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**A Framework for Broadband Adoption in Buffalo City Metropolitan Municipality to Enable
Citizen Access to e-Government**

By

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201613275

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Abstract

South Africa faces multiple issues of poverty and inequality from its apartheid history, combined with a burgeoning middle class and the need to keep the economic engines going, and this means greater challenges ahead for municipalities. Municipalities are vital entities in local government and are the closest government structure to the citizens. The majority of electronic government (e-government) services are progressively executed at the municipal rather than at the national level. Increasingly, there is a need for a broader, strategic approach, with more sophisticated methods of handling municipal needs. E-government has been adopted as one of the cornerstones of the government's strategy for making services accessible to its citizens. The aim of this broadband adoption is to provide high quality public sector services via digital channels to improve cost-efficiency and generate benefits to municipality employees and citizen. Citizens are able to access and find a range of current and archived government information. Without broadband connectivity, service delivery systems would not be possible. However, improved access to e-government and broadband needs to be created, especially in areas where infrastructure may hamper the ability of citizens to access service through the conventional modes of delivery.



A fast-changing world means that traditional approaches for collecting responses may be less effective today, so citizens will appreciate convenient, comfortable and quicker ways to stay informed about municipal services and community issues and address their views on them. Technology, therefore, offers new opportunities for faster and cost-effective ways to distribute information, as well as reaching out and involving citizens. Lack of public participation restricts levels of communication between governments and municipalities and the citizen while lack of public participation means that the public misses out on information and services available online, which results in further inequality. This has a devastating impact on service delivery because participatory democracy would be non-existent. Limited IT infrastructure, resistance to change, cultural barriers and exposure of malpractice are main themes related to IT usage or facilitating IT access for the wider public. Furthermore, lack of meaningful participation and freedom of association emerged as themes related to governance effectiveness. A mixed approach within a case study was considered, and data was collected through an online questionnaire and review of current literature.

This study evaluates barriers of e-government adoption, assessing strategies and techniques for accessing e-government services, examines current technologies to support e-government service

within municipalities and analyses elements of Buffalo City Metropolitan Municipality broadband adoption strategy. A broadband adoption model was proposed based on empirical findings. Key adoption factors include adoption benefits and drivers, concerns and barriers and adoption interventions. These factors provide an essential foundation for the development of the proposed broadband adoption framework. The contribution of this study is a framework based on the Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Organisation Environment (TOE) framework to determine factors that influence or restrict a citizen's intention to use and adopt technology, specifically broadband, in e-government services as a tool for citizen engagement. The proposed framework aims to overcome barriers to broadband adoption in municipalities, specifically Buffalo City Metropolitan Municipality (BCMM) to enable citizens' access to e-government services.

Keywords: Broadband Adoption, Citizens, E-government, Infrastructure, Municipality, Public Participation; Technologies



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Declaration

I, Sithandile Twetwa-Dube (201613275), hereby declare that:

1. I claim the work presented here as my own and that it has not been submitted anywhere for any award.
2. All sources used or referred to in this work have been acknowledged.
3. I am fully aware of the University of Fort Hare's policy on research ethics and I have taken every provision to fulfil with the regulations. I have obtained an ethical clearance certificate from the University of Fort Hare's Research Committee and my reference number is the following: PID011SDUB01 (Attached as Appendix A).

Signature: 



Date: JUNE 2019

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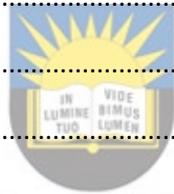


Above all, I wish to thank God for giving me strength, determination and bringing me this far.

