well as online magazines, news, and newspapers[123]. Additional findings revealed that individual Internet users (58.8%) access and use the Internet for emails, while other Internet users (49.6%) use the Internet as a resource for either educational information or training[124].

Similar to other findings pertaining to the most preferred technological device and the frequency at which the Internet is used, the underlying reasons in which individual Internet users access the web vary in accordance with age. Individuals between 15 and 44 years old, use the Internet the most regardless of the nature of the Internet activity. The survey results

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Report, 23.

[119] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

[120] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.
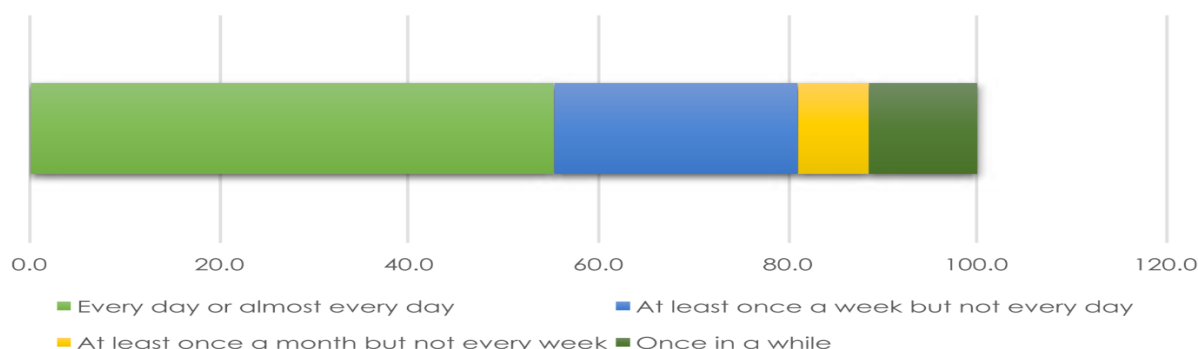
[121] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

[122] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

[123] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

[124] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

show that roughly 41.7% of individual Internet users aged between 15 to 24 years of age participated in social networks[125]. Furthermore, about 34.4% of individuals between the ages of 15 and 24 years old used the Internet for social networking, while 14.9% aged between 35 and 44 years primarily engaged in social networking[126]. Additional findings reveal that a total of 35.3% of individual Internet users between 25 and 34 years old age and 30.0% between 15 and 24 years old download and read electronic books, online magazines, and online newspapers[127]. Individual Internet users aged between 15-24 years old, 25 and 34 years old, and 34 and 44 years old accounted for 25.9%, 36.2%, and 22.7% respectively of those who accessed and used the Internet to send and receive emails[128].

2.3.2 Unified Theory of Acceptance and Use of Technology Model and Botswana

The United Theory of Acceptance and Use of Technology Model (UTAUT), a model highlighting technology acceptance, was developed by Venkatesh and colleagues. It proclaims that the behavioural intention underlying an individual's use of ICT is strongly correlated with effort expectancy, facilitating condition, performance expectancy, and social influence[129]. There is a correlation between the four determinants of the UTAUT Model (performance expectancy, effort expectancy, social influences and facilitating conditions) and key modifiers such as age, gender, and experience determine the prospective results. Hence, the results set forth within the UTAUT Model includes behavioural intentions and use behaviour (as illustrated in Figure 2.5). Since the UTAUT model is comprised of an amalgamation of a total of eight unique theoretical models, it is applicable to varying contexts that explore technology acceptance and adoption[130].

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[125] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

[126] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 24.

[127] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 25.

[128] Isaacs S. 2007. *ICT in Education in Botswana, Survey of ICT and Education in Africa: Botswana Country Report*, 25.

[129] Venkatesh V, Thing J Y L, Xu X. 2012. *Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology, MIS Quarterly*, 157-158.

[130] Venkatesh V, Thing J Y L, Xu X. 2012. *Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology, MIS Quarterly*, 158.

Figure 2.5: Unified Theory of Acceptance and Use of Technology Model[131]
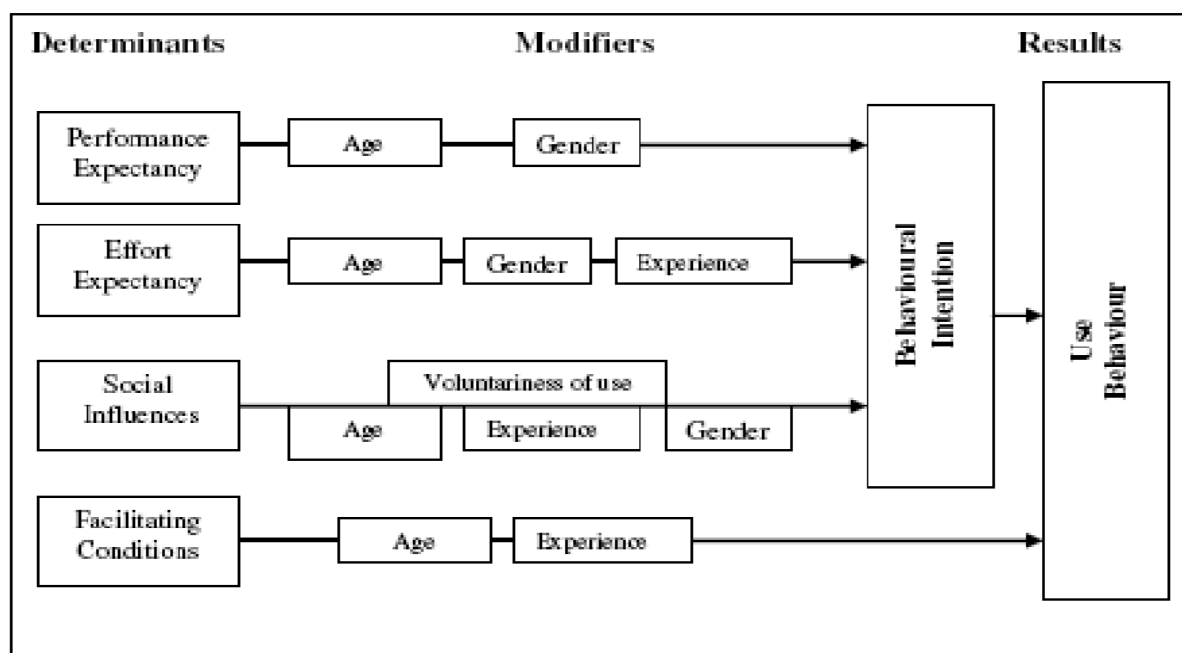
A study examining the perceptions of document workflow management system (DWMS) users was conducted in Gaborone[132]. The study employed a modified version of the UTAUT model as its theoretical framework by exploring an individuals' perception on its adoption and use. The research findings show that individual users had pessimistic attitudes toward technologies and exhibited computer anxiety, negatively viewed the complex nature of computers and its systems; thereby altering their willingness to adopt and use such technologies[133].

A number of research-based studies conducted throughout Botswana used the UTAUT model as their theoretical framework reveal interesting findings. Nichol, Hunter, Yaseen, and Prescott-Clements found that the adoption and use of new technologies were linked to a fear of such technologies[134]. Other studies show that the adoption and use of the Internet and ICTs

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[131] Oye N D, Iahad N A, Rahim N Z A. 2012. *The Impact of UTAUT Model and ICT Theoretical Framework on University Academic Staff: Focus on Adamawa State University, Nigeria, International Journal of Computers & Technology*, 104.

[132] Mosweu O, Bwalya K, Mutshewa A. 2016. *Examining Factors Affecting the Adoption and Usage of Document Workflow Management System (DWMS) Using the UTAUT Model: Case of Botswana, Records Management Journal*, 38.

[133] Mosweu O, Bwalya K, Mutshewa A. 2016. *Examining Factors Affecting the Adoption and Usage of Document Workflow Management System (DWMS) Using the UTAUT Model: Case of Botswana, Records Management Journal*, 38.

[134] Nichol D, Hunter J, Yaseen J, Prescott-Clements L. 2012. *A Simple Guide to Enhancing Learning Through Web 2.0 Technologies, European Journal of Higher Education*, 436.

is adversely affected by the lack of technological knowledge and skills[135], and the negative impact of facilitating conditions on its users[136]. Wang and Wang note the significance of social influence in the use of technology in Botswana[137]. Although the advent of hand held technological devices, inclusive of smart phones, increased access to informational resources from any location at any given time, its acceptance and use is a main determining factor.

2.3.3 Diffusion of Innovation Theory

The origins of the Diffusion of Innovation Theory (DIT) was initially discussed in 1903 by a French sociologist, Gabriel Tarde (Toews, 2003) who plotted the original S-shaped diffusion curve, followed by Ryan and Gross[138]. Diffusion is the development by which an innovation is communicated from the beginning to the end by utilising channels over a given time of period. The innovation is cascaded among the members of a communal system or group of people sharing the same belief. Thus, it can be said that diffusion is characterised by four key features which are communication, innovation, period and social system.

June Kaminski[139] explains that the "The Diffusion of Innovation theory is often regarded as a valuable change model for guiding technological innovation where the innovation itself is modified and presented in ways that meet the needs across all levels of adopters… it also stresses the importance of communication and peer networking within the adoption process" Sahint also cites Rogers to describe innovation as

> " an idea, practice, or project that is perceived as new by an individual or other
> unit of adoption … an innovation may have been invented a long time ago, but
> if individuals perceive it as new, then it may still be an innovation for them…the
> newness characteristic of an adoption is more related to the three steps
> (knowledge, persuasion, and decision) of the innovation-decision process"[140].

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[135] Gruzd A, Staves K, Wilk A. 2012. *Connected Scholars: Examining the Role of Social Media in Research Practices of Faculty Using the UTAUT Model, Computers in Human Behavior*, 2340.

[136] Wang H, Wang S. 2010. *User acceptance of mobile internet based on the unified theory of acceptance and use of technology: Investigating the determinants and gender differences, Social Behavior and Personality*, 415.

[137] Wang H, Wang S. 2010. *User acceptance of mobile internet based on the unified theory of acceptance and use of technology: Investigating the determinants and gender differences, Social Behavior and Personality*, 415

[138] Rogers E M. 1995. *Diffusion of Innovations*. 38 - 79.

[139] Kaminski J. 2011. Theory in Nursing Informatics Column, 25-36.

[140] Sahint I. 2006. Detailed Review of Rogers' Diffusion of Innovations Theory and Educational Technology-Related Studies Based On Rogers' Theory, 1-10.

Taken literally, the DIT describes the process that occurs as people adopt a new innovative idea, creation, practice, thinking, technology and concepts. Rogers models this process by indicating the various stages of adopting a new innovative idea by stating that in most cases, at first the idea in its infancy is adopted by few people and these people are early innovators[141]. As these early innovators 'spread the word' more and more people become open to it which leads to the development of a critical mass. Over time, the innovative idea or product becomes diffused amongst the population until a saturation point is achieved. The foundation and roots of the universally acclaimed concept of DIT lies with Everett Rogers[142]. He attributes four main elements to diffusion process such as innovation, communication channels, time and social system.

Innovation – the innovation, itself, as ideas practices or objects that are perceived as new by an individual or other unit of adoption. All innovations are characterised by five main elements:

Relative advantage: the advantage that the current idea supersedes a similar one. This is usually measured in economic terms, the prestige that the bearer carries when associated with the idea. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is going to be.

Compatibility: the degree to which an innovation is consistent with the existing values practices norms. An innovation that does not complement the existing value systems is not easily adopted.

Complexity: the degree to which it is easy to use the innovation. The easier it is for individuals to use any innovation, the more likely they will adopt it.

Trialability: is the degree to which an innovation may be experimented with on a limited basis.

Observability: is the degree to which the results of an innovation are visible to the users. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it. Rogers mentions five categories of adopters of an innovation namely: innovators, early adopters, early majority, late majority, and laggards. Sometimes a sixth group is added: non-adopters. The first five groups are shown in the bell-shaped curve diagram in Figure 2.6. Rogers continued to state the estimated percentage of each category and the ripple effect from the predecessor group, which, in fact, are very similar to the proportions found in a normal bell-curve. This represents Rogers' view points on the adoption of new innovations and the

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[141] Rogers E M. 1983. *Diffusion of Innovations*, 38 - 50.

[142] Rogers E M. 1995. *Diffusion of Innovations*, 4 – 30.

reactions of innovators and their attitude at each level of adoption.

Figure 2.6: **Roger's Bell Curve**

The innovation-decision process shows key thoughts and feelings about technology which influence the decision to adopt an innovation where issues like previous practice, felt needs/problems, innovativeness, norms of social practice are the key driving forces which quick start the innovation-decision process to adopt and embrace an idea. An innovation is brought out of needs and challenges. It is also critical to note, as Rogers puts it, that an innovation may be a long time created idea. However, individual or social perception can rebrand the idea as something new.

Rogers describes the entire DIT Model and the variables that can be used to determine and measure the state and level of innovation acceptance and diffusion into a given communal system. Additional parameters introduced compared to the innovation-decision process are receiver variables which affect the knowledge and also the notable variable of adoption which as well.

Social system – a set of interrelated units that are engaged in joint problem solving to

accomplish a common goal. A social system is explained by Kincsei as a system with elements co-existing in an environment, sharing common interests and intentions to solve problems and attain esteemed norms and values of that society economically, technically and culturally[143]. Norms and values are the established behaviour patterns for the elements of a social system. The elements of the social system constitute persons, informal groups of people, organisations and related subsystems. The social system exhibits a norm that becomes frontier which is the impetus of DIT for a given technology. This social system becomes the agent of change which influences other members' innovation-decisions in a manner which is desirable to invoke by a change or orientation towards a certain technology.

Communication-   Communication is the process by which members of a social system use to create and share information for the purposes of achieving desired actions and general understanding. Communications, therefore, acts as conveyance facility by which messages about an innovation are transmitted from one person to another. The process of communicating is then defined as the process where the sender transmits a message and the receiver interprets and understands it. Many communication channels or media are used to convey messages from sender to receiver. Korupp and Szydlik contend that mass media channels are more effective in creating knowledge of innovations, whereas interpersonal channels are more effective in forming and changing attitudes toward a new idea, and, thus, in influencing the decision to adopt or reject a new idea[144]. Robinson and Crenshaw reports that a member of a social system reflects and reviews an innovation by looking at norms and values of peer social members[145].

Time – the time dimension is involved in diffusion. Rogers considers three time factors:

Innovation Decision Process Theory – the theory states that there are five distinct stages in this process namely; (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation. The "knowledge" and "persuasion" stages in the case of ICT can be accelerated by the involvement of public and private sectors in informing and providing hard/soft info-structure for the mass public to use ICT. The "confirmation" stage involves the individual or groups own experiences in using ICT. The end users will either reject or continue using ICT if they perceive the quality and relevance of the technology to be of sufficient benefit to them.

Innovativeness Theory – it states that those individuals who are predisposed to being

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[143] Kincsei. A .2007. Technology and society in the information age, 1-25.

[144] Korupp E S, Szydlik M. 2005. Causes and Trends of the Digital Divide, 409-422

[145] Robison K K, Crenshaw M E. 2010. *Reevaluating the Global Digital Divide: Socio-Demographic and Conflict Barriers to the Internet Revolution*, 34–62.

innovative will adopt a new technology earlier than those who are less predisposed.

Rate of Adoption – innovations are diffused over time in a pattern that resembles an "S-shaped" curve. It theorises that an innovation goes through a period of slow and gradual growth before experiencing a period of relatively dramatic and rapid growth. The process of innovation and diffusion with passage of time and also the normal reactions and expectations of an innovator is shown in Figure 2.7. The first exposure and reaction is "ooh, I am pathetic to this technology", as changes occurs and peer pressure increase. The innovator appreciates the technology and resolves to put more effort to the adoption of a technology as it gains value and importance to the adaptor.

Figure 2.7: **Diffusion Innovation Theory Model**
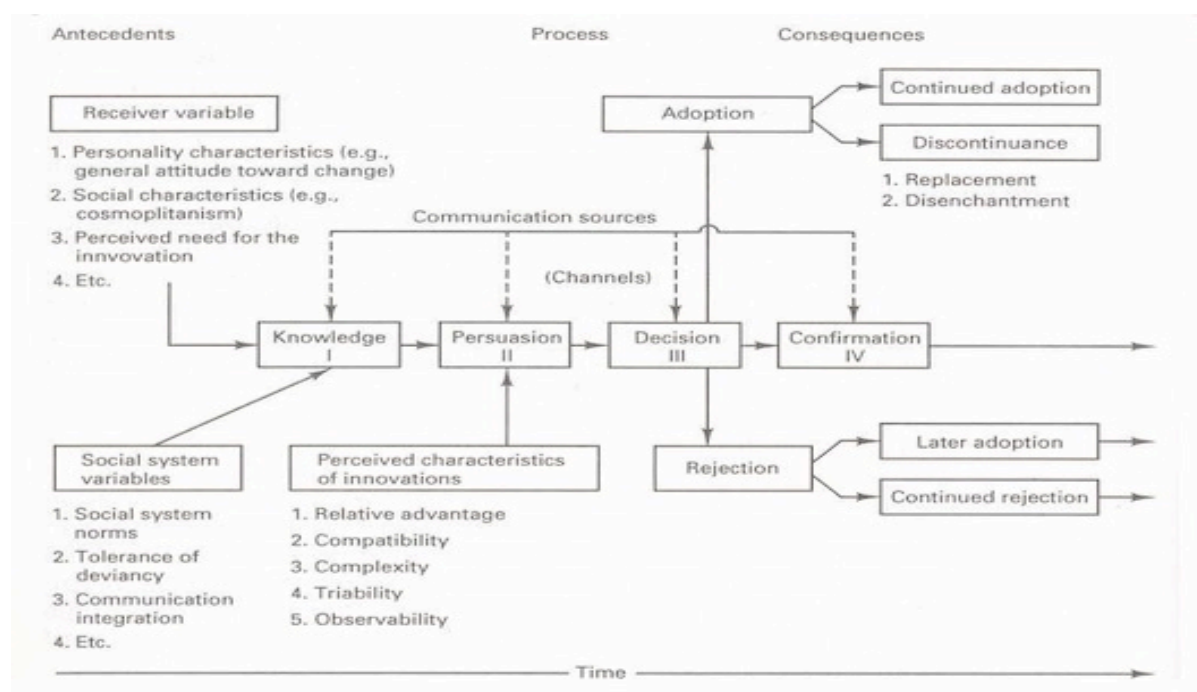
The United Nations (UN) recognises the importance of ICT and it passed a resolution 56/258[146], which states that "Information and communication technologies are among the critical determinants for creating a global knowledge-based economy, accelerating growth, raising competitiveness, promoting sustainable development, eradicating poverty and facilitating the effective integration of all countries into the global economy"[147]. The notion of ICT technologies is clearly applicable in the DIT. The critical mass attained and achieved during the innovation decision process through influence of the innovators and early adopters whose

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[146] United Nations Education, Scientific and Cultural Organisation (UNESCO). 2009.

[147] Demeke W, Olden A. 2012. Researching the adoption of ICT in Ethiopia, 519 – 528.

decisions, attitude and perception initiate a spark to adopt and use ICT technologies is very essential. This group of people shall create a momentum to drive other people and serve as opinion leaders. Opinion leaders play a critical role as agents of change who possess the influential power through peer to peer relations as they influence others to use ICT technologies. This approach functions very well within a society or a given communal system or organisation. For instance, the research could borrow some measurable variables to determine the rate of technological diffusion in the Botswana society and then help to determine whether there is a digital divide or not.

The DIT can serve researchers, information technologists, ICT policymakers and change agents well to determine the level of ICT technologies adoption and utilization. Rogers'[148] comments that the theory also promotes the intention of change because respect and deliberation for all involved parties of interest is knotted with strong approaches for implementing innovative change. Ultimately it is a good tool to use for measuring DD.

Studies conducted in Botswana that utilised the DIT reveal interesting findings. The DIT highlighted how the adopters of ICT perceive technological devices based on its intended advantages and disadvantages. The adoption of technology is interconnected with an individuals' attitudes and personal perceptions. A study by Gono reveals that the level of ICT is dependent on the capabilities and competencies of an individual, both of which impacts the degree of ICT adoption[149]. The relatively slow diffusion of ICT adoption is attributed to economic, political, and technological factors. More specifically, the adoption of ICT and electronic commerce in Botswana is affected by the lack of IT-related knowledge and skills[150].

2.3.4 Spatially Aware Technology Utilization Model

Spatially Aware Technology Utilisation Model (SATUM) was adapted to further examine the affordability, demographic, economic, infrastructural, innovation, social capital, and societal openness with key indicators of internet use (as illustrated in Figure 2.8). Societal openness suggests that an open society is significantly more likely to foster the utilisation of ICT as a way to enhance communication and dissemination of information[151]. Social capital allots users

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[148] Rogers E M. 1995. *Diffusion of Innovation*, 1 -236.

[149] Gono S. 2016. *Exploring ICT Adoption by SMEs in South Africa, LSBM Working Paper Series*, 74.

[150] Usoro A, Majewski G, Ifinedo P, Arikpo II. 2012. Leveraging Developing Economies with the Use of Information Technology: Trends and Tools, 160.