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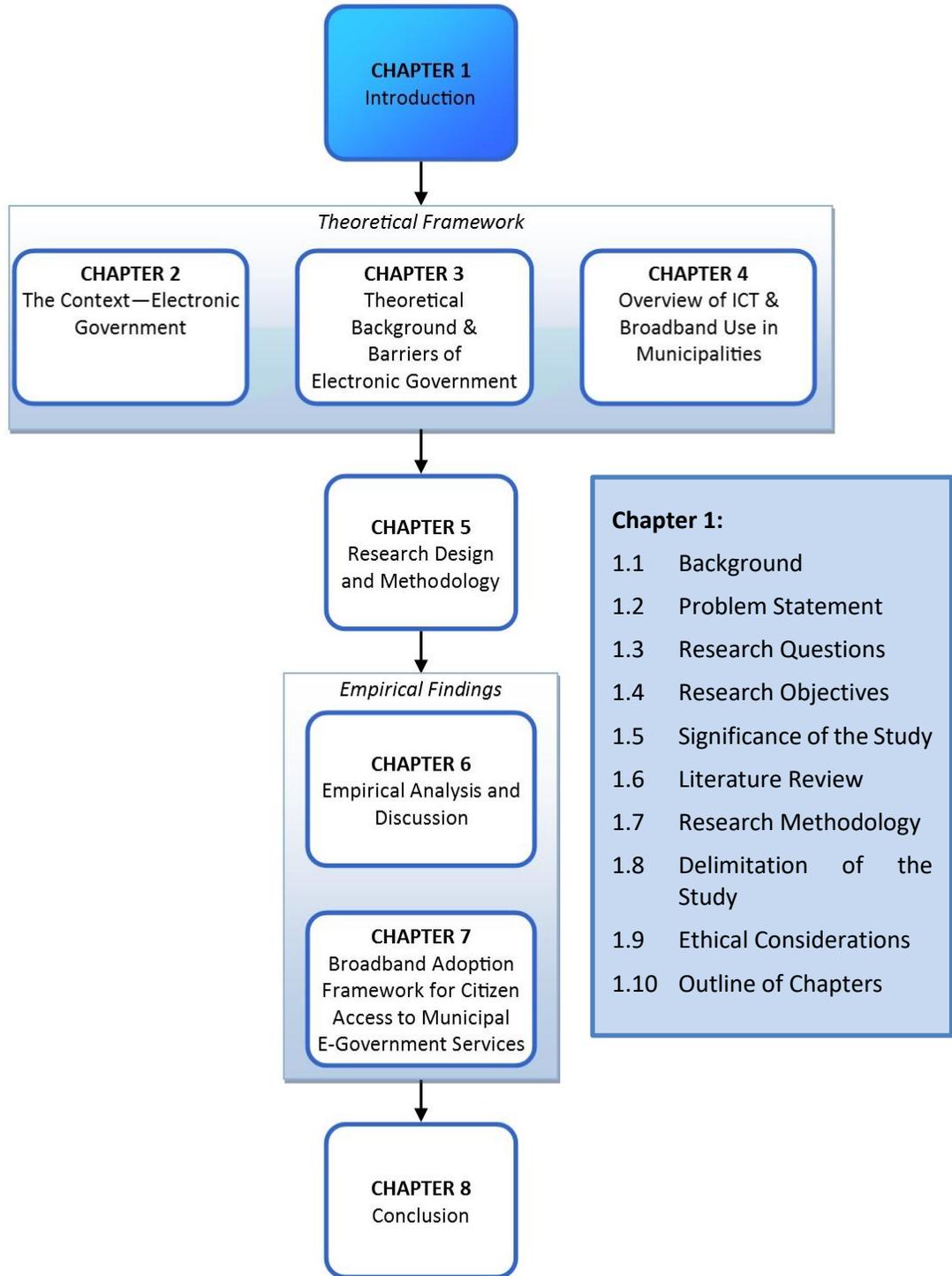
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Chapter 1 : Introduction



1.1 Background

The onset of democratic transformation in South Africa in 1994 had a profound influence on local government, which progressed from being a third tier of government to an equal, autonomous sphere, with implications for comprehensive service delivery (Kroukamp, 2014). It is thus clear that over a period of 25 years, the government has attempted, through numerous pieces of legislation and regulations, to create a policy environment that is beneficial and supportive to one common goal - the improvement of life for all. E-government is viewed by the government as a solution to a surplus of socio-economic problems facing in South Africa and was further revealed that e-government initiatives at the municipality level are quite influential in driving the e-government agenda in South Africa (Shambare, 2019). The main concern of the government sector, globally, is providing easy to access, cost effective, efficient and timely services to a wide range of citizens living in urban as well as rural areas. In specific cases, resolutions that are rather costly in terms of infrastructural and connectivity requirements will still capture government's attention if the overall benefit to its citizens is substantial to express a strong concern and association with its people (Maatouk et al, 2018).