[151] Agarwal R, Amines A, Prasad K. 2009. *Social interactions and the 'digital divide': Explaining variations in*

that are connected socially to support individuals and communities that are challenged technologically[152]. Increased social capital enhances the provision and accessibility to resources including materials and the development of skills. Since SATUM conceptually examines DD on a global, provincial, or macro-regional scale, DD cannot be studied on an individual or household level using SATUM[153].

Demographic and socio-economic factors have examined the digital divide and its association with the indicators related to the access and utilisation of ICT. Factors inclusive of age, education, ethnicity, gender, family structure, income, race, and indicators of economic development such as availability of electricity, cost of ICT access, GDP per capital, market structure, per capita manufacturing costs, public policy and services workforce are used to measure DD[154]. SATUM examines the spatial autocorrelation of key ICT indicators in addition to independent correlates. Research literature posits that "spatial autocorrelation in error terms implies that the geographic forces are exogenous to the conceptual model. Furthermore, ICT dependent variables are also not screened for spatial autocorrelation"[155]. In addition to these spatial factors, a key spatial factor of technology adoption known as the scope and extent of urbanisation is used to further assess its significant correlation with dependent ICT variables. SATUM examines whether communities, provinces, or regions with either low or high levels of technology and ICT adoption are directly or indirectly affected by the geographic location and its "proximity to regions, provinces, or communities with similar levels of ICT adoption"[156].

The issue of geographical differences has always been at the centre of reference on how diffusion of technology is taking place. Rodgers has outlined how people adapt to new innovation. He has also outlined the different characteristics of the people that adopt and own up to the technology. Capella posits that, "the spatial adoption potential theory predicts that technological developments follow a filtering down process from the urban hierarchy (core

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internet use, 277.

[152] Agarwal R, Amines A, Prasad K. 2009. *Social interactions and the 'digital divide': Explaining variations in internet use*, 277.

[153] Norris DT, Conceição, S. 2004. *Narrowing the digital divide in low-income, urban communities*, 74.

[154] Pick J, Sarkar A. 2016. Theories of the digital divide: Critical comparison, 3892.

[155] Pick J, Sarkar A. 2016. Theories of the digital divide: Critical comparison, 3892.

[156] Pick J, Sarkar A. 2016. Theories of the digital divide: Critical comparison, 3892.

area) to the peripheral area"[157]. He further outlines that "the agglomeration effect theory also agrees on how the adoption of a new technology is taking place: the core areas will be the centre for further growth, including with improved or adopting to new technology"[158]. On another note, it can be highlighted that the areas in the peripherals of Gaborone are likely to receive developments at a later stage. These developments include electricity and laying of fibre connection amongst others. Most of the development undertaken are linked to market demands, ability to utilise the technology – skills and knowledge and other economic forces will always be at play.

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[157] Capello, R. 1994, Spatial Economic Analysis of Telecommunications Networks Externalities, 145.

[158] Capello, Roberta, 1994, Spatial Economic Analysis of Telecommunications Networks Externalities, 145

Figure 2.8: Dependent and Independent Variables of SPATUM
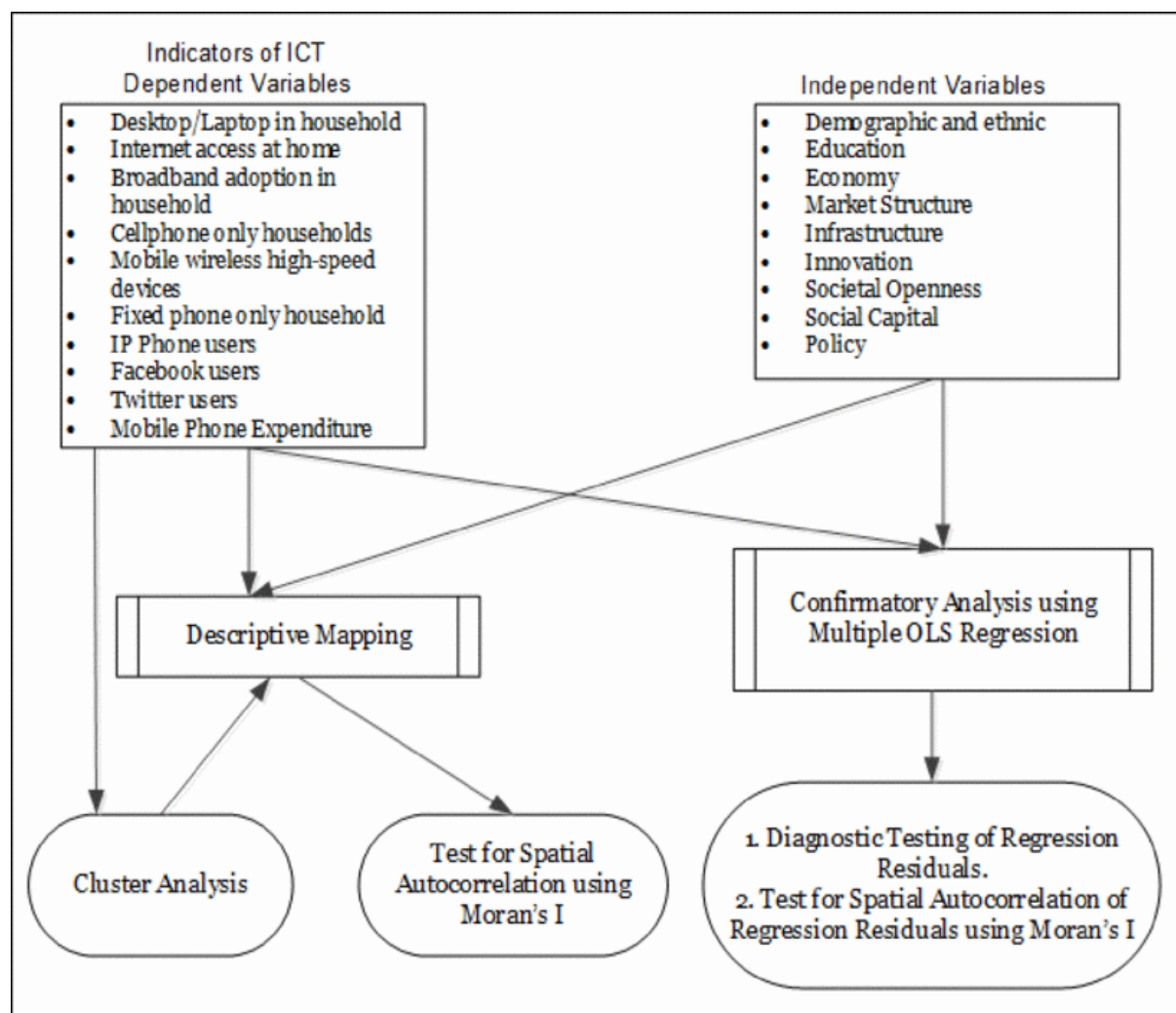
Similar to the other theories and models used in this study, SATUM was beneficial in that it adequately examines the DD within a given geographic area. It focuses on analysing the socio-economic and political determinants that may impact the DD between various geographic locations[159]. Despite its advantages, SATUM has some drawbacks. SATUM fails to provide both multi-directional and multi-level pathways of influence. It also negates to include the presence of psychological factors on an individual level such as behaviours, intentions, motivation, and satisfaction, all of which may influence the existence or lack thereof of a DD[160].

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[159] Pick J, Sarkar A. 2016. Theories of the digital divide: Critical comparison, 3892.

[160] Pick J, Sarkar A. 2016. Theories of the digital divide: Critical comparison, 3893.

2.5 Assessment and Evaluation of Digital Divide

Eamon did a study of DD between the poor and non-poor youth in a community of White Americans, American and Latinos aged between 14 – 21 years old who attended public schools[161]. The study aimed at assessing the disparity of DD in the context of a home computer ownership and its impact on academic achievement. A sample population of 2000 youth was randomly selected for the analysis. Independent variables used to assess the DD were poverty, age, gender, race, parent marital status and parent education. Dependent variables were defined as ownership of home computer, utilisation rate for academic and non-academic purposes. The research determined that 87% of non-poor youth had a computer at home compared to only 55.89% poor youth. The study revealed that since poor youth are less likely to have access to a home computer, they are forced to use computers in schools or in other community locations where their computer use probably would be more restricted and monitored. Indeed, there is a digital divide between poor and non-poor young adolescents.

Djik defines that traditional DD evaluation has been based on individual descriptive data like demographics of individuals who have access to and those without[162]. This information provides a descriptive data which does not offer an insightful analysis of why there is DD. Van Djik mentions such typical demographics information as level of income and education, employment, age, sex, and ethnicity. Due to this deficiency, Djik proposes the use of theory framework of Causal Model of Resources and Appropriation Theory for evaluating DD. The key points of the model highlight the key constructs like personal and positional category, distribution of resources, access to ICTs and their characteristics, and finally participation in the society. Personal and positional construct is meant to explain individual's profile data like age, gender, race, intelligence, personality and health. Positional categories relate to labour position, educational level, household and nation. Kind of access is the construct that looks at innovativeness, motivation and material support to continue using the resources.

Salman *et al.* used the DIT and derived a model to measure internet usage among a Malaysian urban community[163]. The study used a survey questionnaire to obtain data on the adoption and

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[161] Eamon M K.2004. Digital Divide in Computer Access and Use Between Poor and Non-Poor Youth, 1 – 23.

[162] Van Djik J. 2012. Evolution of the Digital Divide: The Digital Divide Turns to Inequality of Skills and Usage, 1- 19.

[163] Salman A, Hasim M S. 2011. Internet Usage in a Malaysian Sub-Urban community: A Study of Diffusion of ICT Innovation, 1 – 15.

usage of internet. Purposive sampling technique was used to get sample population. The study used age, gender, employment status, academic qualification and income to mediate on the adoption and usage of internet. Key constructs used on the usage of internet were information sources, ownership devices to access information and places for accessing information. Using these factors and key constructs the study's results indicate that about two-thirds used internet in their work environment. The respondents found internet to have added advantage of simplicity. This shows typical characteristics which bring about the diffusion of an innovation as put forward by Rogers[164].

LaRosea *et al.* evaluate and assess the DD in American rural places by analysing the broadband gap[165]. Their motivation was the adoption of broadband services in the rural United States. These presents something of a paradox because even where access is available, the adoption has lagged behind than in urban areas. They define the following factors to measure the broadband gap; internet experience, broadband intentions, observational learning, enactive learning, and self-efficacy. Their analysis of these two constructs was mediated by education, household income, gender and age. The research involved 1,592 heads of households in four rural areas in United States. The results indicate that there, indeed, was a DD of broadband gap between rural areas and urban areas. Their research recommended that the promotional efforts by rural community institutions that connect potential users with previous broadband adopters to stress the benefits of broadband usage and bolster the self-efficacy of novices may be necessary to bridge the gap[166].

Chigona and Licker conducted a study using DIT to measure the adoption and utilisation of computing facilities[167]. They did interviews with the participants to determine their perception, experience, behavioural intention and adoption of computing facilities in communal computing facilities. They derived themes from the interview data and fit it in the key constructs of the DIT as a relative advantage, complexity, communication channels, compatibility, observability, trialibility, social system and duration of the time for usage. Their results, when

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[164] Salman A, Hasim M S. 2011. Internet Usage in a Malaysian Sub-Urban community: A Study of Diffusion of ICT Innovation, 1 – 15

[165] LaRosea R, Gregg J L, Stroverc S, Straubhaarc J, Carpenter S. 2007. *Closing the rural broadband gap: Promoting adoption of the Internet in rural America*, 359–373.

[166] LaRosea R, Gregg J L, Stroverc S, Straubhaarc J, Carpenter S. 2007. *Closing the rural broadband gap: Promoting adoption of the Internet in rural America*, 359–373

[167] Chigona W, Licker P. 2008. *Using Diffusion of Innovations Framework to Explain Communal Computing Facilities Adoption Among the Urban Poor*, 57–73

interpreted, gave them an insight on the adoption and usage of the computing facilitates found in these communal centres.

The research based on the application of DIT, opted to use age, gender, geographical location as factors that could be used to explain DD in Gaborone[168]. This approach was determined as applicable in the study because the research measured DD based on what is referred to as first order DD. Dijk and Selwyn criticise the oversimplification of measuring and assessing DD[169] and state that another aspect to study DD is to consider the social systems that occur in a community which is called second order DD[170]. This implies studying the socio-cognitive skills in adoption and usage of technology. It requires establishing what value does one need to enhance their knowledge of using computers, what skills does one have, the experience self-efficacy and geographical location where access is done. Based on this analysis the research adopted geographical location, gender, education as critical factors to explain DD in Gaborone based on internet experience, self-efficacy, information access, devices used, access to internet and places of internet access.

2.6 Conceptual Framework

As societies enhanced accessibility to technology creates opportunities for its ability to adopt and utilize technology. This aids in creating an information society which is more capable of solving social, cultural and economic challenges. This study, we study information society in the context of measuring Digital Divide to the larger people living in Gaborone and surrounding areas.

Information Society (IS) can be explained in a twofold approach as argued by Daniel Bell[171]: first, information is used as an economic resource. A society can create social constructs that make the greater use of information processing, transmission and storage facilities to enlarge its good organisation, stimulate innovation and boost effectiveness and competitiveness through producing quality products and services. Secondly, with the advent of IS, a society, through its social constructs, can identify greater use of information among the general public. People use information more intensively in their activities as consumers: to inform their choices

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[168] Eamon K M. 2004. Digital Divide in Computer Access and Use Between Poor and Non-Poor Youth, 1 – 23.

[181] Van Dijk J. 2006. Digital divide research, achievements and shortcomings, 4-5.

[182] Warschauer M. 2003. Demystifying the Digital Divide,42-47.

[171] Bell D. 1973. The Corning of the Post-industrial Society, 1 – 19.

between different products, explore their entitlements to public services, and take greater control over their own lives. They also use information as citizens to exercise their civil rights and responsibilities.

The DIT informed the study's conceptual framework by considering issues like diffusion of innovation and user technology acceptance. The conceptual framework builds variable construct from the two theories. The conceptual framework provided in figure 4 below build. In assessing the adoption or rejection, the study used DIT constructs as variables with attributes of Innovation, Communication channel, time and social system as illustrated in Fig. 2.9 below.

Figure 2.9: Research Conceptual Framework
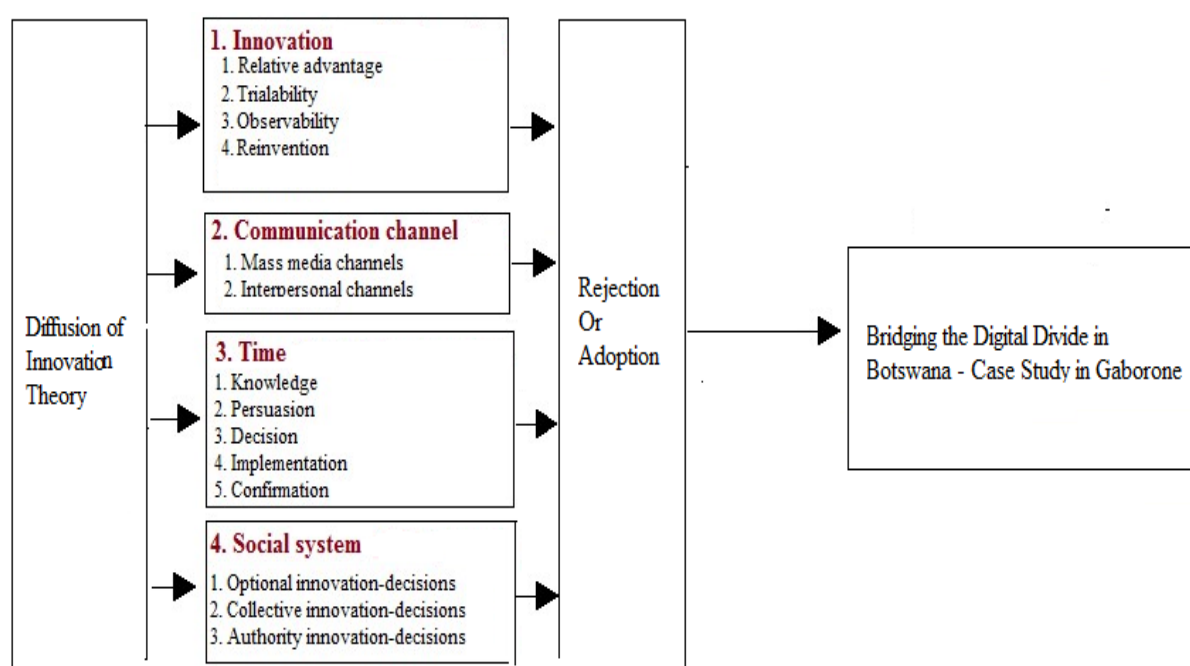
Conceptual framework defined the key focus areas to assist in answering study's research questions. Educational, geographical location and gender were used as mediating factors to explain the internet access, devices used, places of internet access, type of information accesses, skills used and lacking and the applications used to get information. These factors are explained under the key constructs of the DIT as Innovation, Communication Channel, Time and Social System. The justifications and approached is explained below as each factors are categorised under the key constructs of the DIT theory.

Innovation decisions making: The research sought data based on the innovativeness of using internet as source of information and the devices used to get information. The study looked the type of devices used to get information based on the relative advantage of the devices and the convenience involved in such a technology.

Communication Channels informing on Innovations: The research measured and determined what communication media or channels are used by people living in Gaborone and surrounding to inform and learn on new innovative IT skills and technologies. The evaluation considered various IT technologies available in various geographical locations in Gaborone and surrounding areas, educational status, gender status and also authoritative obligation. For instance, the government of Botswana provides services to the citizens online i.e. e-passport and many others. Most banks in Botswana now provide e-banking services. The question is how effective are these IT technologies utilized with respect to spatiality, educational status and individuality.

Level of Innovation of innovators based on Rogers time line scale was measured by prompting users to provide the number of years a user has been exposed to IT technologies in particular for making informed decisions, achieving business tasks. The level of innovation was also provoked by asking the respondents the preferred technologies and how often do they use them.

Social Impact: The social impact was measured as way of determining the response of social constructs in Botswana to electronic commerce like e-banking, e-governance, e-health, and social media engagement. These IT technologies are deemed to project the social image users. A social system is defined as a set of interrelated units that have a common aim to solve a problem and accomplish a common goal. The GoB and the all the critical stakeholders are obliged to provide competitive services to the citizens. The research seeks to determine uptake of internet application usage.

However, DIT as a theoretical framework fails to adequately examine digital divide since DIT fails to acknowledge the importance of geographic proximity and spatial autocorrelation. In order to close this gap in research, SATUM was used as the study's conceptual framework. SATUM is considered a good choice since added to the research framework and the data collected and analyzed to assess the existence and impact of technology and internet use patterns in Gaborone and the surrounding areas[172].

2.7 Summary

Van Dijk has explored widely the concepts of IS. Webster, defines IS as composed of five tenets; economic, technological, occupational, spatial and cultural. In an IS, more and more people become technologically advanced and there is a radical shift that results in a new order.

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[172] Pick, J & Sarkar, A. 2016. *Theories of the digital divide: Critical comparison*, 3893.

The creation of the new order has resulted in advancement in technology. There are new mediums of communication primarily centred on the computer and the internet technology. Access to the computer and internet are crucial entry point to participating in the "new society". While these advancements have been crucial to the positive development of mankind, they have created a new phenomenon called the DD.

This chapter has shown that the DD has rapidly become a concern at both regional and international level for the policy makers. Many researchers have simplistically discussed how the DD was viewed and interpreted from the perspective of the "haves" and the "have not's". Nonetheless, DD is now being discussed beyond the simplistic view of access to the computer and the internet. DiMaggio and Hargittai argue that, the issue of simply access to ICTs is not sufficient.

The provision of the digitally marginalised can be excluded from access to a computer and the internet. They may also have access to the communication system, but demonstrates a significantly low technical capacity to use such. As the "medium" spreads to a majority of the population, it is increasingly important to look at not only who uses the Internet, but also to distinguish varying levels of online skills among individuals. Skill, in this context, is defined as "*the ability to efficiently and effectively find information on the Web and use it in an economically and socially beneficial manner"[173].*The acquisition of knowledge and skills broadens one of the most vital forms of exclusion, cultural and education-based exclusion, following an increase in the digital world[174]". In Castells' view; access, education, technical proficiency and education are considered three major determinant factors for DD.

In summary, the SATUM was employed as the most suitable approach in this study. The UTAUT Model aids in evaluating an individual user's expectancy to access and use ICTs based on expectation, self-efficacy, and other social factors. Moreover, the UTAUT Model further posits that an individuals' use if the internet and ICTs are moderated by age, experience, gender, and voluntariness[175]. SATUM helps to identify the leading determinants of ICT adoption and utilisation including gender, education and geographic location. These are key variables in assessing the utilization of the internet and other technologies.

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[173]Hargittai, E. 2002. *Second-Level Digital Divide*, 1- 10.

[174] Castells M .2005. O caos e o progresso. Portal do Projeto Software Livre do Brasil

[175] Samaradiwakara G C, Gunawardena G. 2014. *Comparison of Existing Technology Acceptance Theories and Models to Suggest a Well Improved Theory/Model*, 1 – 16.

Chapter 3
The Case Study

3.0 Introduction

A case study approach examined the use of computer technology and the internet among residents of greater Gaborone area. This chapter discusses a case study approach, population sample, data collection tools, methods and procedures. It also discusses the validity and reliability of the study. The variables assessed in the questionnaire, data analysis and interpretations, and ethical considerations are also explained.

3.1 Research Questions

The primary research question addressed: What is the impact of ICT and internet use patterns of people living in Gaborone and surrounding areas? The following four research questions served as a guide to this quantitative research study:

Research question #1: What are the most common forms of technologies (devices) \
                               used to access internet resources in the Gaborone area?

Research question #2: How often is the internet used as a source of information?

Research question #3: Where are ICTs used most frequently?

Research question #4: Does access to technology affect the usage rate or frequency

3.2 Research Design

Research design that provides a guideline as to how a research project was executed. It provides the details on the logistics and arrangements on how the data was collected[176]. Yin explains the

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[176] Yin R K (2008) *Design and Methods*

logistical arrangement and conditions for collecting and analysing data in a manner that seeks to add relevance to the research topic, which in turn brings about optimization in the research[177]. This study was conducted within the business terrain where practice, theory and social relations were inseparable entities.

This research employed the quantitative research technique which uses numeric data, structured questions uses a statistical analysis to confirm or deduce the facts of a given theory[178]. The researcher had initially resolved to using both the qualitative and quantitative research approaches, hence combining the Structured Questionnaire and Interviews method of data collection. Along the way, this approach was changed as there was a very poor response from the respondents for the one-on-one interviews. The researcher, therefore, changed the research approach to only quantitative.

3.2.1 The Quantitative Method

The quantitative research method involves obtaining and analysing data in numerical form. It provides values in a statistical form. After familiarisation with the problem area, the researcher developed a hypothesis and created an instrument to gather data to test the hypothesis. After the researcher familiarised himself with the nature of the research problem and generating the hypothesis, quantitative methods provide focus on using the data to confirm or reject hypotheses. In social research the main tool used in quantitative research is the structured questionnaire. It is a standardised instrument to ensure that the responses fit a predetermined criterion. Questions used in quantitative research are close-ended, uniform and rigid. The respondents are asked similar questions in the same order and time to avoid the possibility of anything tainting the data. The data obtained was useful for determining the quantity of variation and predict causal relationships among or between variables. To ensure a higher response rate, the closed ended questionnaire was translated from English to Setswana, the natural language, to encourage a higher participation from the respondents. Researchers who use quantitative methods emphasize the measurement and analysis of causal relationships between the variables. Results in quantitative research are usually illustrated and summarized by the use of charts and graphs, and are expressed in statistical form. Quantitative research can be used to determine the characteristics of a population. This research method has the

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[177] Yin R K (2008) *Design and Methods*

[178] Bazeley P, (2002) *Issues in Mixing Qualitative and Quantitative Approaches to Research*

advantage of high reliability because it cannot be subject to the bias through subjective interpretations.

3.2.2 Data Collection

A structured questionnaire was used to obtain specific responses for easier quantitative analysis. The questionnaire was made up of close-ended questions for easier and clearer data analysis. The questionnaire was constructed in simple English language. There were simple instructions on how to answer the questions to cater for various language competency levels of potential respondents. The length of the questionnaire was a reasonable number of questions to ensure that the respondents did not get frustrated with a long questionnaire. The questions for the questionnaire were formulated using the key thematic points or issues as indicated in the United Theory of Acceptance and Use of Technology Model (UTAUT), DIT and GUT. The aim of the questionnaire was to measure the user's knowledge, skills and usage of the computer. It was also designed to capture and understand how often the users used computers and for what. Each one of the components measured by one or several components incorporated in the questionnaire, which were also been used in previous researches. Adopting or adapting questions used by other researchers makes it possible to compare results, but, most importantly, it provides reliability[179]. Appendix 1 shows the formulated questions. The answers to the questionnaires have definite options and numbers opting for a particular response and can be counted and represented on charts and graphs. The researcher distributed the questionnaire to the respondents at their place of work, in schools and in internet cafes in and around Gaborone. Where possible, the researcher waited for the respondents to complete the questionnaire in order to ensure a good response rate. Where the respondents could not complete the questionnaire on the day it was handed, the researcher made follow ups and collected them from those left behind through an identified representative of the class, government office or the internet café's owners.

3.3. Sampling Strategy

3.3.1 Target Population

The intended population for the case study was 1,000 respondents. This included students,

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[179] Saunders Lewis & Thornhill (2009) Research Methods for Business Students

government employees and customers at internet cafes. Consequently, a total of 1,000 questionnaires were administered. However, only 644 were completed and returned by the respondents. Hence, a response rate of 60.53% was attained for the study's sample, which is deemed acceptable since it is in line with the sampling principle that a good response rate should exceed 30%[180]. Sampling theory guarantees good results regardless of the population size, provided the sample is bigger than 30% (n > 30) of the whole population, where n is the sample size.

Questionnaires were disseminated throughout Gaborone and its peri-urban centres inclusive of Mochudi, Ramotswa and Tlokweng. Rural areas included Ranaka and Otse. These areas are identified and referred to as part of the greater Gaborone. The researcher made an arrangement to distribute the questionnaires to the students in all the schools and government offices in the areas. For the internet cafes, an arrangement was made with the owner of the internet cafes to give printed copies of the questionnaire to all the people that visited the cafes. The questionnaires were filled and left in a box for collection by the researcher. For purposes of anonymity, none of the respondents were expected to provide any names. Another method of distributing the questionnaires included the use of Google docs. A link was shared with the relevant staff members in the government departments and the internet cafes.

3.3.2 The Sample

A sample is an observed subset of population, which is supposed to represent that population[181]. A sample is a portion of the overall population that one wishes to study. It possesses the information and data that the researcher wishes to collect. The identified sample was students, government employees and the general public that were customers of internet cafes. The current research needed to identify the people who were users of the internet and computers and who possessed the requisite information to assist the researcher in undertaking on the research. It was preferable to devote resources to subsets of the population in the hope that such a concentration of effort will produce more accurate measurements. The sampling process is a process of selecting a few (sample) from a bigger group (target population) to become the basis

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[180] Nalzaro (2012), Chapter 8 – Sample and Sampling Techniques, Slides-Share

http://www.slideshare.net/ludymae/chapter-8sample-sampling-techniques. Cited 11 April 2014

[181] Nalzaro (2012), Chapter 8 – Sample and Sampling Techniques, Slides-Share

http://www.slideshare.net/ludymae/chapter-8sample-sampling-techniques. Cited 11 April 2014

for estimating or predicting a fact, situation or outcome regarding the bigger group[182]. It was, thus, prudent to identify the sample in line with the research objectives, its limitations and the overall guidance from literature review.

3.3.3 Sampling technique

The sampling technique employed in this research was the stratified random sampling technique. Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata. In stratified random sampling, or stratification, the strata are formed based on members' shared attributes or characteristics. Through this technique, the student population in all the schools visited in Gaborone, Tlokweng, Mochudi and Ramotswa was divided into stratus. A total of 10 schools where visited in all the places. The main distinguishing factor of the stratus was students that took computer studies as part of their curriculum. A questionnaire was distributed to some of the students to solicit their responses. The ideal was to distribute the questionnaire to all the student community undertaking computing studies but due to time constraints, it was not feasible to undertake this exercises

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[182] Nalzaro (2012), Chapter 8 – Sample and Sampling Techniques, Slides-Share

http://www.slideshare.net/ludymae/chapter-8sample-sampling-techniques. Cited 11 April 2014

3.3.4 Sample size

Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. In determining the sample size, two major factors were taken into consideration. Firstly, the time constraint in undertaking and completing the research study and secondly, the sample size had to be large enough to provide a good basis for undertaking the analysis. The sample size for the study was 644 responses gathered out of the 1,000 who were targeted. This is approximately 64.4% of the population size. The nonresponses were mostly due to the non-returning of the questionnaires by some of the students, government employees and the customers in the internet cafes. Government employees cited that they have some demanding work schedules, while the students cited pressure from school assignments. Most of the customers who did not participate in internet cafes, cited their limited time – they only came into the café for a short time to quickly access the internet and leave. In summary, the population was students and adults. Their ages ranged from 13 to 65 years. These are people who understood both English and Setswana. Furthermore, they used a computer in one form or the other.

3.4   Data Collection Tools

A structured questionnaire was used to obtain specific responses for easier quantitative analysis. The questionnaire was made up of close-ended questions for easier and clearer data analysis. The questionnaire was constructed in very simple English. There were simple instructions on how to answer the questions to cater for various language competency levels of potential respondents. The length of the questionnaire was made modest to ensure the respondents do not get frustrated with a long questionnaire. The questionnaire was provided in a paper based medium and in an electronic medium.

3.5   Data Collection Procedures

All research participants were given 30 days to complete and return the questionnaire. An arrangement was made to return the questionnaire to a class, office and internet service provider representative. The questionnaire was to be physically delivered to the relevant person. The survey questionnaire was available in both print and electronic to maximise response rate. The participants were provided with a sealable envelope and advised to place their completed questionnaire in it.

3.6   Validity and Reliability of Research

The validity and reliability ensure that the research findings have good quality output.

3.6.1 Reliability

Reliability refers to the consistency of the data-gathering instrument in obtaining the same results in a similar situation[183]. The questionnaire used to gather data from the respondents was designed to ensure consistency as long as the participants understood and responded. Reliability refers to the extent to which an instrument maintains consistency in whatever it is measuring, wherever it is administered as long as the population is the same. Consistency gives the researcher confidence that the results truly represent what he / she intended to study[184]. Reliability can be assessed by posing the following questions.

    a.   Will the measured yield the same results on other occasions and in different places?

    b.   Will similar observations be reached by other researchers?

    c.   Is there transparency in how the data was constructed?

Careful consideration was undertaken to simplify the questions as much as possible in instrument design. Objectivity refers to the absence of subjective judgments[185]. In addressing this problem, the questionnaire was pilot tested. The feedback solicited during the piloting of the research was incorporated to ensure a robust and unambiguous questionnaire.

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[183] Sharan B M (1995) What Can You Tell from an N of 1: Issues of Validity and Reliability, 57

[184] Sharan (1995), What Can You Tell from an N of 1: Issues of Validity and Reliability, 56

[185] Sharan (1995), What Can You Tell from an N of 1: Issues of Validity and Reliability, 56

3.6.2 Validity

Validity is quality of the data gathering instruments that enables them to measure what they are intended to measure[186]. A sound argument and justification can easily be made from the data that has been carefully collected through a well validated and robust instrument. There are three forms of validity: construct validity, internal validity and external validity[187]. For construct validity, it is important to establish correct operational measures for the concepts that are being studied and that objective judgment is used to collect data. Quantitative research validity refers mainly to construct validity in which the construct is the initial concept, notion, question or hypothesis that determine data to be gathered and how it is to be gathered. The way the instrument is constructed determines its credibility. Internal validity entails establishing the causal relationships, which shows that specific conditions lead to other conditions[188]. Validity concerns the establishment of the field to which the findings can be generalised.

Again, the validity of the study may be further influenced by the fact that people's perceptions can vary over time, which makes it difficult for the researcher to achieve the same results even if the same sample were to be used. The researcher did everything possible to ensure that the data collected, captured and analysed was valid and relevant to this study.

3.7   Data Collection Procedures

All research participants were given 30 days to complete and return the questionnaire. An arrangement had been made to return the questionnaire to a class, office and internet service provider representative. The questionnaire was to be physically delivered to the relevant person. The survey questionnaire was available in both print and electronically to maximize response rate.

The electronic medium was emailed to the survey participants. Each participant accessed the shared link and captured their respective answers accordingly. Once the participant had submitted the electronic questionnaire, they could not provide input from the same computer again. This ensured that one person did not make multiple submissions to a questionnaire.

Prior to utilisation, the questionnaire was pilot tested to ensure all research participants fully

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[186]Sharan B. M. (1995) What Can You Tell of an N of 1, 40-60

[187] Sharan B. M. (1995) What Can You Tell of an N of 1, 51-60

[188] Sharan B. M. (1995) What Can You Tell of an N of 1, 51-60

understand the questions asked within the questionnaire.

3.8 Description of the Questionnaire Variables

The questionnaire was subdivided into a total of five major sections. The following sections were addressed accordingly:

(i)   Section 1: Demographic information

(ii)   Section 2: Internet utilisation

(iii)   Section 3: Communication Channels

(iv)   Section 4: Level of adoption, skills and utilisation

(v)   Section 5: Social impact

3.8.1   Demographic Information

Key variables, inclusive of gender, education level, and geographic location, were measured in this study. It is important to understand the socio-economic and demographic factors that contributed to the profile of the respondents. A number of factors have been suggested in previous researches. These factors include income, employment, gender, age, disability, ethnicity, age, income, education, employment and disability. The importance of these factors vary across the various researches previously conducted. Gender was measured by asking the respondents to choose between male and female. Educational level was measured along primary, junior, secondary and tertiary education categories.

Finally, the location was measured according to urban, peri-urban and rural areas. The purpose of this variable was to appreciate and document the location of the respondent. SATUM identifies the proximity of regions, provinces or communities as being critical to the adoption of ICT. It further highlights that the areas in the same proximity are likely to have the same level of technology adoption. The purpose of the "location" variable was to identify the location and its proximity to the urban areas. It is critical to explore the issue of geographical difference in line with the adoption of technology. Previous studies have highlighted that rural population are more likely to follow the laggards in the adoption of technology[189].

3.8.2   Internet Utilisation

Hargittai explains that as the "medium spreads to a majority of the population, it is increasingly

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[189] Capello, Roberta, 1994, Spatial Economic Analysis of Telecommunications Networks Externalities, 145

important to look at not only who uses the Internet, but also to distinguish varying levels of online skills among individuals". This claim is further supported by LaRose, Mastro and Eastin[190], who posit that there is a need to profile a typical user's week'. This can be achieved by measuring typical internet utilisation patterns, sites visited and search engines that were predominantly used. This section (Internet Utilisation) also assessed the relative advantage of using the internet, value of using internet, trialiability of using the internet as well as the overall effectiveness and convenience of using ICT and the internet for information (i.e. whether the technological devices used are mobile or fixed etc.). Based on the DIT, the answers generated from this section of the questionnaire aims to measure the innovation of a given technological advancement. This information can be used to measure the level of adoption, acceptance, and utilisation of ICTs such as the internet and online applications. A review of literature highlighted a number of factors that can determine the level of usage of internet / computer by an individual. These factors are guided by the following questions as captured in the questionnaire:

i.   Which of the following do you use internet for;

ii.   How often does a use access and use the internet in a particular week;

iii. Which of the social media related sites does a user access;

iv.   Their choice or preference of the search engine;

v.   Which online services do you frequently use for online purchases;

vi.   Which of the following online payment services do you use; and

vii. Which type of cloud based storage solution do you use.

3.8.3 Communication Channels

An open society is more likely to leverage on ICT as a medium of communication. Societal openness suggests that an open society is significantly more likely to foster the utilisation of ICT as a way of enhancing communication and dissemination information. This section of the questionnaire sought to establish the level of utilisation of the computer and the internet the for purposes of communication. Communication channels were used to help measure key information pertaining to the types of technologies used and where users learnt how to use such technologies. All questions measured in accordance to communication were designed to address the issues underlying learning by examining how each respective research participant

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[190] LaRosea R, Gregg J L, Stroverc S, Straubhaarc S, Carpenter S. 2007. Closing the Rural Broadband Gap: 359–373.

learnt about the ICTs used.

One of the most significant factors that contribute to the existence of a DD reviews an individual's physical access to ICTs and the Internet. As critiqued in the literature, digital divide is defined as "inequalities between various social groups in the accessibility of digital technologies". In undertaking these questions on communication channel, the research sought to establish whether the respondents had access to the computers / internet. This provided an input to the issues related to the first order digital divide of the "haves" and the "have nots". The findings reveal that cybercafés are popular as these public spheres enhance the provision of an array of services with a heightened degree of convenience. While analysing the utilisation of Internet Services in Botswana, Sairosse and Mutula argue that "Cybercafés are becoming preferred Internet access points because most of them open for long hours, charge reasonably, provide assistance to users, have diverse services and are generally convenient and flexible places for searching the Internet". The questions related to access of the internet sought to validate the assertion made in the literature. The following questions where captured in this section:

i.   Where do you access the internet?
ii.   What medium are you using for accessing the internet?
iii.   What access type of connection do you use for your internet?
iv.   How often do you use the internet in a week?
v.   Which government services have you accessed over the internet
vi.   How many years have you been having access to computer and Internet?

Those who are digitally marginalised are first excluded due to their inaccessibility to the computer and the internet[191]. The literature identifies a number of possible places where people who utilise computers and internet can have access to them. These include home, internet cafes, school, library, work / office and/ or at a friend's place.

3.8.4 Level of Adoption, Skills and Utilisation

The literature has identified the digital divide with respect to (1) the physical availability of the technology and (2) social access in terms of the knowledge and skills necessary to leverage ICT to one's benefit[192]. In section 3.6.1.3 above, the questioned sought to identify the physical access of the respondents in relation to where they access the internet and the computers. The

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[191] Castells M .2005. O caos e o progresso. Portal do Projeto Software Livre do Brasil

[192] Kling R.1998. Technological and Social Access on Computing, Information and Communication Technologies, 10 – 27.

questions also identified the type of communication medium that they utilise in accessing the internet. The purpose of this section was to cover the dimensions related to the second order DD. As identified in the literature, concerns about access to computer and the internet have shifted from access to more on the utilization of the internet, skills used to manipulate the computer and the benefits derived.

The level of adoption measured the time at which the technology was used by each respective research participant. This measure identified the level of adoption according to Rogers' bell curve. All research participants, who completed the questionnaires, were categorised as either early adopters of technology or late adopters of technology based on the individual's usage and the time they used ICT technologies[193].

Hargittai used a number of research studies to address second order digital divide. He argues that as the "medium spreads to a majority of the population, it is increasingly important to look at not only who uses the Internet, but also to distinguish varying levels of online skills among individuals". Skill, in this context, is defined as the ability to efficiently and effectively find information on the Web. The research questions assessed the skills possessed by the respondents in their usage of the computer and the internet. It also assessed their ability to critically determine reliable sources of information, the ability to determine secure connection and to specific search engines and specific internet address pages. It further determined the ability of the respondents to undertake advanced computer operations such as manipulation of mathematical formulas in Microsoft Excel, designing and use of databases. The following questions were covered in this section of the questionnaire:

 i. Which of the following do you use to determine authenticity of information on web pages?
 ii. Which search engine are you using for your school research?
 iii. How do you learn new skills for using the computer?
 iv. Can you create music?
 v. Can you create a query in a database to get specific information?
 vi. Can you calculate the mean of 4000 numbers or compute sum of 300 numbers in Excel Spreadsheet?
 vii. Determine if web page is secure?
 viii. Opening of the internet browser
 ix. Go to a specific web page by typing a web address
 x. Are you able to determine if information found on a website is reliable?
 xi. Can you differentiate between https and http in website url?
 xii. Determine if web page is secure?
 xiii. Delete a web page that you have saved as a bookmark?

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[193] LaRosea R, Gregg J L, Stroverc S, Straubhaarc S, Carpenter S. 2007. *Closing the Rural Broadband Gap*, 359–373.

xiv. Organise your bookmarks into favourites or folder?
 xv. Download and save new software?
xvi. Log on or off an email application (Gmail, yahoo, Hotmail)

3.8.5 Social Impact

The social impact on all research participants was assessed in accordance to the individual's perception of the technologies used. Such a perception is influenced by the status of the technology. For instance, the use of social media such as WhatsApp is the norm in today's society so every individual who failed to utilise these apps may have varying perceptions of the society we live in. The measure focused on assessing these participants' perception and how they are viewed by society.

3.8 Data Analysis and Interpretations

Frequency distribution and modal computations were used to analyse the nominal data and other information collected. Correlational analysis was used to determine the relationship that exists between key variables. A chi-square test was used to test the significance of the relationships determined and the Phi and Crammer's V were used to determine the degree of relation on the identified relationships. These were used as inferential analysis to explain the behaviour and findings of the sample population.

3.9 Ethical Considerations

The researcher requested approvals from various governmental agencies and departments in addition to internet cafes, centres, libraries, and schools that were used in this study.

(i) *Informed consent and voluntary participation* – Consent of respondents was also sought as much as possible, and the relevant authorities were informed wherever possible about the research. A written request was made to the Ministry of Education and Skills Development seeking to undertake the research. This was acknowledged and permission was granted to the research to undertake the relevant research. Participation from the government employees, students and customers at the internet café was voluntary. Where information sought was not of sensitive nature consent was not sought. However, this did not lead to unethical conduct since the researcher did not divulge any information.

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(ii)   *Confidentiality* –The researcher undertook measures to ensure that the questionnaire did not capture any information that identifies the respondents. The information given by the respondents for the purpose of this research was, therefore, kept confidential. The names of the respondents were not captured in the questionnaire.

Chapter 4
Data Presentation and Analysis

4.0   Introduction

This chapter presents and analyses the data. It articulates aspects related to the use of computers and internet in Gaborone and her surrounding areas. This is based on geographical locations, gender and education level. An inferential statistical analysis is done to extrapolate the findings to the larger population of the study.

4.1   Descriptive Analysis

A descriptive analysis was conducted on the sampled data to establish the demographic characteristics of the sample population. The data variables, representing these values were expressed as nominal data thus distribution frequency, contingency tables values, and modal values were computed to explain the sample population characteristics.