According to Ramli (2017), this is maintained by improved technology usage by government which, in turn, increases citizens' demands and expectations of better services by the government. It is stated by Benany and Beqqali (2017) that e-government must become an important mechanism of how governments work. This can increase the online presence of government and preserve information and service quality.

The United Nations (UN) (2018) e-Government Survey revealed a positive reflection for South Africa (SA), with the global ranking standing at 39th position. This is the highest ranked African country in terms of e-government. Naturally, government intervention is dependent on service providers being considerate of municipal customers' needs in accessing e-government services (Shambare, 2019). The study of Kassongo *et al* (2018) revealed that e-government, understanding of citizens' urgency and extensive awareness programmes are required to ensure that benefits of e-government are realized.

As South African's digital divide is significant, the SA government has prioritized adoption of broadband as a means of ensuring citizen access to e-government. In order to accomplish this, each municipality is obligated to deliver basic services to its community or citizens; by delivering e-government services through broadband connection, services can be delivered economically and efficiently. Municipalities

operate under guidance from their respective district municipalities but at the same time operate relatively autonomously. Each municipality must ensure that e-government services are rendered accordingly and must work with external support to ensure that governance structures and processes exist and are functional.

Du Plessis (2012) points out that local government relies substantially on the national sphere for funding to render services in line with the constitutional provision for sharing nationally raised revenue. In addition, the situation is complicated in that although provinces have a monitoring role, grants are directly paid to municipalities and are not channeled through the provinces, except in the case of housing subsidy provision. This monitoring role should be fulfilled in a manner that will not compromise or impede the ability of a municipality to exercise its powers or perform its functions. It is therefore important that resources are utilized optimally and the incapacity of people and their performance addressed to improve service and therefore the overall performance of municipalities.

Heeks (2008) defines Electronic Government (e-government) as the use of Information and Communication Technologies (ICTs) to improve activities of public sector organizations. According to Thakur and Singh (2013), e-government is comprised of four delivery models, namely:

1. *Government-to-Citizen (G2C)*: government provides the needed products and services to fulfill the needs of the citizen;
2. *Government-to-Business (G2B)*: online non-commercial interaction between local and central government and the commercial business sector with the purpose of providing businesses information;
3. *Government-to-Government (G2G)*: online non-commercial interaction between government organizations, departments and authorities; and
4. *Government-to-Employees (G2E)*: online interactions through immediate communication tools between government units and their employees.

Within each model, four levels of interactions can take place, and these are posting information, communicating, transacting and governance. Thus, citizens can transition from a passive phase to become active participants in local government. An increased number of e-government services are progressively executed at the municipal rather than at the national level (Seena, 2014). Thus, there is

increasingly a need for a broader, strategic approach, with more sophisticated methods of handling municipal needs.

According to Nengovhela (2012), the South African government has established constitutional bodies to co-ordinate the implementation of e-government projects, namely: State Information Technology Agency (SITA) and Government Information Technology Officers Councils (GITO Councils). The Department of Public Services and Administration (DPSA) has been experiencing difficulty in gaining recognition as a mandated home for e-government. There have been very few successful initiatives and several challenges encountered at municipal level for citizens in accessing the e-government services.

This study sought to overcome barriers to broadband adoption in Buffalo City Metropolitan Municipality (BCMM) to enable citizen access to e-government. It involved government, municipal staff, citizens and users in BCMM as well as the broadband team in that municipality. Their contributions are anticipated to assist in overcoming barriers to municipality broadband accessibility for e-government information access by citizens. The framework proposed by this study aims to assist the implementation of e-government initiatives by the above-mentioned constitutional bodies for the success of e-government projects.