Figure 4.1 represents the number and percentage of the respondents' response rate. The response rate served as the basis of analysis for the research questions. There is no significant difference between response rate and gender as there exists a balanced representation of responses from the male and female respondents. Response rate measured in accordance to geographic location demonstrates a relatively similar gender representation. This conditional distribution of gender in respective geographical locations encompass balanced opinion, which has minimal bias on opined views of the research. Results show a greater number of male respondents in urban areas (55.10%), peri-urban locations (51.60%), and rural regions (51.00%). Findings from peri-urban, rural and urban areas reveal a total male response rate of

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53.60% compared to a total female response rate of 46.40%. Response rates were relatively similar across both genders (males and females) with the largest statistical difference (10.20%) observed among research respondents in urban areas.

4.1 Gender Analysis

Table 4.1 Gender Analysis

Gender	Frequency	Percent %
Male	345	53.6
Females	299	46.4

Table 4.1 above shows the demographics of the sample. The respondents comprised of 345(53.6%) males and 299 (46.4%) females. This number comprised of all the students, government employees and the general public who had visited the internet cafes. Based on this analysis, there is a fair representation of both males and females, and it can be concluded that there was no gender bias in the responses provided.

4.2 Educational Level

Table 4.2: Education level analysis

Education Level	Frequency	Percent %
Primary Education	113	17.5
Secondary Education	252	39.2
Tertiary Education	278	40.3
Total	644	100.0

An insight analysis measured the education level of the respondents. Significant differences exist between primary, secondary, and tertiary levels of education. Table 4.2 shows a total of 113 respondents from lower education bracket, representing 17.5%, 252 respondents from higher education, representing 39.2%, and 278 respondents from tertiary education.

4.3 Geographic Location

Table 4.3: Geographic Location Analysis

Area	Frequency	Percent
Urban Area	402	62.5
Peri-Urban Area	190	29.5

Rural Area	52	7.9
Total	644	100.0

Table 4.3 above demonstrates the geographical distribution of the sample. The respondents were located in three distinct areas being: urban with a frequency of 402 (62.5%), peri-urban with a frequency of 190 (29.5%) and rural area, with a frequency of 52(7.9%).

4.4 Cross Tabulation

Further data analysis was undertaken through cross tabulations. Data tables present the results from the entire respondents, as well as from sub-groups of survey respondents. These tabulations were undertaken to further unearth any relationships on the collected data.

Figure 4.4: Response Rate Based on Gender and Geographic Location

	Peri-Urban Area	Rural Area	Urban Area	Total
■ Male	51.60%	51.00%	55.10%	53.70%
■ Female	48.40%	49.00%	44.90%	46.30%
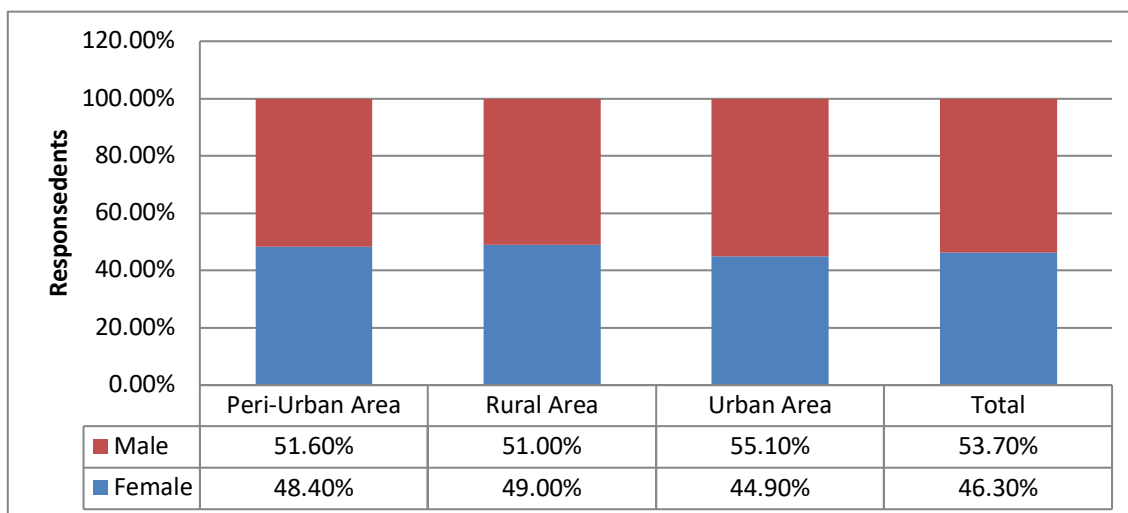
Geographical locations inclusive of urban, peri-urban and rural areas were measured against the level of education of the respective research respondents. The highest statistically significant association between educational level and geographic location was observed among the respondents with a tertiary level of education (43.32%) (as shown in Figure 4.4). Findings show that approximately 2.48%, 9.16% and 31.68% of respondents with a tertiary level of education resided in rural, peri-urban, and urban areas, respectively. Urban and rural locations have a cumulative percentage of 62.74% and 22.82% with a composite of lower, higher, and tertiary education graduates, respectively. However, a low significance was observed in primary education respondents in peri-urban areas (2.48%), secondary education respondents in peri-urban areas (2.95%), and tertiary education respondents in rural areas (2.48%).

Figure 4.5: **Respondents education level based on geographic location**

	Rural Areas	Peri-Urban Area	Urban Area
■ Lower Education	7.76%	2.48%	7.30%
■ Higher Education	12.58%	2.95%	23.76%
■ Tertiary Education	2.48%	9.16%	31.68%
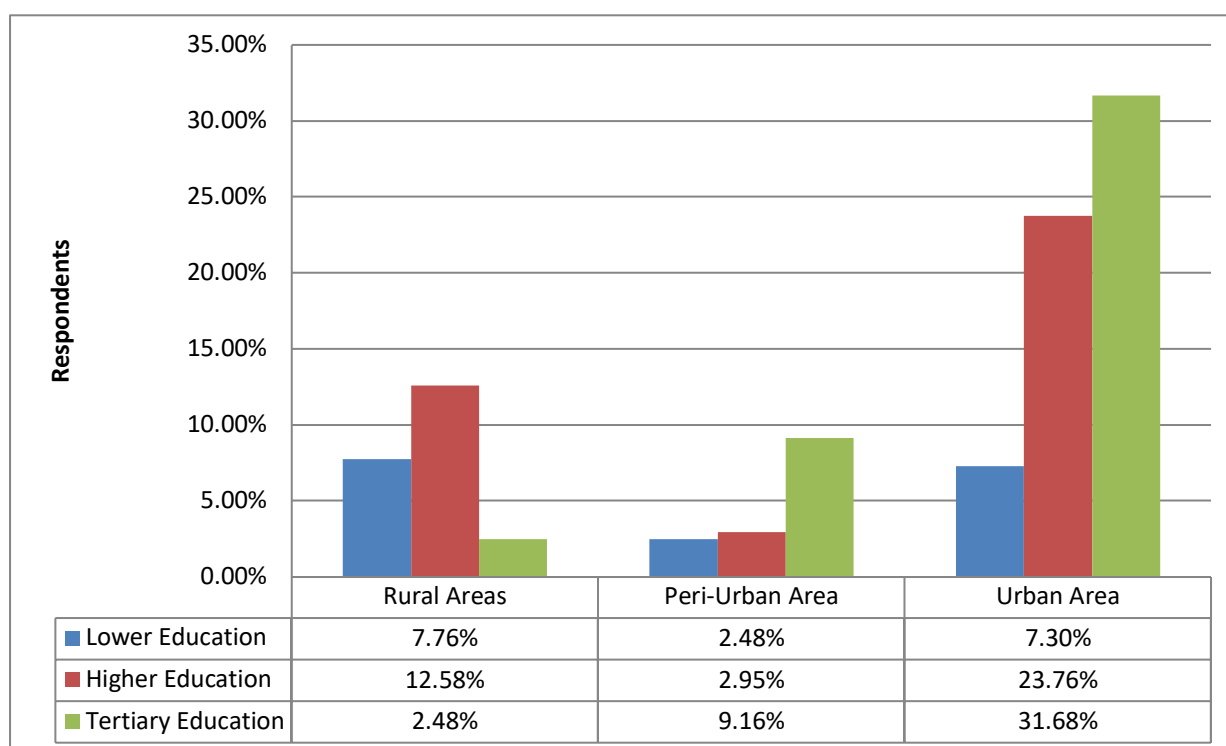
An insight analysis measured the education level of respondents on gender and geographic location. Significant differences exist between lower, higher, and tertiary levels of education and geographic locations. However, gender affected the degree of difference. Urban areas show dominant frequency analysis or gender, geographical location and educational attainment (as shown in Figure 4.5). The most significant difference was revealed among males and females in tertiary education within urban geographic location as indicated by 11.49% and 20.03% respectively. A significant difference was also inherent between females and males in rural settings (females 2.02% versus males 0.47%). A less dominant trend is also illustrated in females and males in higher education and females in lower education within peri-urban locations compared to rural locations had the least number of respondents with a lower educational level. No statistically significant difference was revealed between female and males in higher education in rural areas (females 1.4% vs males 1.55%), peri-urban areas (females 6.04% vs males 6.53%), and urban areas (females 12.73% vs males 11.02%).

Figure 4.6: **Respondents Education Level Based on Gender and Geographic Location**

	Female_Tertiary	Female_Higher	Female_Lower	Male_Tertiary	Male_Higher	Male_Lower
Rural	2.02%	1.40%	0.47%	0.47%	1.55%	2.02%
Peri_Urban	4.04%	6.06%	4.19%	5.12%	6.52%	3.57%
Urban	11.49%	12.73%	3.88%	20.03%	11.02%	3.42%
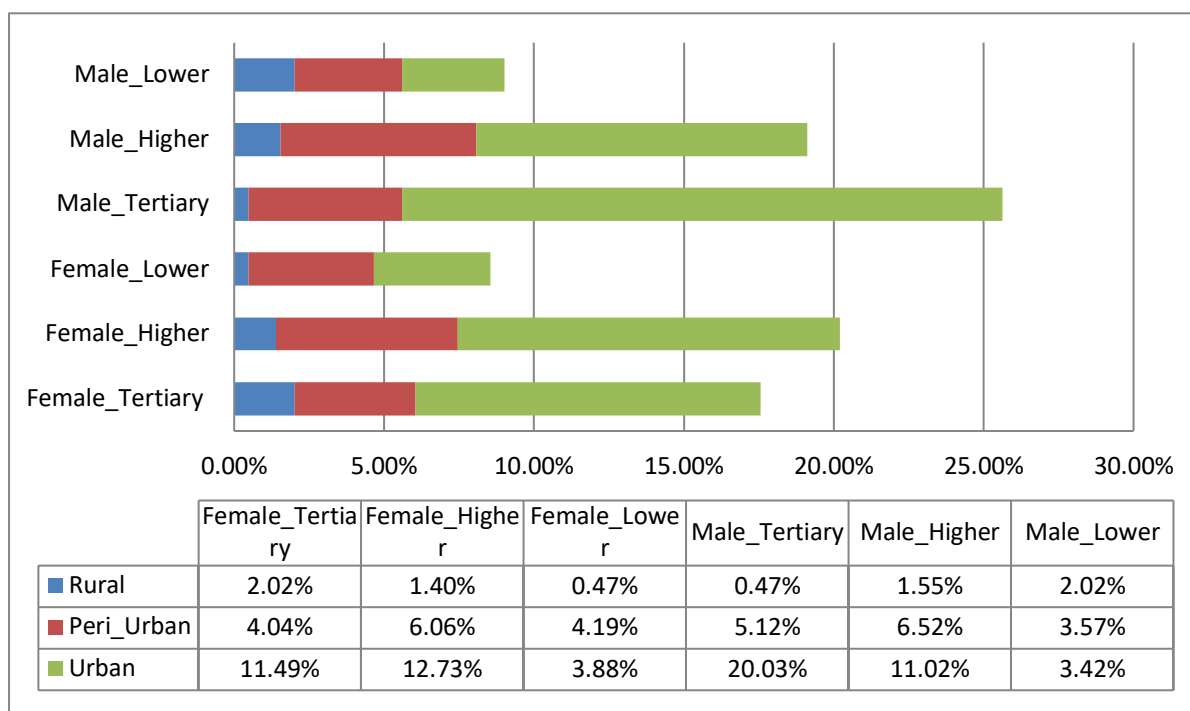
4.5   Inferential Analysis

Inferential statistics was used on data collected from the sample population. Inferential statistical analysis is based on models that test its significance and determination of degree of strength for a relationship on associated variables. This analysis enabled the research to make inferences to the research population. Inferential statistics are mandatory, especially when it is difficult to measure and evaluate each member of the research population hence a sample of the research population is randomly selected. Inferential statistical models are used to compute the probability of patterns and trends based on the outcome of the evaluated variable and project it to the research population.

Based on this approach, variables and constructs from the SATUM theory formed the basis of inferential analysis of the sample population. Inferential analysis was based on observability of technological diffusion of ICT technologies relative to education level, gender as a reflection on individualism and geographical location, communication, and knowledge about ICT technologies. Further inferential statistical analysis was done on communication media used to communicate and enhance skills for ICT technologies alongside user's responses and attitudes. The empirical findings were used to infer on the DD in Botswana based on individuality, represented by gender, business orientation as use of online internet applications and

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4.5.1 Innovation Decision Making and Internet Adoption

The study reflected on internet (worldwide network) and derivative ICT applications utilisations as innovative technologies that have been adopted or rejected based on issues such as; relative advantage of the technology, its observability, timely adoption, social and peer norm. Data was content analysed to deduce thematic points and relations were tested between or among those variables to deduce statistical significance relevance and the strength of the relationship.

4.5.2 Internet Access

Routine access was used to determine the rate of interaction, access, and utilisation of the internet and ICT technologies. Based on content analysis, four key levels of internet access (everyday, occasionally, rarely, and never) were defined as every day, therefore implying the use of the internet seven days a week. The rate of internet access among the respondents with primary, secondary, or tertiary education level was examined in urban, peri-urban, and rural areas. Tertiary education level respondents are the most significant group of the respondents with a cumulative value of 15%, followed by higher education at 4% and lower education at 1% (as depicted in Figure 4.4). The same trend of respondents residing in urban areas outperform the respondents in peri-urban locations. The respondents in rural regions yield a clearly distinct pattern of results. This pattern is befitting of the trends of urban, peri-urban and rural regions that examine infrastructure, socioeconomics, and politics. Findings showed that tertiary education (27%) has the highest cumulative representation across all geographic locations with 18%, 7%, and 1% of respondents from urban, peri-urban, and rural locations, respectively (as illustrated in Figure 4.6). Higher education has a slightly lower cumulative percentage of 25% followed by a significantly lower total percentage of respondents (10%). Table 4.4 shows the rate of internet access and its relationship to respondents' geographic location.

Figure 4.7 shows tertiary education with a cumulative percentage of 11%, which is the most significant in peri-urban areas. The same correlation was shown for the respondents in peri-urban locations with a higher education. As shown in Figure 4.8, fractional percentages are inherently marginal indicating a relatively small percentage of the respondents who do not use the internet at all. Additional findings showed a significantly low number of higher education

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and tertiary education respondents that never use the internet. Statistical significant of variables associated with internet access based on education level and geographic locations are illustrated in Table 4.2 alongside the degree of relationship between these associations. Results indicate a strong relationship between geographic location and respondents' access to internet facility. A strong positive association exists in urban and peri-urban areas with a moderately strong association in rural settings based on Cramer V.

Table 4.1: Pearson Chi-square test on internet access rate and geographic locations

Urban*Internet Access Rate		Peri-urban *Internet Access Rate		Rural * Internet Access Rate	
X^2	df	X^2	Df	X^2	Df
251.087[d]	108	108.371[b]	32	42.365[c]	14
Phi = .789 Cramer V= .644		Phi = .755 Cramer V= .534		Phi = .755 Cramer V= .308	

Legend: X^2 -Chi-square, df-Degree of freedom

Satisfactory utilisation of the internet is dependent on the respondents use of a user friendly, result-oriented, and observable internet browser. Innovative and upper market browsers inclusive of Chrome, Internet Explorer, and Mozilla were assessed. Google Chrome was the most widespread internet browser based on gender, followed by Mozilla and Internet Explorer. However, internet browser preference for Google Chrome failed to reveal a statistically significant difference between male and female respondents. Figure 4.8 reveals that approximately 70% of the respondents reportedly use Google Chrome, of which 37.58% were female, and 37.27% were male. Statistical significance of preferred browser and utilisations was done on gender (as indicated in Table 4.2).

Table 4.2: Pearson Chi-square test on Preferred Browser and Gender

Gender* Preferred Browser	
X^2	df
12.429[a]	2
Phi = .139, Cramer V= .139	

Legend: X^2 -Chi-square, df-Degree of freedom

Figure 4.7: Internet Access Rate - Everyday
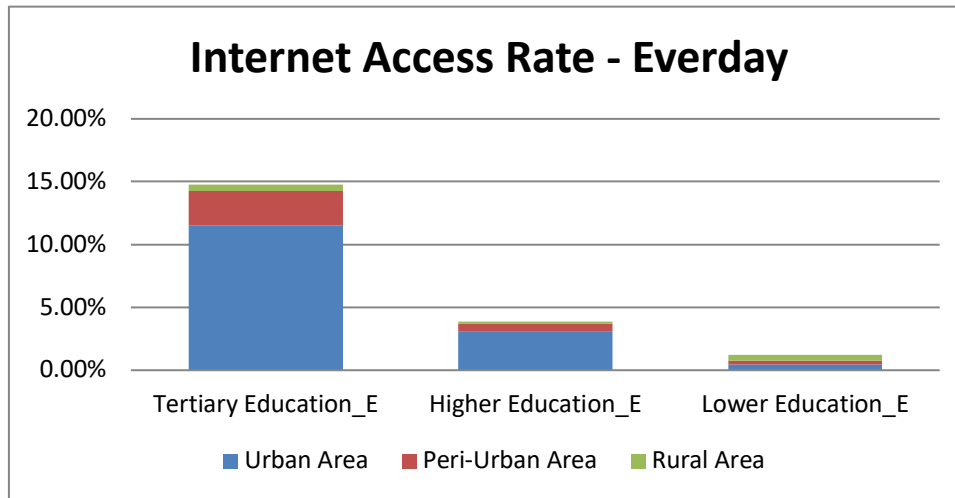
Figure 4.8: Internet Access Rate - Occasionally
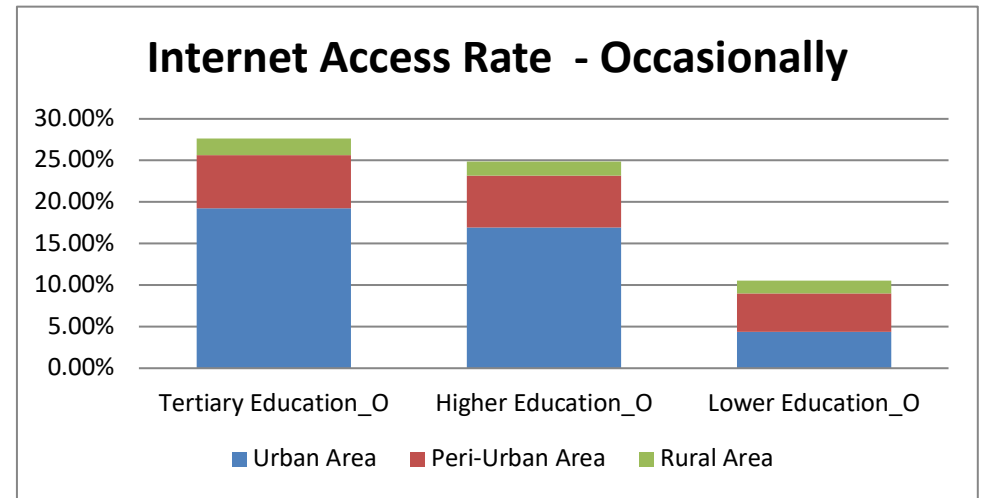
Figure 4.9: Internet Access Rate - Rarely
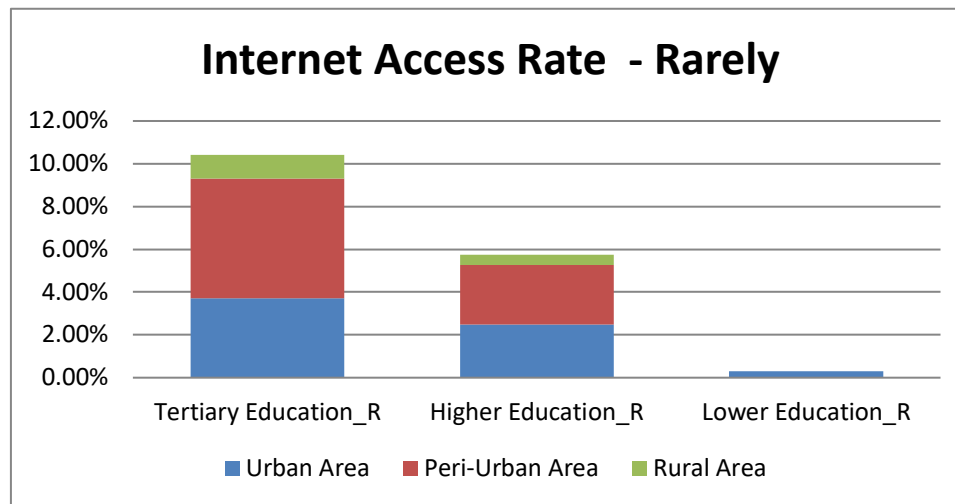
Figure 4.10: Internet Access Rate - Never
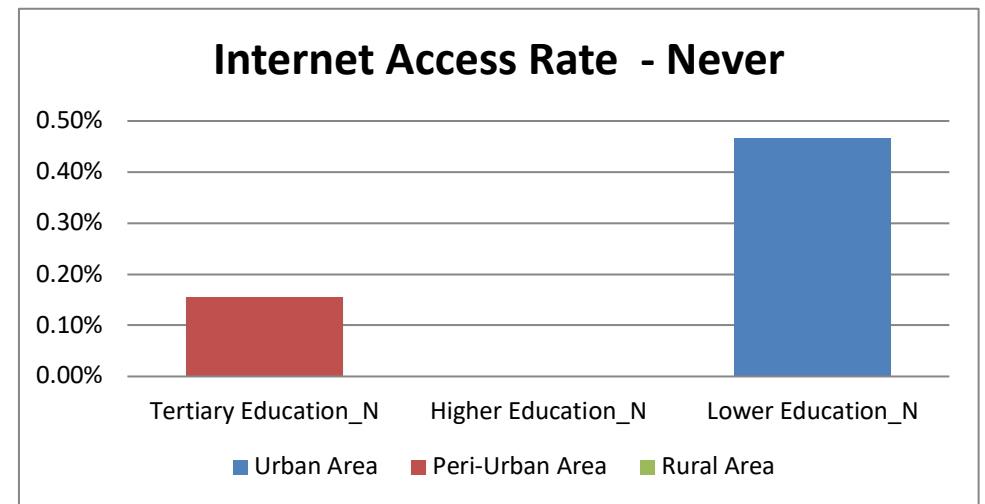
Figure 4.11: Preference of Web Browser Based on Educational Level