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This chapter first describes the research problem which this study addresses. Thereafter, the research questions to be addressed and the objective of the study are described. This is followed by an explanation of the significance of the study and a brief introduction of the theoretical and empirical literature underpinning this study. The research methodology, delimitation, ethical considerations and outline of the chapters of this dissertation are briefly introduced. The problem statement is presented below.

1.2 Problem Statement

The Eastern Cape is a largely a rural province with two metropolitan municipalities, namely, the Buffalo City Metropolitan Municipality and Nelson Mandela Bay Metropolitan Municipality. This province is characterized by poverty, poor service delivery and socio-economic underdevelopment. Poor development has generally led to a “digital divide” with limited access to Internet technology. As such, establishment of access to broadband connectivity can drive the Internet economy of rural communities in the province. It is indicated that failure to implement effective IT governance practices means that municipalities are not obtaining maximum value from the use of IT (Sibanda and Solms,

2019). Singh and Averweg (2015) found that most causes of system challenges could be related to government administration, lack of communication, technological complexities and system design. Mimbi and Kyobe (2017) identified lack of IT infrastructure, resistance to change, cultural barriers and exposure of misconduct to be main themes related to IT usage for the wider public. Furthermore, limited meaningful participation and freedom of association emerged as themes related to governance effectiveness. Their findings clearly showed that there is no meaningful participation between the government and citizens that can ensure effective governance (Mimbi and Kyobe, 2017). The government does not significantly involve citizens in issues that concern their welfare in policy-and decision-making circles. Kassongo *et al* (2018) discussed the value proposition of e-government and associated ICT programmes that does not simply comprise the number of e-centres and a range of connectivity. These programmes should involve grassroots communities and educate them to be aware of e-government and ICT programmes via consultation.

Essentially, a structured approach is needed for implementing broadband for citizen use to access e-government services. No framework exists within which municipality can measure the feasibility or readiness of broadband connectivity for e-government services. Additionally, careful consideration needs to be given to the deployment of technology solutions for rural areas where citizens are in a disadvantaged position regarding Information and Communication Technology (ICT) infrastructure and connectivity, in comparison to those in an urban zone (Pavez et.al, 2017). This is supported by Kassongo *et al* (2018) who note that the development and demand for e-government, especially in municipalities, and the assessment of broadband adoption are among the foremost concerns of IT decision makers. In order to establish a broadband adoption framework for Buffalo City Metropolitan Municipality (BCMM) as a solution to this research problem, the following research questions were established.

To further understand and address the problem statement, the following research questions and objectives are proposed.

1.3 Research Questions

1.3.1 Primary Research Question

How can barriers to broadband adoption be overcome to enable citizen access to e-government in Buffalo City Metropolitan Municipality?

The primary research question is addressed through the following sub-questions.

1.3.2 Secondary Research Questions

Sub-question 1: What barriers impact on the adoption of e-government in Buffalo City Metropolitan Municipality?

Government municipalities need to be aware of all the challenges they may face in implementing e-government services. Lack of public participation means that the public misses out on information and services that are available online, which results in more inequality (Bwalya and Mutula, 2014). This has a devastating impact on service delivery because participatory democracy would be non-existent. The number service delivery protests currently taking place in South Africa clearly show that channels of communication between the government and its citizens are very poor or non-existent. Once the infrastructure is available for use, then citizens must be aware of this availability. If targeted citizens have no idea that the e-government services exist, no one will participate in them. The success of e-government is dependent on making connections between individuals, departments and municipalities via Information Technology (IT) (Bolivar, 2016). Barriers, in the context of this study, are discussed further in Chapter Three.

Sub-question 2: What are the techniques available to ensure access to e-government within Buffalo City Metropolitan Municipality?

The implementation of broadband connection for e-government services is a relatively new approach within the Information Technology (IT) industry. There are numerous considerations in terms of the required technology infrastructure that needs attention for successful implementation of e-government. The government needs to create the perfect environment for e-government to thrive in this country (Mawela *et al*, 2017). The adoption of broadband adoption should be prioritised to meet the critical needs of the community in accessing e-government services.

Sub-question 3: What are the available technologies currently in the Buffalo City Metropolitan Municipality?

As citizens become used to a customer-centric approach from the private sector, they are now beginning to demand the same type of services from government institutions (Kaisara and Pather, 2011). As governments seek to engage their citizens, promote transparency and improve their public

service offering, social media technologies have been introduced into government workplaces as effective tools to promote service delivery. These technologies enable citizens and government to communicate, collaborate and engage in all issues and matters relating to governance (Oliviera and Welch, 2013).

Sub-question 4: What are the elements of the Buffalo City Metropolitan Municipality broadband adoption strategy?

Shambare (2016) emphasized the infrastructural weakness of government municipalities for hosting e-government services. Due to high costs of access, citizens tend to shy away from using e-government services. The following research objectives are suggested to answer the indicated research questions.

1.4 Research Objectives

In order to address the research questions stated in Section 1.3, the following primary objective was put forward: *To propose a framework which will assist in overcoming barriers to broadband adoption for Buffalo City Metropolitan Municipality to enable citizen to access e-government.*

The primary objective was achieved through the following secondary objectives:

1. To evaluate barriers of e-government adoption within Buffalo City Metropolitan Municipality.
2. To assess techniques for accessing e-government services within Buffalo City Metropolitan Municipality.
3. To examine current technologies to support e-government service with Buffalo City Metropolitan Municipality.
4. To analyze elements of Buffalo City Metropolitan Municipality broadband adoption strategy.

Having outlined the research questions and objectives of this study, the next section discusses significance of the study.

1.5 Significance of the Study

Citizens are not familiar with the technical complexity of e-government services, its needs and limitations. The citizens need a simple framework to measure the accessibility of these e-government services in such a way that they can make a decision without needing to understand Information and Communication Technology (ICT) related areas. This study is vital as it provides a framework which is aligned to both Information Technology (IT) and citizens' needs for better service delivery.

South African society has the second highest level of inequality in the world, with a few upper and middle class citizens and the majority being poor, unemployed and less educated (Dalvit, *et al*, 2014). Four of the eight metropolitans in Eastern Cape recorded a higher official unemployment rate than non-metropolitans in their provinces. However, these municipalities had recorded the lowest gap between official and expanded unemployment rates. The metropolitan municipalities in the Free State and KwaZulu-Natal recorded the lowest official unemployment rates, compared to non-metros in their provinces.



The South African government recognizes that e-government permits the public to communicate with the government and contribute to policy and decision-making (Kaisara and Pather, 2009; Sharma, *et al*, 2013). Nonetheless, it has been revealed that e-government implementation has remained lower than anticipated and highly challenging in developing countries compared to developed countries (Aker and Mbiti, 2010; Akkaya, *et al*, 2013). South Africa is not an exception as the public is not fully utilizing the available technology to ensure maximum participation in government activities. However, South Africa is the highest ranked African country on the United Nations (2018) e-Government survey in 39th position.

Many governments all over the world have put more emphasis on e-government implementation for many reasons. The reason that South Africa is pursuing e-government development and implementation is that of legislative mandate as well as benefits proposed (Mawela, *et al*, 2017). The legislative environment in South Africa places a mandate on government to deliver extensive access to government information. The National Planning Commission (NPC) appointed in May 2010 by former President Jacob Zuma developed the National Development Plan (NDP) in which the South African government committed itself to create an enabling environment that will provide its citizens with more government services electronically by 2030 (Republic of South Africa, 1994). Collectively, these show

that the South African government has been devising ways to enhance citizens' access to government institutions and services. The South African government acknowledges that e-government is at the heart of the drive to modernize government and it can attain this by: making services more available, valuable, responsive and economical; making government heads and members more transparent and responsible so that they are capable of guiding their societies and encouraging local economic vitality (SALGA, 2015).