Prefered Internet Browser Based on Education Level

	Chrome	Internet Explorer	Mozilla
■ Tertiary Education	35.56%	2.17%	1.55%
■ Higher Education	22.83%	4.97%	15.37%
■ Lower Education	16.46%	0.47%	0.62%
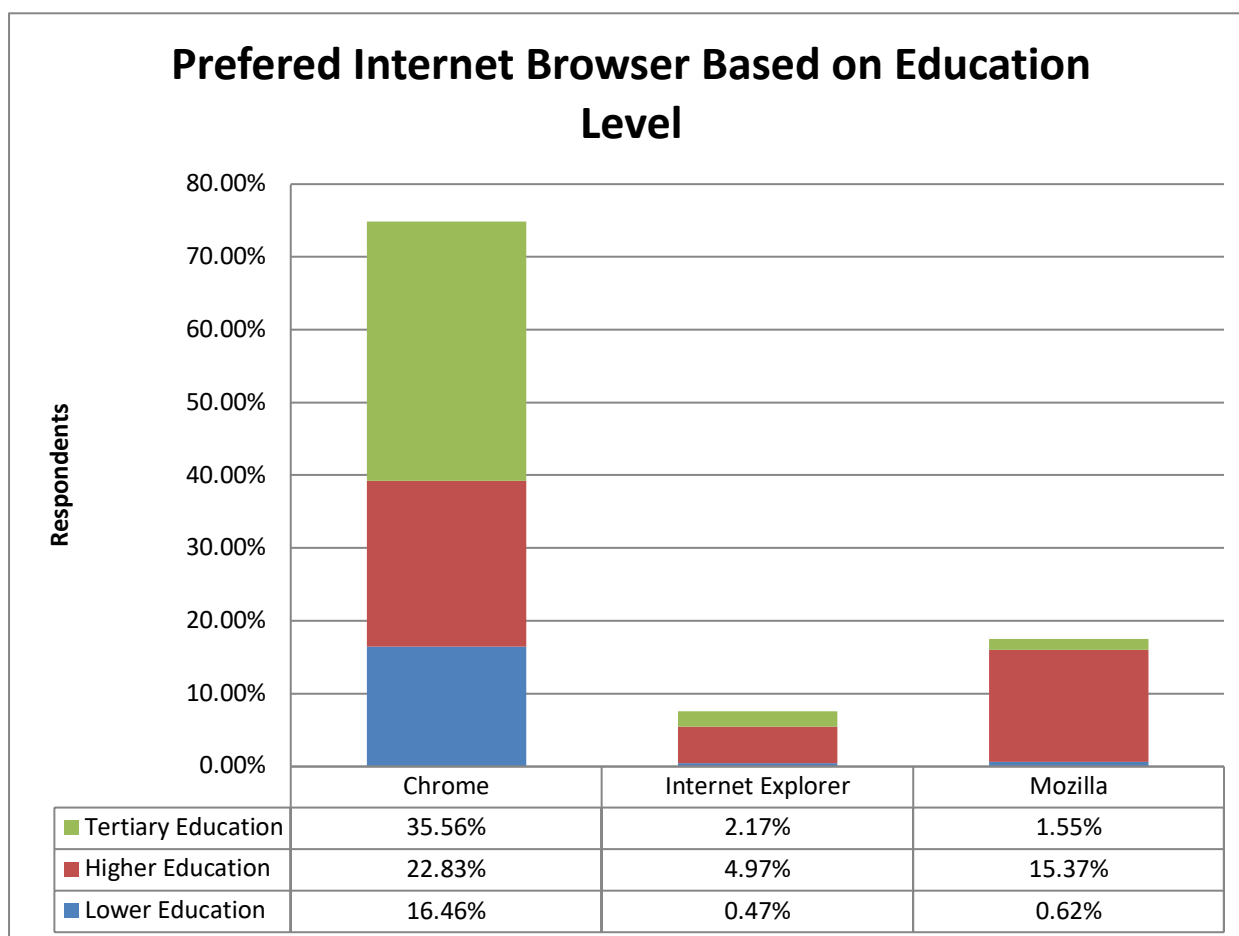
Preferred internet browsers are also ranked in accordance to geographic location. All three geographic locations (urban, peri-urban, and rural areas) identified Google Chrome as a preferred innovative IT tool for accessing the internet with a cumulative percentage of 74.85% (as represented by Figure 4.11). The urban geographic location showed the highest percentage rate of 47.52% of the respondents followed by peri-urban regions at 21.27%, and rural areas with 6.06% of the respondent. The relationship between the adoption and utilisation of Google Chrome as an innovative technological advancement is shown in Table 4.4. Browser preference relative to geographic location failed to show a statistically significant relationship.

Table 4.4: Pearson Chi-square test on preferred browser and geographic location

Geographical * Preferred Browser	
X^2	df
1.696a	4
Phi = .051, Cramer V= .0036	

Legend: X^2 -Chi-square, df-Degree of freedom

Figure 4.12: Ranking of Web Browsers by 2016

	Chrome	Internet Explorer	Mozilla
■ Urban Area	47.52%	4.35%	10.71%
■ Peri-Urban Area	21.27%	2.80%	5.43%
■ Rural Area	6.06%	0.47%	1.40%
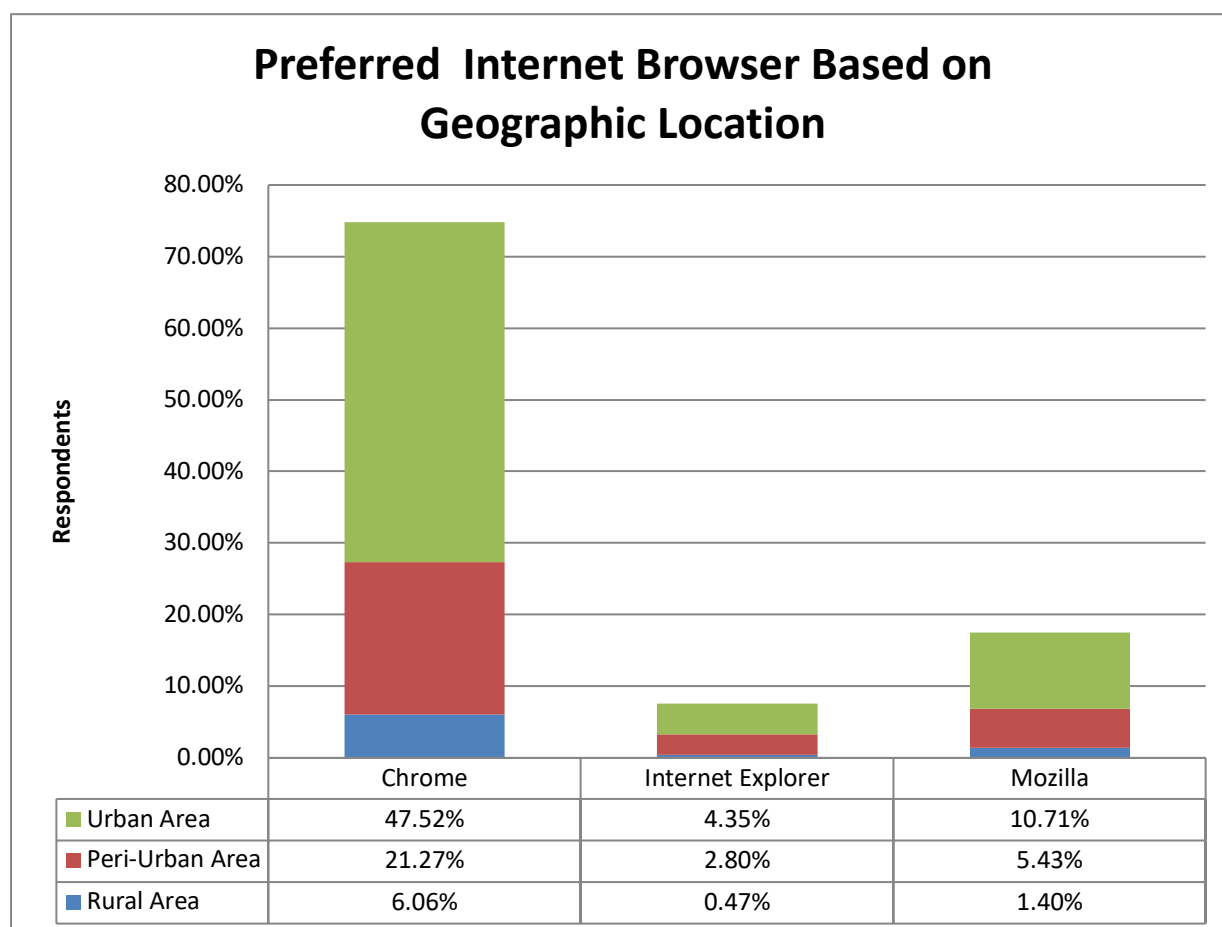
4.5.3 Internet Connection

Connection to the internet contributes to an IS's ability to effectively store, transmit, and process information. An analysis of the type of internet connection based on the respondents' geographic location determines the operation and status of the information society in Gaborone and the surrounding areas. Urban areas in Gaborone, have the largest rate of internet connection (62.57%), followed by peri-urban (29.5%) and rural (7.93%) areas (as illustrated in Figure 4.12). Results show that Wi-Fi represented a widespread type of internet connection in urban (29.19%), rural (4.66%), and peri-urban (13.04%) areas, with a total Wi-Fi connection and utilisation of 46.89%. Frequency analysis demonstrates that 3G (22.36%) is the second most significant type of internet connection based on geographic location, followed by Broadband, which has a frequency analysis of 15.06%. The next significant connection is Broadband with frequency analysis value of 15.06%. The association between the type of internet connection and geographic location is measured in accordance to Pearson's chi-square test. The findings reveal a statistically significant relationship between geographic location $\chi^2 = 93.667$ (as shown in Table 4.5). The relationship between the two variable is weak, yet positive with a strong

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relationship in urban locations. However, the association weakens and is significantly lower in rural areas.

Figure 4.13: Type of Internet Connection Based on Geographic Location

	3G	Broaband	Satellite	Wi-Fi	Wi-Fi/3G	Wi-Fi/Broadband	Wi-Fi/Broadband/3G
Urban Area	16.15%	5.43%	0.31%	29.19%	5.75%	1.24%	4.50%
Rural Area	1.09%	2.02%	0.16%	4.66%	0.00%	0.00%	0.00%
Peri-Urban Area	5.12%	7.61%	0.47%	13.04%	2.17%	0.16%	0.93%
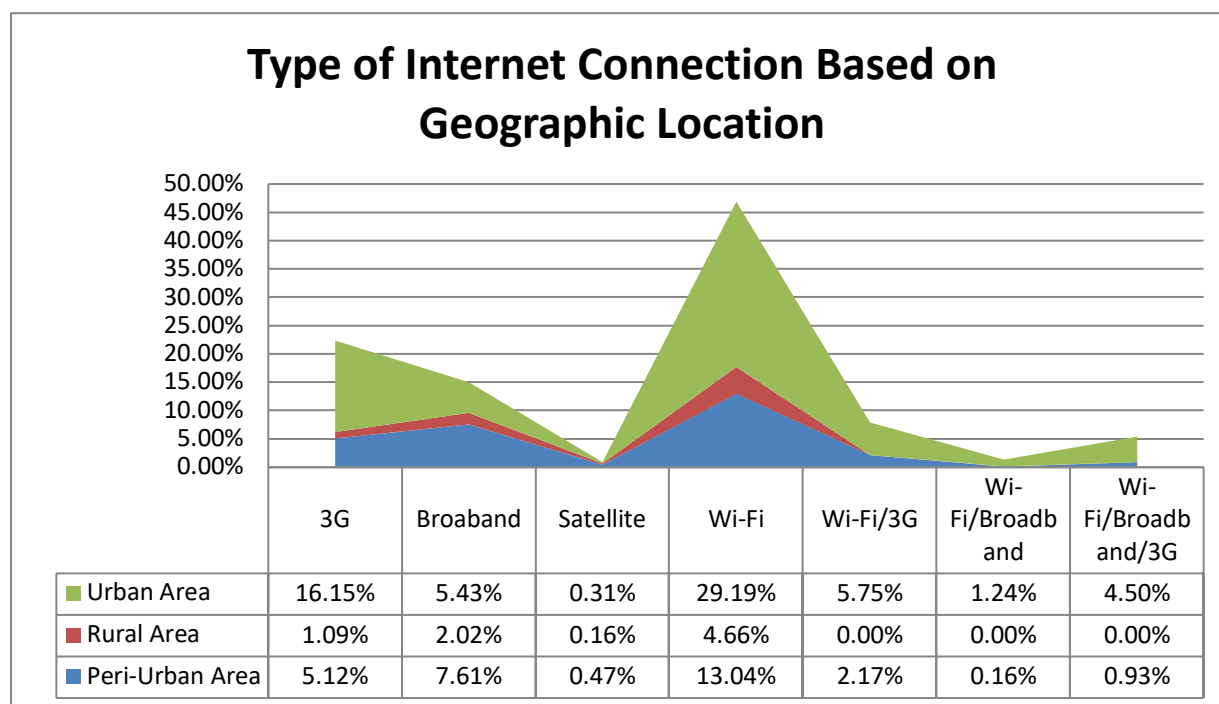
Table 4.5: **Pearson Chi-square Test on Internet Connection Type and Geographic Location**

Internet connection * geographical location	
X^2	df
93.667[a]	52
Phi = .381, Cramer V= .270	

Legend: X^2 -Chi-square, df-Degree of freedom

4.5.4   Access to Internet

After assessing the type of connection respondents in Gaborone and the surrounding areas, an analysis of the places of internet access based on gender was used to better understand the extent to which the respondents utilise the internet. The analysis was based on five key content areas, including surfing internet at home, internet cafes, library, school, or work. Home was identified as the most common place for internet access with the highest frequency noted among female urban dwellers (15.58%), followed by male dwellers (13.55%) (as illustrated in Figure 4.12). A similar pattern was noted among female peri-urban and male peri-urban dwellers. However, the pattern was markedly different for the male and female rural dwellers. The school is ranked the second most common place for internet access based on gender with

a respondent percentage of 12.75% across all geographic locations.

Figure 4.13: Places of Internet Access Based on Gender

	Female_Peri_Urban	Female_Rural	Female_Urban	Male_Peri_Urban	Male_Rural	Male_Urban
All Options	3.42%	1.09%	7.61%	4.35%	0.62%	17.55%
Home	6.37%	1.09%	15.68%	4.97%	1.71%	13.35%
Internet Cafe	0.31%	0.47%	0.47%	0.16%	0.00%	0.00%
Library	0.16%	0.00%	0.00%	0.78%	0.62%	0.62%
School	3.11%	0.31%	3.11%	3.11%	1.09%	2.02%
Work	0.93%	0.93%	1.24%	1.86%	0.00%	0.93%
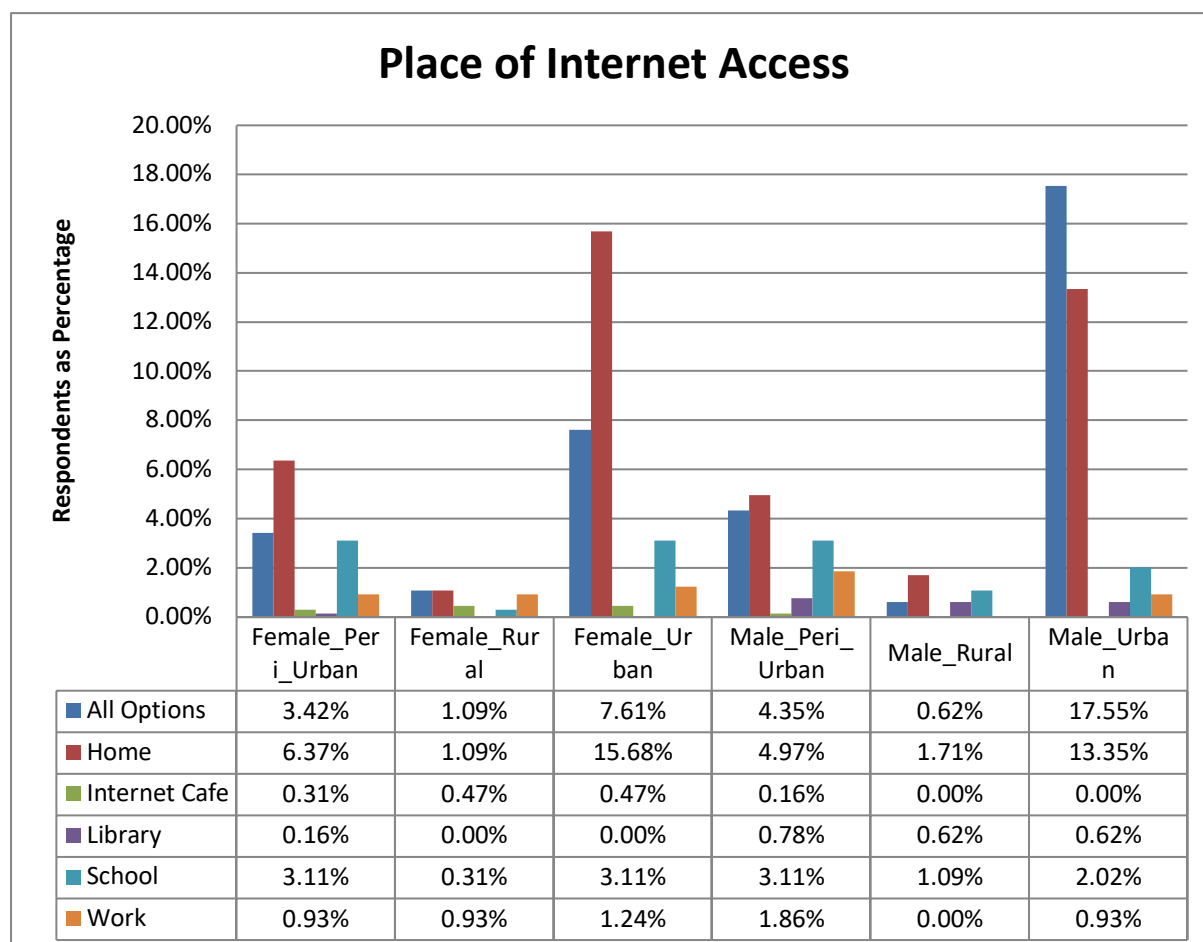
As illustrated in fig 4.13 above, the results examined the computed statistical significance and relationship between places of internet access and gender. Findings showed a large statistically significant relationship with a moderate positive association ($\chi^2 = 220.554$) (as shown in Table 4.6).

Table 4.6: Pearson Chi-square test on places of internet access and gender

Places of Internet Access * Gender	
X^2	df
220.554[a]	64
Phi = .585 Cramer V= .414	

Legend: X^2 -Chi-square, df-Degree of freedom

The context and magnitude of internet utilisation in this study was assessed by identifying all the devices used for internet connection and types of internet access. Mobile phones are the most commonly used device to connect to the internet in all the three geographic areas.