This study is unique in its approach to determining challenges of a specific technology adoption within South African municipalities, namely, broadband connection. The establishment of a framework from which municipalities can measure feasibility and willingness of their broadband adoption for e-government services is highly valuable. The proposed framework offers an opportunity for practical improvement of this process without detailed technical expertise required. The next section offers an overview of empirical literature and underlying theory, as discussed in detail in Chapter Two to Chapter Four.

1.6 Literature Review



1.6.1 Underlying Theories

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1.6.1.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

The ultimate goal of this study was to determine factors that influence or restrict a citizen's intention to use and adopt technology, specifically broadband, in e-government services as a tool for citizen engagement. Despite emerging use of technology as a tool for citizen engagement, there has to be much focus on the citizen (McGee, Rosemary & Carlitz, 2013). This theory was chosen because it is comprehensive as it consolidates eight different acceptance models, namely: the Theory of Reasoned Action, the Technology Acceptance Model (Davis 1989), the Theory of Planned Behavior (Fishbein and Ajzen 1975), the Model of PC Utilization (Thompson, *et al*, 1991), the Motivational Model (Davis, *et al*, 1992), the Social Cognitive Theory (Bandura, 1986), and the Innovation of Diffusion Theory (Moore and Benbasat 1991; Rogers 2003). The resulting UTAUT model (depicted in Figure 1.1) engages constructs from across the eight models and has proven to be more accurate and comprehensive in predicting use, acceptance and adoption of technology than any of the other eight models when used separately (Venkatesh, *et al*, 2003).

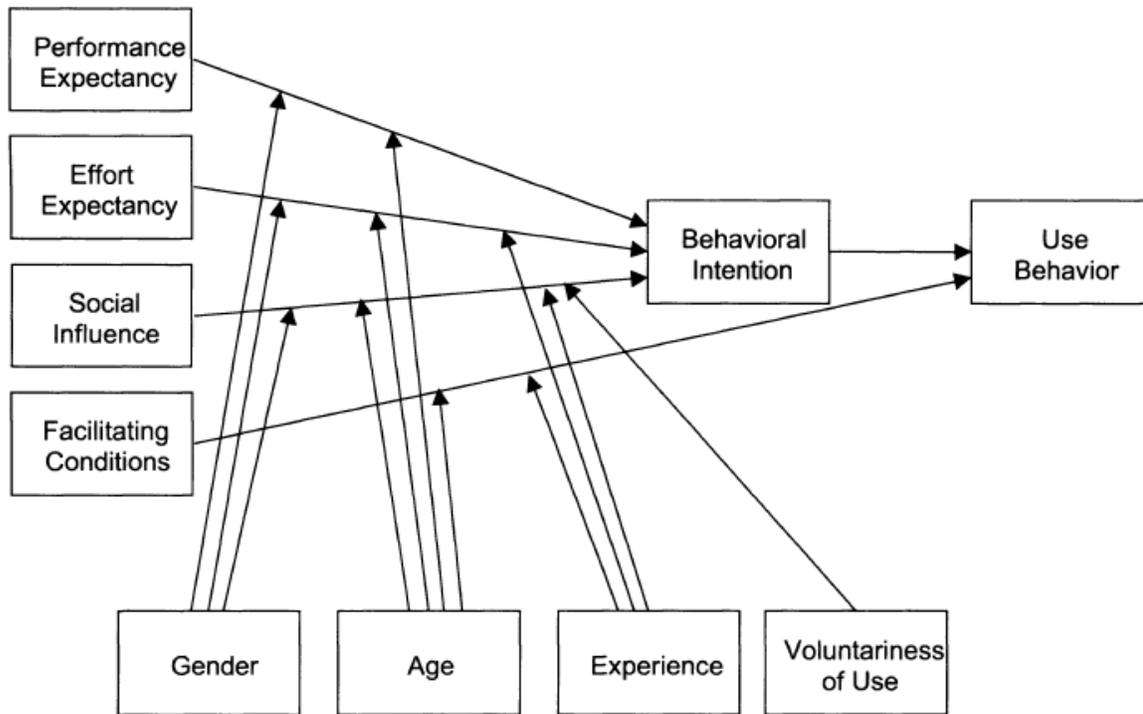


Figure 1.1: UTAUT Model (Adapted from: Venkatesh, *et al*, 2003)

Several frameworks have been used to deliver a theoretical base for examining factors that influence technology adoption in organizations (Davis, *et al*, 1989). The UTAUT model attempts to explain user intentions and continued usage behaviour patterns of users when adopting a new technology. The researcher suggests that lack of participation of citizens be presented as a determinant of Attitude within the core model. This approach is aligned with the views of Venkatesh *et al* (2003) who argue that lack of participation should not be considered a direct determinant of Behavioural Intention. In this research, lack of participation may be viewed as a determinant of Attitude of potential adopters of an e-government system, where citizens may be unfamiliar with the technology and the implications of using this channel to engage with government.

Moreover, the model recognises the significance of relationships between Social Influence and Performance Expectancy and Facilitating Conditions and Performance Expectancy evident from an analysis of prior research (Rana *et al*, 2015). These, according to Davis (1989), are direct elements that determine usage intention and behaviour of users. Again on the same mode, gender, age, experience, and voluntariness of use facilitate the impact of the four key concepts on usage intention and technology use behaviour.

According to Davis (1989), performance expectancy is seen as the level at which a user believes that they will make use of new technology to efficiently complete their tasks while effort expectancy is the user's perception of the ease of use of a technology. Social influence is seen as consideration of how other employees in the organisation view the importance of technology and its expected impact. Finally, facilitating conditions in the UTAUT model is the degree to which an employee believes that organisational and technical infrastructure is accessible and supportive to the effective and efficient use of the new technology (Davis, 1989). The most influential factor in this study was facilitating conditions. E-government service providers could, therefore, potentially increase adoption levels by emphasizing this aspect of the service. For example, individuals may associate importance to facilitating conditions such as help desks, common service centres (CSCs) and training programs. Hence, government organisations should consider providing adequate infrastructural facilities and proper training to users and citizens through the CSCs established across the country to positively influence the use of relatively new e-government systems (Rana, *et al*, 2016). A study by Alshehri *et al* (2012) used various technology adoption frameworks for adoption of information systems in both the public and private sectors of developed and developing countries. The UTAUT model is relevant for this research as it assisted in understanding the potential citizen's intentions for using e-government services.



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1.6.1.2 Technology Organisation Environment (TOE) Framework

The TOE framework describes how technological innovation adoption occurs at the firm level (Tornatzky and Fleischer, 1990). The TOE theory states that in addition to the qualities of an innovation, there exist broader contexts that influence innovation adoption, implementation and use. The TOE framework serves as an important theoretical perspective for studying contextual factors (Tornatzky and Fleischer, 1990). According to Mueller and Urbach (2013), research theories assist researchers to systematically carry and organise ideas to gain a detailed understanding of a complex phenomenon. This study refers to the Technology-Organization-Environment (TOE) theoretical framework proposed by Tornatzky and Fleischer (1990) as the basis for exploring the research questions mentioned in this chapter. The framework is represented in Figure 1.2.