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Findings show that mobile phones had a frequency analysis equivalent to 35.4% (as shown in Figure 4.14). The largest total percentage of the respondents used devices for internet access in urban areas (23.29%), which was followed by the peri-urban locations (8.54%), and the lowest total percentage throughout rural regions (3.57%). The second most frequently used device for internet access are laptops as indicated by a total respondent percentage of 18.01% across all the geographic locations. The respondents in urban areas had the highest frequency analysis (12.42%) compared to other locations. A significantly lower frequency analysis show that the respondents in peri-urban (4.04%) and rural locations (0.9%) used laptops for internet access. The least common singular device for internet access includes desktops. The findings showed that 8.70%, 5.43%, and 2.02% of the respondents used desktops for internet access. The relationship between devices used for internet access and geographic location is $\chi^2 =$ 110.413 (as shown in Table 4.7).

Figure 4.14: ICT Devices Used for Accessing Internet Based on Geographical Levels

	All Options	Desktop	Desktop, Laptop	Desktop, Laptop, Mobile Phone	Desktop, Mobile Phone	Laptop	Laptop, Mobile Phone	Mobile Phone
Urban Area	4.04%	5.43%	0.47%	7.92%	1.24%	12.42%	7.76%	23.29%
Peri-Urban Area	0.93%	8.70%	0.62%	2.02%	2.33%	4.66%	1.71%	8.54%
Rural Area	0.47%	2.02%	0.00%	0.47%	0.47%	0.93%	0.00%	3.57%
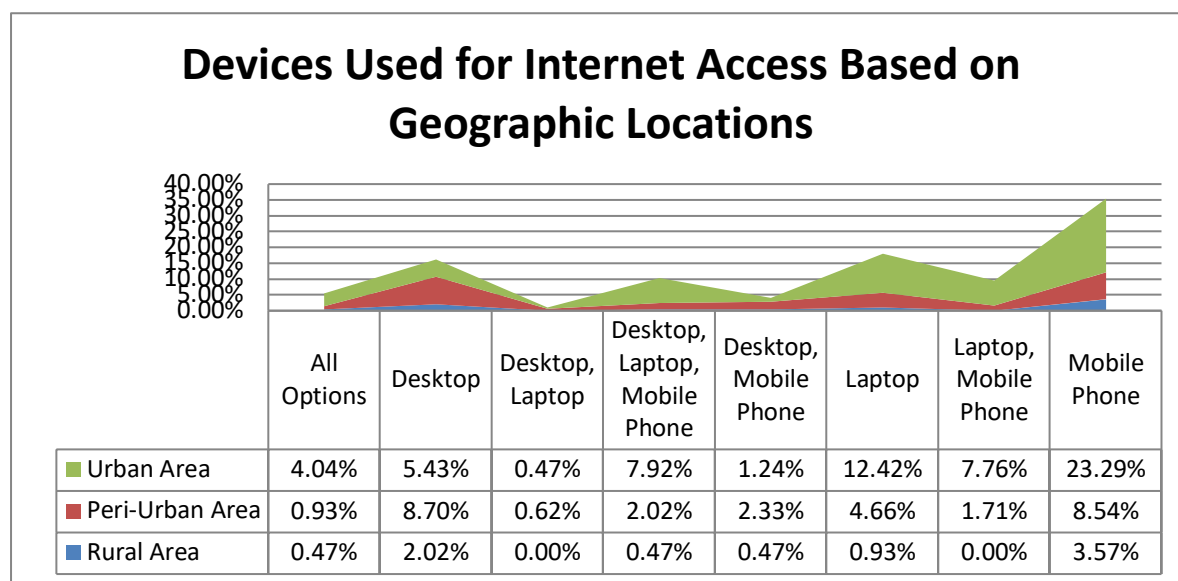
Table 4.7: Pearson Chi-square Test on Devices Used for Internet Access

Devices for Internet Access * Geographical Location	
X²	df
110.413ª	52
Phi = .414 Cramer V= .293	

Legend: X² -Chi-square, df-Degree of freedom

4.5.5 Utilisation of Internet

Despite internet access and the identification of the most common devices used to access it, the

purposes for utilization are vital to understand the different groups of the respondents in the geographic locations. The respondents were asked to identify key information use and the type of information readily searched. This was analysed based on these four key areas; access to information, communication purposes, entertainment as well as additional areas (as shown in Figure 4.15). The responses demonstrate that the majority of the respondents used the internet for communication purposes. These are segregated in the following way; urban areas (34.47%), peri-urban regions (10.87%), and rural settings (5.12%). Findings identify access to information as the second most important need. In urban, peri-urban, and rural areas, access to information was 11.18%, 6.99%, and 1.40% respectively. Overall, urban geographic locations have the large statistical access to information using the internet (0.47%) followed by peri-urban and rural regions.

Figure 4.15: Information Accessed Over the Internet per Geographical Location

	All options	Access To Information	Communication Purposes	Entertaiment	Learning and Research	n/a
Urban Area	0.47%	11.18%	34.47%	6.99%	9.47%	0.00%
Rural Area	0.00%	1.40%	5.12%	0.47%	0.93%	0.00%
Peri-Urban Area	0.00%	6.99%	10.87%	4.35%	7.45%	0.16%
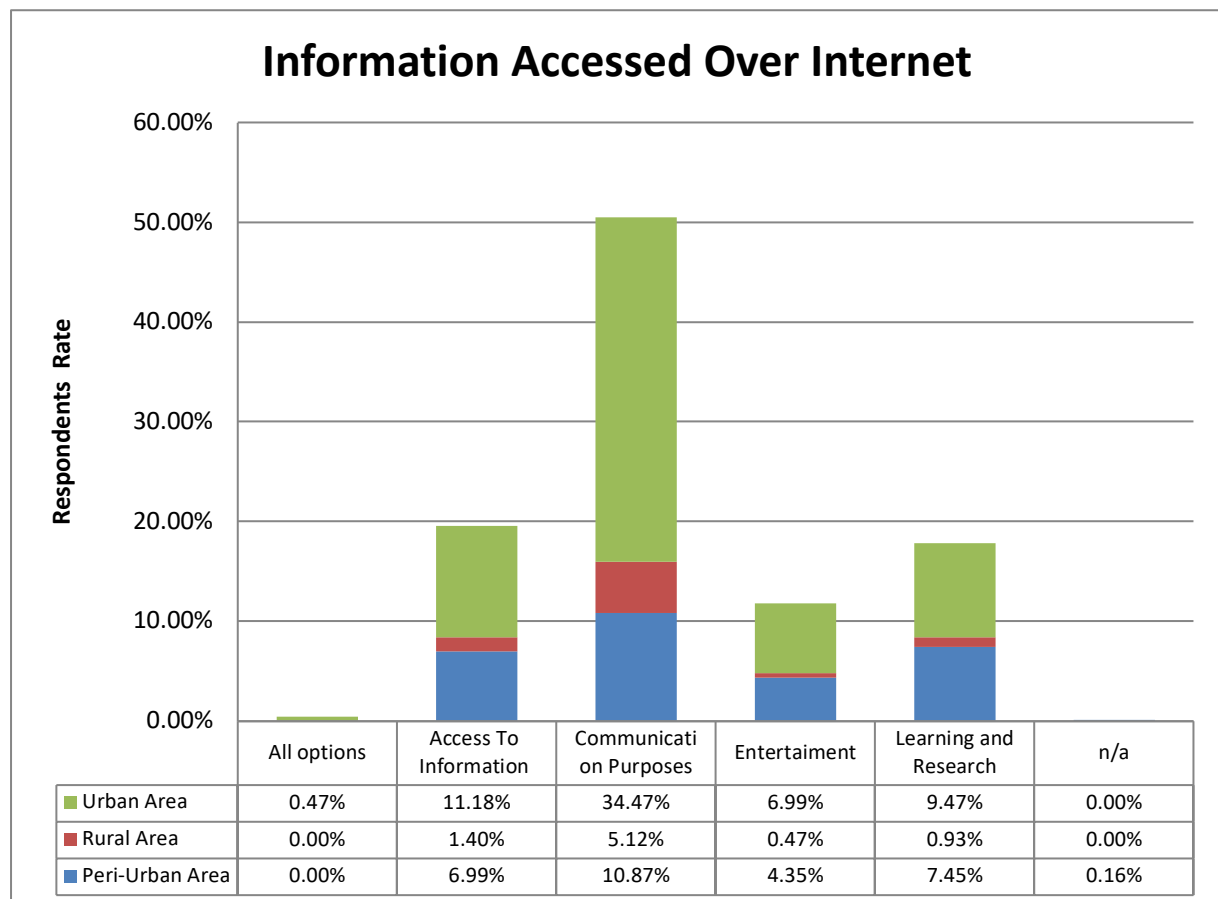
Utilisation of internet services for business applications were determined based on geographic location and education level. An evaluation of educational status based on three geographical locations (urban, peri-urban and rural areas) was performed, and the results are illustrated in Figure 4.15. In accordance to education level, the results found that the respondents with

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tertiary education had the highest overall percentage that utilized internet services with the highest reported response in urban areas (19.88%). Higher education in the peri-urban and rural locations had a respondent percentage of 9.47% and 1.86%, respectively. The least significant percentage of respondents that utilized internet services lived in rural areas and had a lower level of education (1.55%) and a tertiary level of education (1.55%).

Figure 4.16: Utilization of Internet Based on Education and Geographic Location

Utilization of Internet Business Applications Based on Geographical Location

	Tertiary Education	Higher Education	Lower Education	N/A
Rural	1.55%	1.86%	1.55%	2.95%
Peri_Urban	5.90%	9.47%	4.35%	9.78%
Urban	19.88%	14.13%	3.42%	25.16%
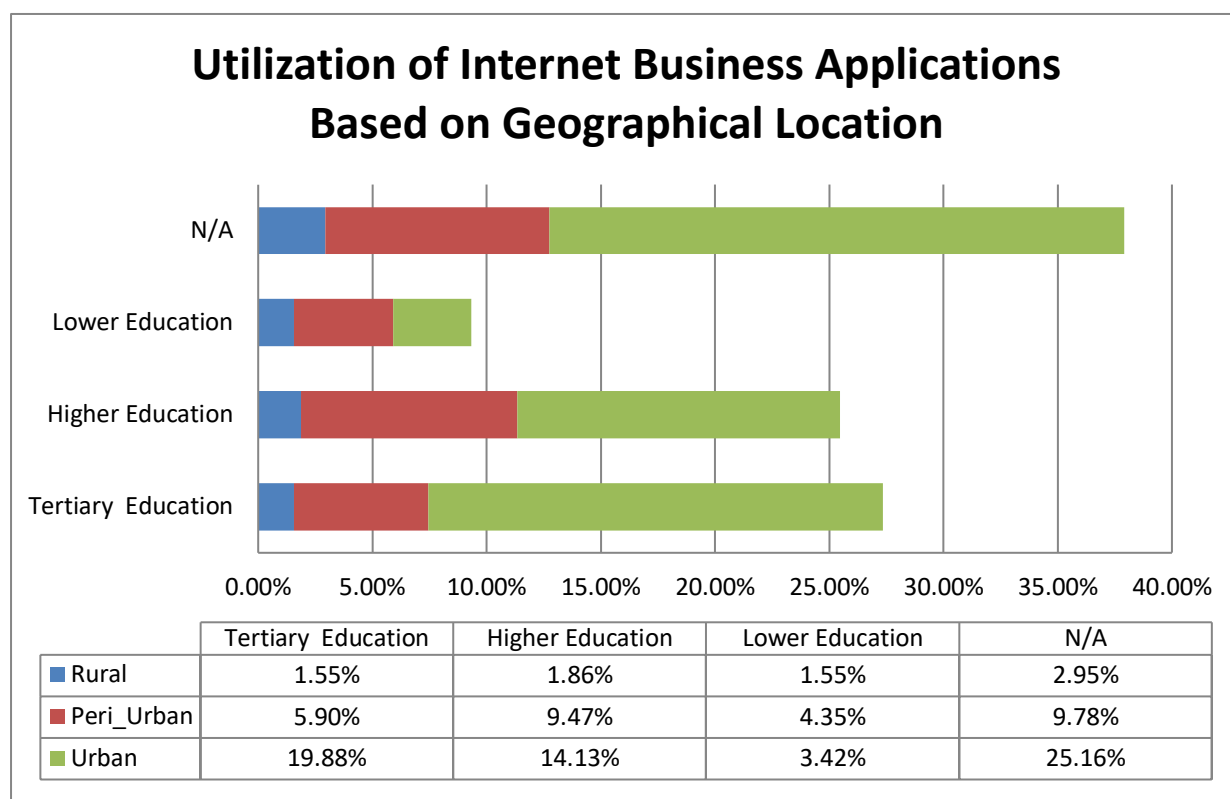
The time of utilisation for business applications centred on the study's ability to determine the level of innovation by identifying each respondents' application of electronic commerce. Approximately 42.24% of the respondents, reported that they have been using internet business applications for more than five years (as shown in Figure 4.16). This represented a significant number as it is the majority.

From year one to year two, the respondents' time of utilization of online internet business services and applications increased in the rural areas. The results show an increase from 0.31% to 1.55% of respondents in rural settings, 3.57% to 5.12% of respondents in per-urban locations, and 2.33% to 7.92% of the respondents in the urban areas. However, respondents with three years of experience were nearly half of respondents with two years of experience, with 0.93% of respondents in the rural areas, 3.73% in peri-urban regions, and 3.88% of respondents in urban geographic locations. Based on the respondents with four years of

experience, only the respondents in urban areas who utilized internet business services and applications increased from 3.88% to 4.35%. The respondents' in rural areas remained the same in year 4 (0.93%) yet decreased in peri-urban settings by 1.56%. This behaviour and pattern is consistent with observation made from the utilisation of online business applications. Table 4.8 shows the relationship of the use of utilisation of business applications based on time ($\chi 2$ = 5.24).

Figure 4.17: Time of utilization of business applications based on geographic location

Internet Busines Applications Time of Utilization

	1 year	2 years	3 years	4 years	5 years plus	> 5 years
Rural Area	0.31%	1.55%	0.93%	0.93%	1.86%	2.33%
Peri-Urban Area	3.57%	5.12%	3.73%	2.17%	5.59%	9.32%
Urban Area	2.33%	7.92%	3.88%	4.35%	13.51%	30.59%
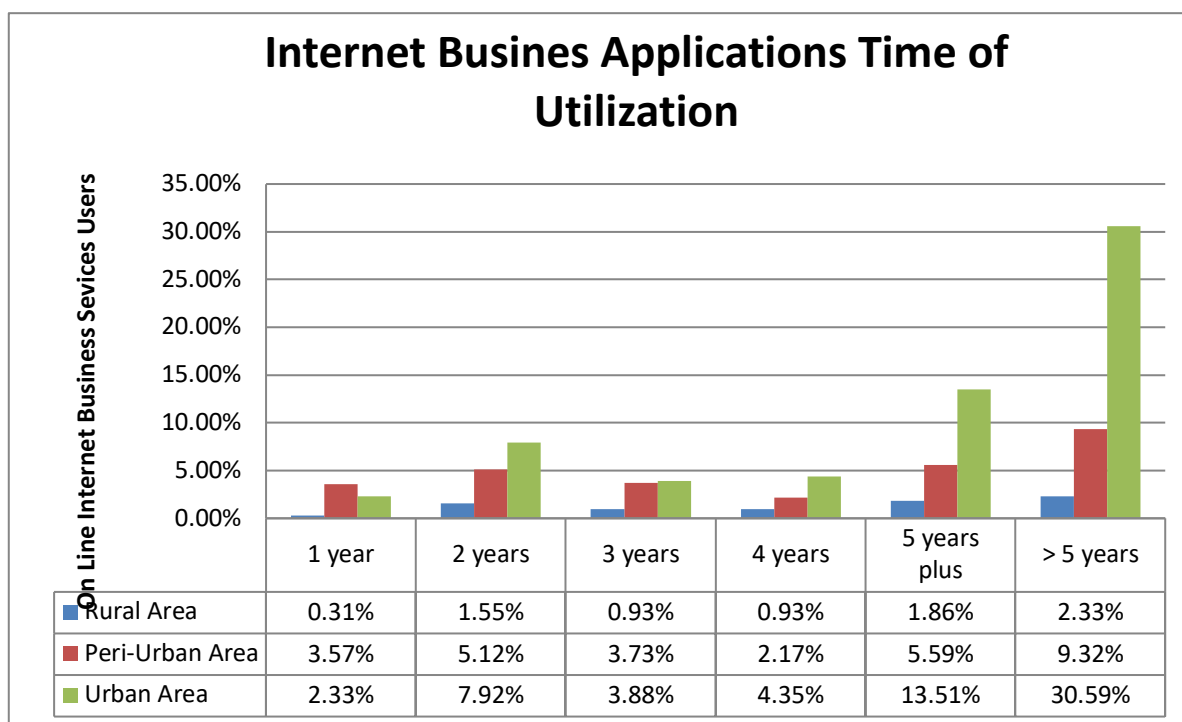
Table 4.8: **Pearson Chi-square test on utilization of business applications based on time**

Internet Online Government Services * Adoption rate	
X²	df
5.246a	6
Phi = 0.090. Cramer V=0 .064	

Legend: X² -Chi-square, df-Degree of freedom

The GoB provides essential service to the citizens of Botswana. It developed and implemented electronic commerce applications to provide effective and efficient services to all citizens. Through the questionnaire, the study identified usage of electronic commerce applications. These included school registration, passport application, license renewal (vehicle), identity card (*Omang*) application, case management system, business registrations form, tax filing and

Botswana Telecommunications (BTC) directory system. Evaluation of the state of utilisation and adoption of e-Government business applications correlated with the geographic location of the respondents. The findings demonstrate a low utilization of BTC directory, BURS, case management system, school registration, and license renewal across all three geographic locations (as illustrated in Figure 4.18). The highest response to online internet government services was recorded in urban areas (25.16%) followed by peri-urban (9.78%) and rural (2.95%) locations. However, these respondents revealed non-applicability to e-Government business applications. in urban area column. The most prevalent e-Government service includes business registration forms. Findings regarding the use of business registration forms in urban, peri-urban, and rural areas were 21.74%, 13.51%, and 2.33%, respectively. The most used electronic government services mostly used are business registration forms.

Figure 4.18: Utilization of e-Government Business Applications Based on Geographic Location

	BTC Directory	BURS	Business Registration Forms	Case Management System	Identity Card (Omang) Application	License Renewal	Paaport Application	School Registration	N/A
Peri-Urban Area	0.00%	0.47%	13.51%	0.00%	2.48%	0.78%	2.48%	0.00%	9.78%
Rural Area	0.00%	0.00%	2.33%	0.00%	1.09%	0.62%	0.93%	0.00%	2.95%
Urban Area	0.93%	0.47%	21.74%	0.47%	8.23%	1.86%	2.80%	0.93%	25.16%
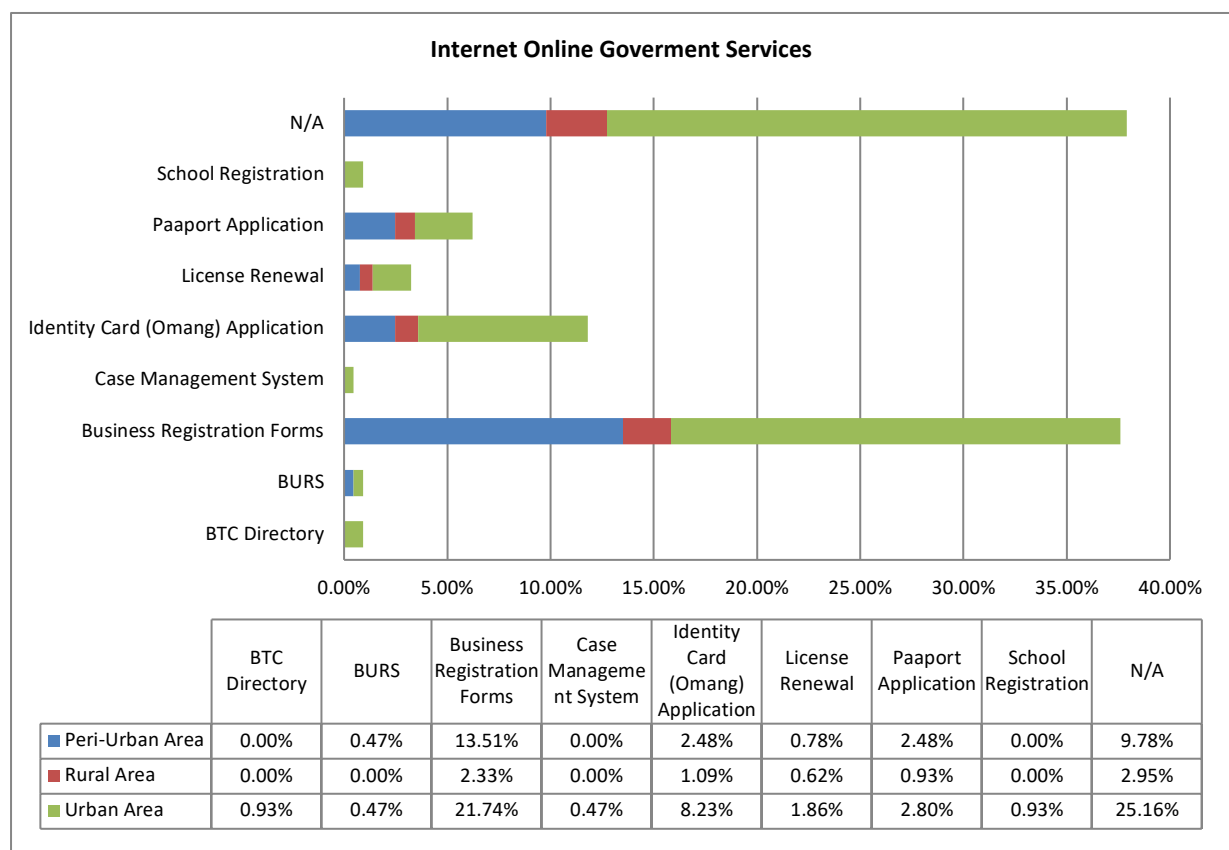
4.5.6   Communication Media Used for Informing in ICT Innovations

Communication media serves as a conduit to transmit information from sender to receiver by effectively creating a platform in which attitudes and intentions influence the adoption or rejection of a new idea. An evaluation of communication channels that influence the use and

adoption or rejection of new ICT skills or tools was performed and the results are presented in Figure 4.19. The results were computed based on the geographic location of respondents and the type of communication skills used for informing and changing the users' relative to their development of new IT skills and the utilisation of technologies. Content analysis identified 11 key categories of communication media channels used that influenced the respondents' decision to acquaint or change ideas. These include Yahoo, Webopedia, videos from the internet such as YouTube, training platforms, subscription magazines, research, observing others, N/A, Google, expert level, and Bing. The respondents in urban areas had a cumulative frequency of 62.58% indicative of their active engagement in the use of communication media for informing internet skills and IT learning. Cumulative frequency analysis in peri-urban locations is 29.50%, followed by rural settings with a frequency of 7.92. Google is the most statistically significant frequency finding (50.93%) regarding communication media used across all geographic locations. Additional findings show that videos from the internet sites such as YouTube have a cumulative frequency of 19.26%. Observing what others are doing revealed a cumulative frequency of 12.89% with the largest frequency of the respondents in urban areas (8.23%) and the lowest frequency in rural areas (1.40%).

Figure 4.18: Communication Channels Based on Geographic Locations

Communication Media for Internet Skills and Learning

	Rural	Peri_Urban	Urban
■ Yahoo	0.00%	1.09%	1.09%
■ Webopedia	0.47%	1.40%	5.12%
■ Videos from Internet	0.47%	2.80%	15.99%
■ Training	0.00%	0.47%	0.47%
■ Subscription Magazines	0.00%	0.47%	1.40%
■ Research	0.00%	0.93%	0.47%
■ Observing Others	1.40%	3.26%	8.23%
■ N/A	0.00%	0.00%	0.31%
■ Google	5.59%	18.32%	27.02%
■ Expert level	0.00%	0.00%	0.93%
■ Bing	0.00%	0.78%	1.55%

(Y-axis: Respondents Based on Geographical Locations, 0.00% to 70.00%)

4.5.7   Social Norm and Skills for Internet and Technologies

An IS involves inherent attributes that allot its members to exhibit technical skills needed in the processing, utilisation, and storing of information using computer networks or the internet and other allied IT technologies. This study measured the skills of the respondents within an IS to determine its pattern or trend. Most of the respondents reported their preferred internet browsers Google Chrome (as shown in Figure 4.20). A majority of them (87.75%) had the ability to type the web address (URL) and access it directly. In accordance to the geographic location, the largest proportion of the respondents resided in urban areas (55.75%) and demonstrated the likelihood of typing the web address followed by the respondents in peri-

urban (24.38%) and rural (5.59%) settings. Additional findings show that 12.27% of all respondents were unable to type the web address and access web page.

Figure 4.20: **Access to Internet Based on Gender and Geographical Level**
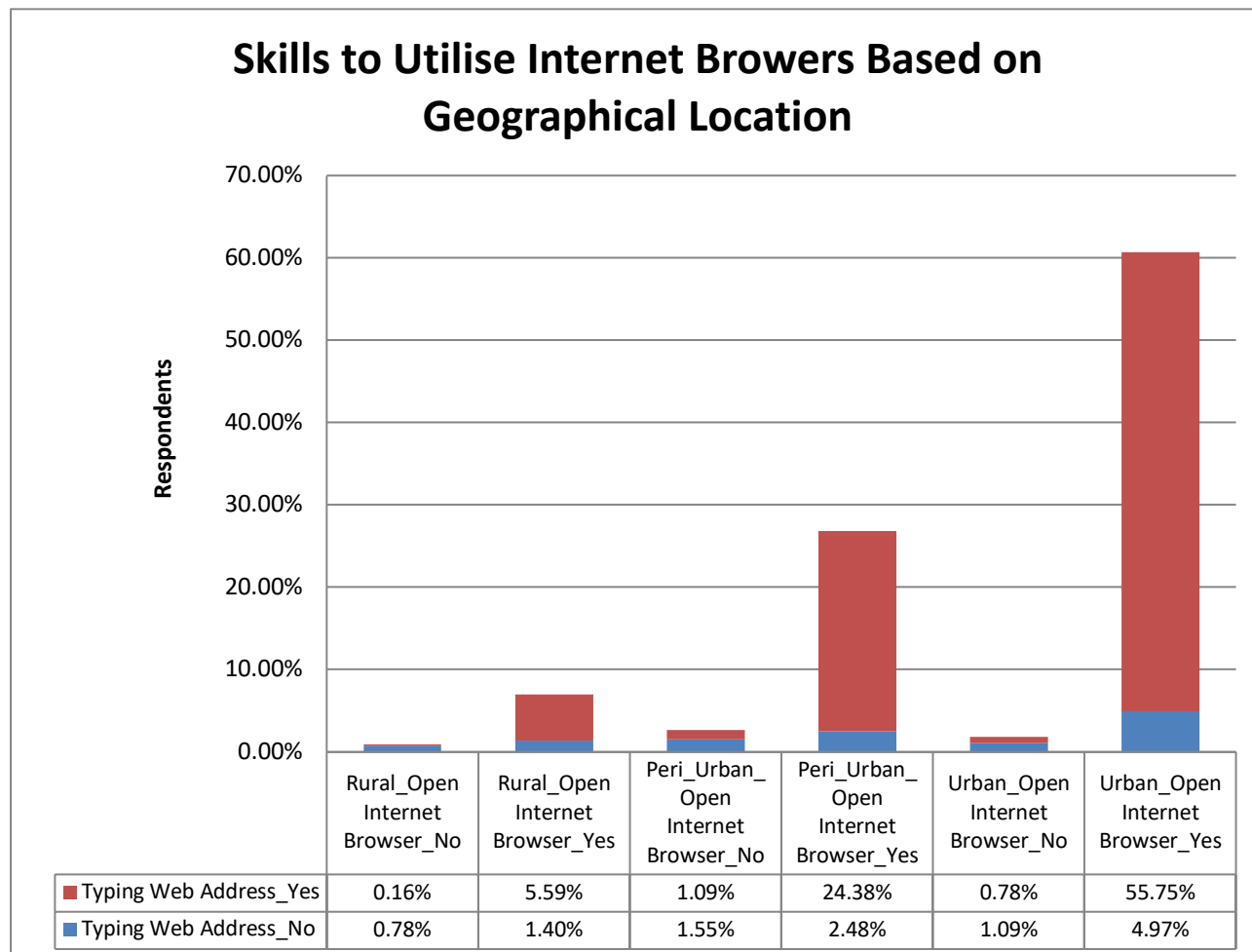
The study also examined respondents' ability to differentiate between secure internet access (https) and non-secure internet access (http). Upon computing the respondents' response rate, the most significant findings reveal that the respondents in urban areas (28.42%) used secure websites while those in rural areas used the least secure websites (3.42%) (as shown in Figure 4.20). Approximately 54.19% of the respondents use non-secure websites. More than half of these (34.16%) reside in urban areas. A low statistically significant difference was found between the respondents that have the skills needed to access secure websites compared to those without. The difference between skill utilisations needed to access secure and non-secure websites is 8.37%.

Figure 4.21: HTTPS Utilization Skills

HTTPS Utilization Skills

	Rural Area	Peri-Urban Area	Urban Area
■ HTTPS_No	4.50%	15.53%	34.16%
■ HTTPS_Yes	3.42%	13.98%	28.42%
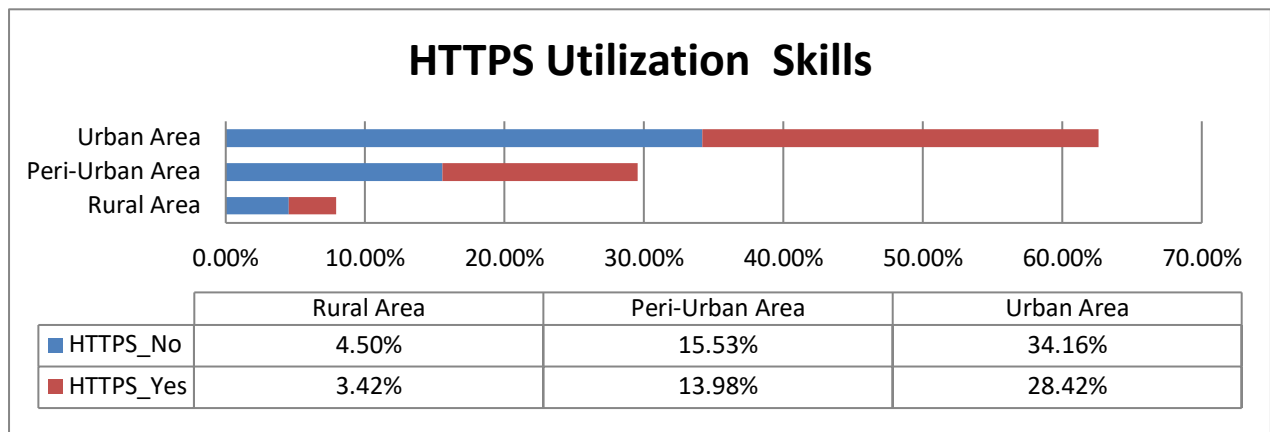
4.5.8   Timely Adoption of Internet and ICT Technologies

Adoption and utilization of technologies were examined across a period of five years based on education level and geographic location. The highest rate of utilisation and adoption of technologies was observed in urban areas among the respondents with either higher or tertiary levels of education at a rate of 13.04% and 29.35%, respectively. The findings show that a total of 64.44% of all the respondents have been using IT for a period greater than five years (as shown in Figure 4.21).

Figure 4.22: Internet Utilization and Technologies and Time

	Rural_T	Rural_H	Rural_L	Peri-Urban_T	Peri-Urban_H	Peri-Urban_L	Urban_T	Urban_H	Urban_L
■ 1 year	0.00%	0.16%	0.16%	0.00%	3.11%	3.11%	0.16%	1.40%	0.78%
■ 2 years	0.00%	0.93%	0.62%	0.00%	2.80%	2.80%	1.71%	3.73%	2.48%
■ 3 years	0.00%	0.47%	0.47%	0.00%	2.33%	2.33%	0.16%	2.95%	0.78%
■ 4 years	0.00%	0.47%	0.47%	0.16%	0.78%	0.78%	0.16%	2.64%	1.55%
■ > than 5 years	2.48%	0.93%	0.78%	9.01%	3.57%	3.57%	29.35%	13.04%	1.71%
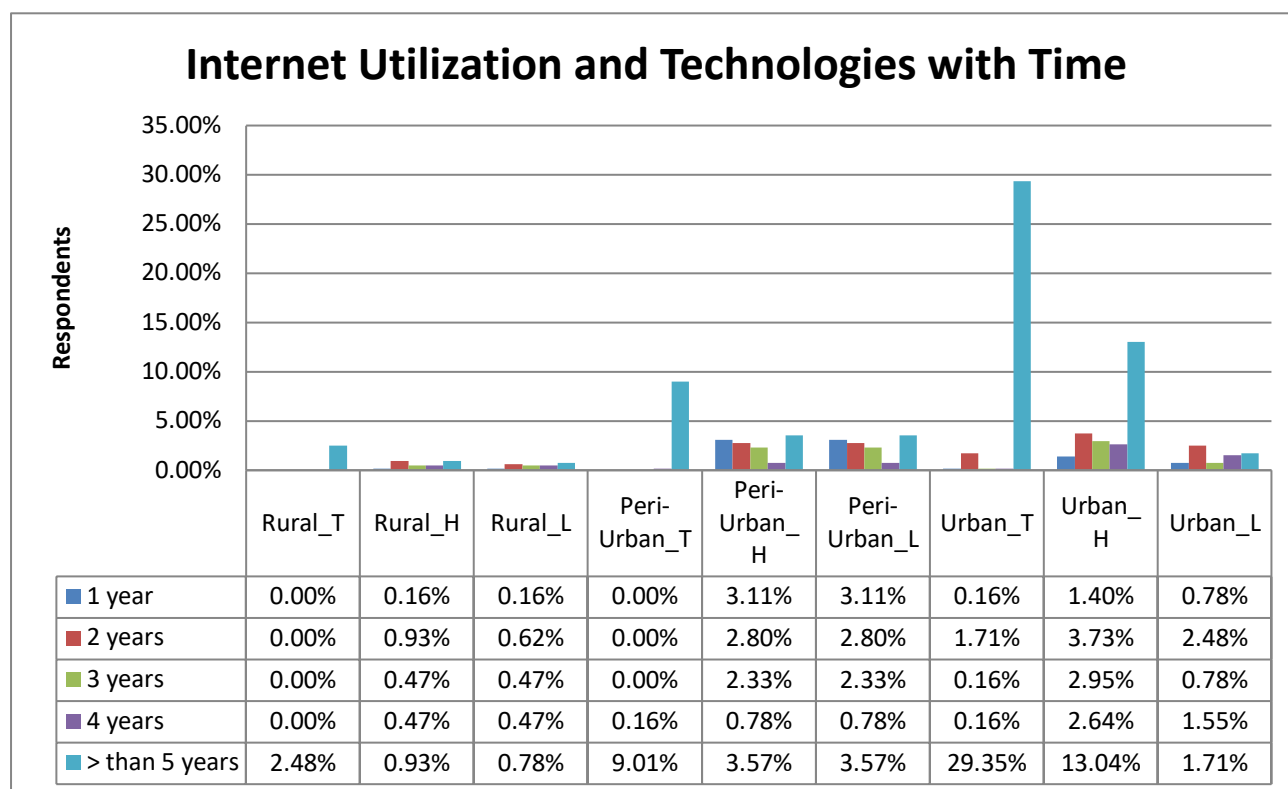
4.6   Summary of Data Analysis and Presentation

This chapter presented the data and analysed with it the aim of identifying patterns and trends of ICT utilisation. The study used the adoption and access to the internet as well as the utilisation of ICT technologies as a basis for measurement. The findings identified the research respondents in accordance to gender, education level, and geographic location. Such an approach served as the foundation for observing the existence and impact of technology and internet use patterns in Gaborone and surrounding areas. A more interpretation and explanation of the results is provided in chapter 5.

Chapter 5
Discussion and Recommendations

5.0   Introduction

This chapter summarises and analyses the research findings presented in Chapter 4. It interprets the applicability of the findings to the conceptual framework, which is based on a composite of the UTAUT Model, DIT, and SATUM. The chapter further explores the findings with respect to each individual theory or model. It also explains the implications of the theories to this study. The conclusion is drawn from the data. The results are compared to the theoretical and conceptual framework in relation to the existing literature on DD. The detailed recommendations are also provided. They specifically address the impact of the three dimensions; the education level, gender, and geographical location on the adoption and utilisation of the internet and ICT. The study's limitations are also discussed. Including suggestions for future research. This chapter concludes with some remarks highlighting the social implications, of the study's findings.

5.1   Type of Connection, Devices and Access to Internet

Internet connection in Botswana is mostly based on Wi-Fi and 3G inter connection. The mobile internet network based connection is prevalent in Botswana because of the massively built associated network infrastructure that has been massively built in Botswana[194].

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[194] Esselaar, S. & Sebusang S. 2013. Understanding What is Happening in ICT Botswana: A Supply and Demand

The Wi-Fi technology has potential to increase internet access to remote locations in Botswana. The amount of investment required to install Wi-Fi technology is cheaper and this can benefit the people in the rural areas where there is physical wires/ no massive broadband telecommunication infrastructure. The research shows people from the urban and peri-urban areas have continued to benefit more from the Wi-Fi technology as it is complemented by the mobile broadband for internet connection. This explains the reason why internet access is more dominant in urban and peri-urban than the rural areas.

Laptops, smartphone, tablets and handheld mobile devices are regularly used for internet access mostly in the urban and peri-urban. The results also show a highly statistical significance and a moderate strong relationship for use of these devices to access internet. Internet connections in Botswana's urban and peri urban areas has been shown to support Wi-Fi, 2G, 3G and 4G technologies hence the wide use of mobile devices. This development typically denotes an IS which can access information anywhere and provides the relevant services for supporting the production or social engagement and many other areas of information need. Informed decisions are made with convenience and regardless of fixed structures

BOFINET, a quasi-government organisation entrusted with implementing and monitoring internet usage in Botswana, have to implement affordable Wi-Fi. The affordability of Wi-Fi allows people living in Botswana to gain access to hospitals, Instagram, shopping malls, social media, twitter, WhatsApp and other internet sites[195]. Despite this remarkable achievement most internet users are located in the urban areas as noted from figure respondents on connection mode for internet access[196]. The availability of the internet and technologies increases in urban areas, which explains why the respondents residing in the urban areas tend to have access to Wi-Fi and an array of other modes of internet connection compared to their counterparts from the peri-urban and rural areas.

Places of internet access have also been found to have shifted from the traditional areas like internet cafes, school and work to in Botswana. A high statistical significance for accessing internet at home also shows a moderate strong relationship. More female respondents to access internet at home than male, and at all geographical locations with the urban dominating, followed by the peri-urban. In contrast, the male respondents have been shown to access

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of The ICT Sector, 1 - 39

[195] http://www.bofinet.co.bw/index.php/2015-10-21-09-51-55/botswana-wifi-hotspots

[196] Esselaar, S. & Sebusang S. 2013. Understanding What is Happening in ICT Botswana: A Supply and Demand of The ICT Sector, 1 – 39.

internet at work, home, school and internet café.

Based on the respondents' response, there could exist a shift due to the increase in Wi-Fi and 3G mobile internet work thus enabling internet access from mobile phones and laptops. Similar findings are noted by Stork, Calandro and Gamage, who state that there is mobile internet work connection equivalent to 95.9%, 15.3% broadband network using dial up MODEMs (ISDN), and 4.9% using ADSL modems in Botswana[197]. Desktop computers have been replaced as the primary devices used to access the internet because of the omnipresence of Wi-Fi and 3G connections in Botswana.

The use of mobile broadband and mobile devices is essentially explained by the World Bank report of 2013. Botswana's mobile cellular subscription rate of 76 per 100 people rose to 143 rates per 100 by 2011. By 2014, it was 167 per 100. This ratio represents an ownership of two or more cell phones per person. Botswana's mobile penetration is strong with a good coverage as provided by the three MSP's. Botswana has one of the highest cell phone penetration rates in Africa. However, as for internet access and connection it is mostly concentrated in urban and peri-urban centres as already discussed.

5.2   Skills Used for Internet Utilization

Skills to manipulate and use internet were dominant in the respondents from the urban and peri-urban areas. The general and basic ICT skills included the use of browsers to access web sites, but not advanced skills to determine and realise access to secured web sites and no secured web sites. Some of the skills exhibited were the use of devices like smart phones, laptops and tablets to access the internet and these skills were still dominant in urban and peri-urban areas. The respondents from the urban and peri-urban areas had high statistical significance in the use of state of the art devices like smartphones, laptops and other handheld devices to access and manipulate information from the internet. The rural areas showed a poor response on the use of mobile devices for internet access and data manipulation. This could be caused by the lack of 3G and 4G mobile technologies in rural areas and also minimal facilities on Wi-Fi installation as well.

The respondents in urban areas and peri-urban show a remarkable skill and utilisation of internet to access information for communication purposes, access information to make informed decisions, entertainment information and learning and research information. The

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[197]Stork C, Calandro E, Gamage R. 2012. The future of Broadband in Africa, 1 – 22.

rural respondents only showed keen interest in using internet for communication purposes only.

The research also noted the lack of use of internet for electronic commerce applications or business application. All geographical locations show a poor utilisation rate of electronic commerce applications. This occurred despite the educational levels of respondents. They used secure and not secured web sites. The usage of electronic commerce applications like payment on line, purchases on line and also use of Botswana government electronic commerce services was at minimal.

The use of ICT technologies and display of skills go along with exposure to favourable and promoting environment. The respondents from the urban areas show a duration of more than five years being exposed to ICT technologies and skills compared to the respondents from the peri-urban and rural areas. The level of exposure and the mastery of ICT skills by the respondents is evidenced by the appetite to learn more skills using different communication media as deduced from the results. The respondents in urban areas show a remarkable use of communication media like internet search engines, in particular Google, learning from peers, use of training videos from internet and the use of internet encyclopaedia like Webopedia and Bing to learn new ICT skills and technologies.

5.3   Educational Status and Geographical Locations versus Internet Utilisation

The results indicate that tertiary educated respondents were the most dominant users of internet and ICT technologies in all geographical areas. The higher educated respondents' utilization is second to the tertiary educated respondents. The primary educated graduates show a very insignificant utilisation of internet and ICT technologies in all the geographical areas.

The degree of the relationship between urban and peri-urban respondents' use of internet and ICT technologies indicate a moderately strong association. From an ICT adoption perspective, it could be argued that urban users of technology, who have been using ICT for four to five years are more than likely innovators or early adopters and not considered laggards or the late majority.

Edishina *et. al.* proclaim that increased utilisation of IT is generally linked to a good education level, which is associated with higher levels of education[198]. These findings suggest that both

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[198] Adeshina T J, Udoh A, Ndomi B & Muhibeedeen A. 2013. The Relationship between the Information Technology Skills Acquired by Secretarial Teachers in Nigeria Colleges of Education and Their Utilization of

males and female respondents with higher or tertiary levels of education in urban locations in Gaborone, tend to utilise the internet and ICT at a higher proportion on an everyday basis. SATUM theory suggests that education level and geographic location affect technology and internet use patterns in Botswana.

Google Chrome is attractive because it is a freeware web browser that uses the WebKit rendering engine to display web pages with an auto-completion feature that grants web developers and programmers access to the internal components in the web browser and its application[199]. These features have proven to be affective with the academic community, which informs researchers as to why the respondents with higher and tertiary education utilise Google Chrome more than the respondents with a lower levels of education.

5.4   Digital Divide in Botswana

The research notes that, there is a first order DD which simply considers the users who have access and those without access to internet and ICT[200]. The implication is that access to internet and ICT technologies could be physically constrained by the proximity of the resources, its distribution or its 'economical' availability. Hargittai mentions another category of DD, the second order DD, which is stated "as the medium spreads to a majority of the population, it is increasingly important to look at not only who uses the Internet, but also to distinguish varying levels of online skills among individuals. Skill, in this context, is defined as *the ability to efficiently and effectively find information on the Web*[201]". Hargittai not only looks at access, internet and ICT technology availability, but also considers the ability to use the available internet and ICT resources. He further considers the skills to utilise these resources.

First, DDD is present in Gaborone and surrounding areas. The rural areas and partly the peri-urban areas have limited access to internet access. The 3G, 3.5G, 4G and Wi-Fi internet networks are predominantly installed in the urban areas and partly in the peri-urban and scantly in the rural areas. The same sentiments are echoed by Duncombe and Heeks, who argue that some rural areas in Botswana have inadequate ICT and telecommunications infrastructure[202].

Internet for Effective Teaching, 105 – 116.

[199] Narayanan S A, Chrome RLZ. 2012. International Journal of Computer Applications, 49-52.

[200] Van Dijk J. 2006. Digital divide research, achievements and shortcomings, 220 - 222.

201 Hargittai E. 2002. *Second-Level Digital Divide*, 1- 10.

[202] Duncombe R, Heeks R. 2002. Enterprise across the Digital Divide: Information Systems and Rural Micro-Enterprise in Botswana, 61-74.

Besides the availability and advent of better telecommunication services which do not require massive structural development, for instance Wi-Fi the presence of such internet networks services could be a challenge in Botswana rural areas because of the limited or unavailable electrical infrastructure and erratic electrical supply[203].

The research has also reveal that there is second order DD in Botswana in the context of using electronic commerce skills or the use of online business. All the respondents in all geographical areas show poor utilisation of online business facilities despite the presence of mobile broadband network, broadband network and relevant software applications in all urban and peri-urban geographical locations. This indicates the lack of appropriate skills to use the facilities or just having fear of doing business on line due to the disclosure of very sensitive information. In their research for investigating the adoption and utilisation of electronic commerce in Botswana, Uzoka and Seleka concluded that, "there is a low level of e-commerce adoption due to organisational and socio-economic structures. These are caused by organizational, internet marketing and customer characteristics" [204]. The customer characteristic factor is attributed to issues like levels of internet access, computer literacy, internet awareness, gender and educational status. Furthermore, it has been noted that the adoption of e-commerce in Botswana has not been easily adopted and embraced. Traditionally, the Botswana population believe in physically seeing items they are buying.

Research literature regarding the utilisation of business application, including advertising, marketing, payments, provision of services, and purchasing from the government and many other business processes is relatively low[205]. Kende reports that e-commerce in Botswana is at the lowest level of utilisation despite its vast infrastructure. Low utilisation has proven to be attributed to organisational and socio-economic structures[206]. Although customers are part of the socio-economic structures; they fear doing business online as it is a shift from the traditional method of doing business. Shemil and Procter posit that environmental challenges shapes poor utilization of ecommerce in Botswana. This stems from the lack of a friendly business atmosphere, a contextualised credit card payment system, and macro-economic regulatory

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[203] Oreku et al., Uzoka et al.2007. Factors Affecting E- commerce Adoption in Small and Medium Enterprises.

[204] Uzoka E F, Seleka G. 2007. Organizational, Environmental and Technological Determinants of E-Commerce Adoption in Botswana, 1421-1430.

[205] Shemil A P, Procter C T. 2013. Challenges of E-Commerce Adoption in SMEs: An Interpretive Case Study of Botswana, 17-30

[206] Kende, M. 2014. Internet Society Global Report 2014: Open and Sustainable Access to All, 137 - 138.

policies that support e-commerce[207]. In relation to the utilisation of e-commerce, respondents in this study may have demonstrated a lack of utilisation due to the fear associated with the use of ecommerce technology for doing business online. Fear stems from instantaneous online payments and security issues that may arise.

Another manifestation of second order DD exits amongst all the respondents in the form of lack of use of advanced ICT skills. This is evidenced by the test of significance done between knowledge of using secured web site and knowledge of using none secured web sites. The majority of respondents failed to recognise and know the difference between these two skills and termed this as the lack of advanced internet awareness by internet users[208].

5.5   Victims of Digital Divide

The fourth research questions sought to understand and identify the most challenged victims of DD in Botswana. The research identified all the respondents in the rural areas, of all educational levels and gender as highly disadvantaged because they have limited telecommunication infrastructure. This is in view of the fact that some telecommunication infrastructure does not require massive resource to be deployed. The other factor that makes the rural respondents victims of the first order DD is the issue of availability of electricity in the entire country. As noted before, not all rural areas in Botswana have access to electricity.

Another category of victims to DD in Botswana are all the respondents who are keen to use electronic commerce. These includes individual, business organisation and the government. Major investments are made to facilitate access of the different groups of individuals and yet people are not able to benefit from these provisions. The study, "Challenges of E-Commerce Adoption in SMEs in Botswana" notes that majority of developed countries use electronic commerce and there is a significant growth in electronic commerce utilisation in developing countries including Botswana[209]. This positive development will benefit *Batswana* as they adopt the utilisation of e-commerce. The GoB has already embarked a number of electronic commerce applications like e-passport, e-health, e-thuto, e-learning and many others. By virtue

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[207] Shemil A P, Procter C T. 2013. Challenges of E-Commerce Adoption in SMEs: An Interpretive Case Study of Botswana, 17-30

[208] Uzoka E F, Seleka G. 2007. Organizational, Environmental and Technological Determinants of E-Commerce Adoption in Botswana, 1421-1430.

[209] Shemil A P, Procter C T .2013. Challenges of E-Commerce Adoption in SMEs: An Interpretive Case Study of Botswana, 17-30.

of non-utilization of these facilities which also require operational and maintenance the organisations become victims because there is a second order DD on the user part.

5.6   Drivers of Digital Divide

The last research question needed an explanation on the drivers of DD in Botswana. It is noted that key DD in Botswana is due to lack of access to internet, network resources and the lack of advanced ICT and electronic commerce skills. The following are stated as main drivers of DD in Botswana:

a) Lack of advanced ICT skills by users.

b) Lack of advanced skills in internet utilisation.

c) Lack of electronic commerce and internet application skills amongst the users.

d) Inadequate distribution of telecommunication and electrical services in the rural and peri-urban locations.

5.7   Overall Findings of the Research

The results of the literature review and data analysis are clearly reveal the following patterns:

(a) Geographical differences have a major influence on the adoption of information technology and internet usage. The issue of geographical differences has always been the centre of reference on how diffusion of technology is taking place. Analysis on the utilisation of internet have revealed a low utilisation rate of rural areas while for Urban and Peri-Urban, there is a clear indication that internet is accessed daily for long periods of time. This corroborates with the assertion that rural areas have a low absorption of technology. The spatial adoption potential theory predicts that technological developments follow a filtering down process from the urban hierarchy (core area) to the peripheral area"[210]. Furthermore, "the agglomeration effect theory also agrees on how the adoption of a new technology is taking place: the core areas will be the centre for further growth, including with improved or adopting to new technology"[211]. There exists a digital divide between the urban and rural populations, with the urban

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[210] Capello, R. 1994, Spatial Economic Analysis of Telecommunications Networks Externalities, 145.

[211] Capello, Roberta, 1994, Spatial Economic Analysis of Telecommunications Networks Externalities, 145

population valuing access to, and use of ICT more highly than the rural population.

(b) There is very little to no evident DD based on gender differences. No statistically significant difference was revealed between females and males in higher education in urban, rural and peri-urban areas. A comparison of the utilisation of technology in all the different areas (urban, rural and peri-urban) have demonstrated a balance between males and females. This suggests that the level of technology adoption by both sexes is balanced.

(c) The adoption and usage of technology is more skewed towards the literate cadres. There is a need to develop a robust training curriculum to provide the necessary knowledge and skills to all people to ensure the utilisation of the internet and computers.

One of the main output of this research was to provide action plans that are geared towards the closing of the DD in Gaborone and surrounding areas. The lessons learnt can be further applied to all areas in Botswana. This can only be possible provided the same type and kind of infrastructure is applied and installed throughout the country. The recommendations made are in line with the literature review, the findings and trends in international treaties and action plans of the IS. The following are the recommendations:

(a) *Focus of the government investment should be for both the hard and soft infrastructure with special attention to the rural areas*

The existence of DD in Botswana, with particular focus to the geographical locations is a documented and well known issue. There are a number of programmes that the government has continued to develop and implement aimed at closing the DD in rural areas. Clearly, ICT is a critical component and a tool in the delivery of the National Development Plan of Botswana. The existence of DD has a potential of making the country fail to achieve its vision of a well-educated and knowledgeable society. Effort and measures need to be put in place to ensure improved ICT infrastructure in all the villages in Botswana. There are trends in the data that suggest a hunger for ICT infrastructure in the urban areas. There is an accelerated adoption of technology that has resulted in a different movement as compared to the natural "S-curve". A number of projects have been undertaken by the government to improve infrastructure in the rural areas. These are evident through the Nteletsa I and II projects. Despite these, there is also

a need to accelerate the adoption of technology by providing high speed internet facilities.

Furthermore, a deliberate attempt should be made to improve the soft issues in relation to the geographic area. There is a need to provide internet access in all the schools in the rural areas as they will provide a place for students to access computers and internet. For diffusion of ICT to be successfully accelerated, the focus should include soft issues. There is a need for lifelong learning in the rural areas. Most of the population in the rural areas are using the Nteletsa amenities for photocopying, emailing and printing. Advanced possibilities of the internet and its capabilities need to be demonstrated to different people. The use of e-commerce application is one of the areas that rural areas do not participate in or use as a platform. Most of the people in the rural areas do not use application such as online banking, e-commerce and other advanced computer related facilities.

(b) The Provision of subsidy on Internet prices. Tariffs should be reduced to ensure a better playing field for all people

The majority of people in Botswana are sensitive to costs. Through BOCRA, the government needs to continually make improvements on the traffic for usage of internet and computers in the country. Lower internet prices will attract more people towards the usage of internet and the penetration levels will be improved.

Another alternative in tariff implementation is to impose pricing discrimination for rural areas. This would increase the volumes of people accessing internet facilities in villages and rural areas.

(c) Participation of the Private Sector – liberalisation of the market

The GoB has made tremendous efforts by liberalising the telecommunication industry. To date, there are three service providers. More efforts should be made to reduce participation by government in this sector. The private sector should be given leverage and motivation to setup more businesses that are geared towards telecommunication. The more competition there is in the market, the more innovative products and pricing will be enjoyed by citizens. The diffusion of ICT in rural and urban areas can be possible and accelerated when there are more players in the market willing to offer unique and competitive solutions.

(d) Policy to encourage personal computer ownership

According to the analysis made, it has been shown that there are a number of people who use internet at home as opposed to work and internet cafes. Based on this analysis, interventions

have to be made to propel the growth of ownership of personal computers by citizens.

5.8   Significance and contribution of the research

From an administrative point of view, the research has created awareness to policy makers in Botswana, especially those who are engaged in reviewing ICT policies and strategic policies. These policy makers could be operating at organizational, institutional, or national level. It is believed that as an independent initiated research study, the research would bring to attention issues that might not have been considered in their planning processes.

Economically, this research is directed to business entities that wish to engage in electronic commerce. Most business entities are found to dump electronic commerce applications on the internet with the hope that the targeted users will utilise them. This research has identified second order DD in particular the use of electronic commerce applications as a concern that needs to be addressed. End users in Botswana are not able to use e-commerce and internet related applications because they lack the relevant skills and awareness.

This study has identified the existence and impact of technology and internet use patterns in rural, urban, and peri-urban locations throughout Gaborone and its surrounding areas. The conceptual framework used in this study covers an array of variables that some theories and models fail to examine. An amalgamation of the UTAUT Model, DIT, and SATUM allot researchers to understand the significance of examining key dependent and independent variables with respect to the respondents' geographic location and its underlying socio-economic and political determinants. The variables in this study facilitated a process of determining the relationship, pattern and trends of internet and ICT technologies utilisation in the geographic context of Botswana.

The main contribution of the study was centred on identifying the patterns of ICT use to assess whether such patterns are indicative of a DD in Botswana. Developing countries such as Botswana have embarked on full throttle ICT acquisition and deployment.

5.8   Limitations of the research

The use of ICT in Botswana is at an early stage of diffusion. Therefore, there are only few available studies conducted. thus limiting secondary data. Therefore, the scope of the study has some limitations and these are as follows:

a. The use of micro-level samples to represent the general pattern of diffusion of the population. Although the study has a substantial sample size, the population may not be a good representation of the entire populace. A more thorough and all-inclusive research needs to be undertaken to examine all districts the country.

b. This research might have lost key factors in the final modelling and questionnaire, as certain factors thought to contribute to the problem of multi-collinearity may have been eliminated. These eliminated factors might have significant cause-effect relationships with the use of ICT by the mass population. However, to mitigate its impact on the study's findings, the study utilized a conceptual framework comprised of the UTAUT model, DIT, and SATUM to examine the existence and impact of technology and internet use patterns of Batswana.

c. The use of Gaborone and surrounding areas in the South-East District as the research location has given a conservative representation of the state of ICT diffusion in Botswana. Conversely, the use of all other cities, towns, and villages to represent the working population's use of ICT might over represent the working populations use of ICT, since the capital city is located where infrastructure development and investment in ICT is very high. Gaborone and few of the surrounding areas have superior telecommunications capabilities and are able to provide a good representation of state of ICT in Botswana.

5.9   Future Research

Given the limitations of the current research, the following future areas are recommended to address:

a. Considering the limited sample size and variations, the analysis of the current research has only been able to highlight limited differences in the diffusion of ICT between the three dimensions studied, in terms of gender, geographical area and education. More factors and dimensions can be researched to provide a true picture and reflection of diffusion of ICT in Botswana. A mix of macro-level and micro-level analyses covering the same dimensions and possibly including income level and age should be conducted at a national level, covering each district in Botswana, and using different sample groups. This would provide a more secure generalisation about the diffusion of ICT and digital divide in Botswana,

b. There is a need to further examine the "second-level" digital divide based on differences

in competency in using ICT, especially among the working population. The existence of this type of divide has been proven from this research. It is predicted that the problems associated with it will become more observable when more of the mass population becomes ICT literate, at which time the issue of DD will shift from simply being an issue of accessibility to a more complex and competence based. This issue will also become more prominent in the future when more public and private services require the use of sophisticated ICT applications. Those with limited and basic skills in ICT will be marginalised in the future especially in the ever-changing digital age.

c. There is a need to conduct more research that advocates the users' perspective in the diffusion of ICT. The current research has shown that there are different, sometimes conflicting, views held by the supply-side and the demand-side. For example, not many of the rural schoolchildren are using the Internet at school, even though there is Internet access available there. This kind of problem might have been prevented if the demand side perspective had been taken into account at the planning stage. Another example is, the lack of local content on the Internet that relates to the rural lifestyle. This makes it difficult for the Internet to be appealing for the rural population.

5.10   Conclusions

In conclusion, the research evaluated the impact of ICT utilisation and implementation in Botswana by measuring the skills available, devices used to utilise ICT and internet, the state of adoption rates based on geographical locations, educational level and business orientation at personal level. The research sought to answer questions like ICT skills used to manipulate, transmit and process data, ICT tools used and business application, ICT resources skills availability and their distribution based on three key geographical levels i.e. urban, peri-urban and rural areas in Botswana.

The research concludes that in Botswana, there exists a DD. It is confined in two orders of DD, first and second order Digital Divide. The first DD is defined based on geographical locations that rural areas are more disadvantaged of ICT skills and technology. Second order DD is defined in the context of lack of advanced ICT skills i.e. the use of secured web pages, cloud computing services etc. and also lack of electronic commerce skills as well.

The research concludes that the drivers of DD in Botswana are an uneven distribution of ICT technology and skills which is mainly centred on urban and the peri-urban gains because of its proximity. Botswana has a population of about 2,029,307, and around 120,000 of its population

are using the Internet, a penetration rate of about 5.9%. User growth from 2000 to 2010 was about 700%. Google was the leading search engine with 81.99% market share in August 2010. Both Yahoo! and Bing had around 8% market share. Botswana has around 0.1% of all Internet users in Africa. Internet World Stats in March 2011 estimated 2,095,006,005 people around the world were online, or 30.2% of the total world population. Google had 91.2% of the total search engine market, and Search Engine Usage by Country Global Search Engine Marketing.

The successful implementation of government of Botswana initiatives and programmes in becoming an IS needs participation and full involvement of all the relevant stakeholders in the industry. It cannot be left to government alone. Through the involvement of the private enterprises, NGO's and citizens of Botswana, DD can be narrowed and Botswana can become a success information society.

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Appendix
Questionnaire

Bridging the digital divide in Botswana: Case study of Gaborone

Please circle the appropriate answer that best describe you.
Section 1: To begin some facts about you. Please circle the answer that best describes you

Gender
1. Male: 2. Female:

Education Level
1. Lower Education   2. Higher Education   3. Tertiary Education   4. Other_____

Geographical Location
1. Urban   2. Peri Urban   3. Rural

Section 2: Usage of the internet

Which of the following do you use the internet for?
1. Communication   2. Access to information / research   3. Downloading of school work
4. Learning and research   5. Entertainment and leisure

How often do you use the internet in a week?
1. One day   2. two days   3. three days 4. More than 3 days   5. Other (Specify)____
_____

Which one do you use the most and how often do you use it?
1. Twitter   2. Facebook   3. Google Talk   4. LinkedIn   5. Other _____
_____

Which search engine do you prefer?
1. Google   2. Yahoo   3. Bing   4. Other (Specify) _____

Which online services do you use frequently for online purchases?
1. Amazon   2. Eastbay   3. eBay   4. Other: (Specify)_____
_____

Which of the following online payment services do you use?
1. PayPal   2. PayMate   3. Amazon Payments 4. Other (Specify) _____

Tick the type of cloud based storage solution that you use.
1. SkyDrive   2. Drop Box   3. Google Drive   4. Apple iCloud   5. Other (Specify)
_____

Section 3: Access of the internet

Where do you access the internet?
1. Home   2. Work   3. School   4. Internet café   5. Friend's place
        6. Library

What medium are you using for accessing of the internet?
1. Computer / desktop   2. Laptop   3. Mobile Phone   4. Tablet

What access type of connection do you use for your internet?
1. Wi-Fi   2. Broadband   3. 3G   4. Hotspots   5. Satellite   6. LTE

How often do you use the internet in a week?
1. 1-3hrs   2. 4-5hours   3. 6-10hrs   4. More than 10hrs

Which Government services have you used over the internet
1. License Renewal   2. Passport application   3. Application / downloading of business registration forms   4. Identity Card (Omang) Application

How many years have you been having access to computer and Inter?
1. 1year   2. 2years   3. 3years   4. 4 years   5. 5 years' plus

Section 4: Skills to use the internet and computer

Which of the following do you use to determine authenticity of information on web pages?
1. Author Names   2. Date of Information 3. Source of Information   4.   Website Domain   5. Writing Style

Which search engine are you using for your school research?
1. Bing   b. Google   2. Yahoo   3. WebCrawler   4. Other _____

How do you learn new skills for using the computer?
a. Webopedia   b. Observing others   c. Subscription Magazines   d.   Videos from Internet

Section 5: Practical use of the internet and computer. Provide a yes or no to the below questions

Can you create music?   Yes / No
Can you create a query in a database to get specific information?   Yes / No
Can you calculate the mean of 4000 numbers or compute sum of 300 numbers in Excel Spreadsheet?   Yes / No

Determine if web page is secure?   Yes / No

Opening of the internet browser   Yes/No

Go to a specific web page by typing a web address   Yes / No

Are you able to determine if information found on a website is reliable   Yes / No

Do you difference between https and http in website url?   Yes / No

Determine if web page is secure?   Yes / No

Delete a web page that you have saved as a bookmark?   Yes/No

Organize your bookmarks into favourites or folder?   Yes/No

Download and save new software?   Yes/No

Log on or off an email application (gmail, yahoo, Hotmail)   Yes/No