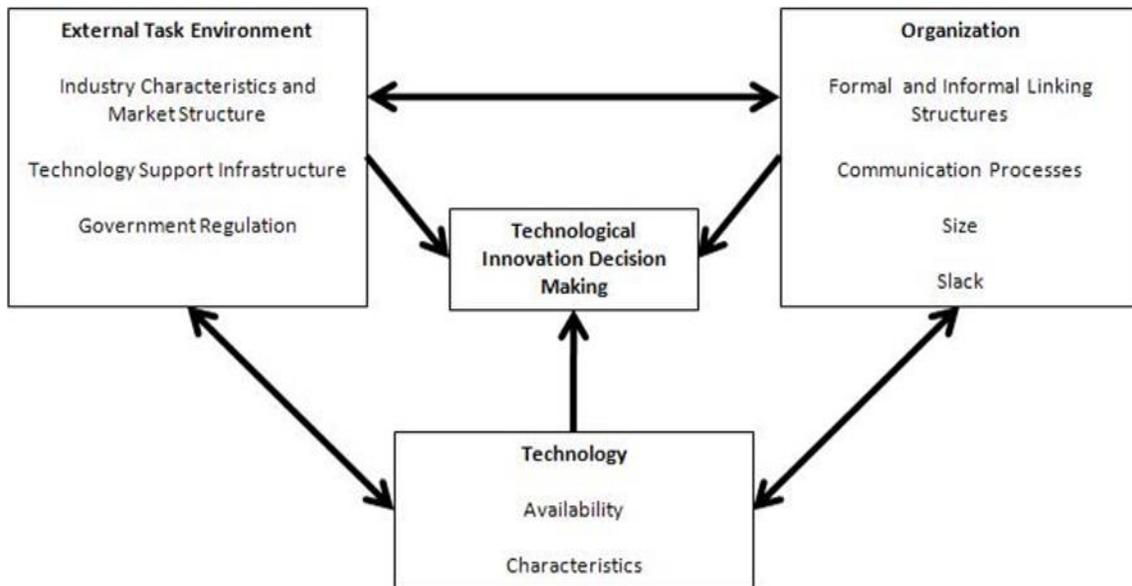


Figure 1.2: The TOE Theoretical Framework (Adapted from: Tornatzky and Fleischer, 1990)

The following are three TOE elements of a firm's context that influence the process by which it adopts and implements technological innovations: organizational context, technological context, and environmental context (Tornatzky and Fleischer, 1990).

1. *Technological Context*: In this framework, the technological aspect describes the technologies available for e-government and how ready these technologies are for adoption. This is available technological infrastructure and technical skills. The structures of existing resources are important towards adopting broadband (Gangadharan and Byrum, 2012). The infrastructure serves as a platform upon which technology runs while human capital is the skill needed to operate the technology (Aikins, 2015). Technological context describes both the internal and external technologies relevant to the organization and technologies available for possible adoption (Tornatzky and Fleischer, 1990). Its main focus is on how technology characteristics can influence the adoption process (Tornatzky and Fleischer, 1990). This includes existing technologies inside the firm, as well as the pool of available technologies in the market (Tornatzky and Fleischer, 1990). Technological context describes relevant technologies available to the organization, both internally and externally in terms of equipment and developments.
2. *Organizational Context*: The organisational context outlines some organisational characteristics or resources, such as size, quality of human resources, lack of resources and the

level of interaction among members. In e-government, this involves the quality public sector employees in terms of IT background and experience and how they can relate in IT related activities. Organizational context is typically defined in terms of several descriptive measures, characteristics and resources of the firm: firm size, organizational structure, quality of its human resources and amount of slack resources available internally (Tornatzky and Fleischer, 1990). In addition, it includes strategies, structure, culture, top management championship and process of communication among employees (Tornatzky and Fleischer, 1990).

3. *Environmental Context*: The environmental context refers to the external field where the firm conducts its business, its ability to access resources supplied by others and interactions with the government and other firms (Tornatzky and Fleischer, 1990). It includes the competitive, legal and regulatory environment. These three elements are theorized to interact and present constraints and opportunities for technological innovations (Tornatzky and Fleischer, 1990). The environmental context plays an important role in the integration of e-government and it usually consists of factors such as ICT readiness, financial institution support and government policy (Pudjianto et al, 2013).



1.6.2 Empirical Literature

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1.6.2.1 Improving Participation in E-Government

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Shambare (2019) revealed that e-government initiatives at the municipality level are quite important in driving the e-government agenda in South Africa. Of note, municipalities have rolled out various e-government programs. Citizen involvement has a great influence on the success of any e-government project (Montequin, *et al*, 2014). Citizen, government, Information and Communication Technology (ICT) infrastructure, deployment and services are associated components that have an important contribution to e-government implementation (Khamis and van der Weide, 2017). Information and Communication Technology (ICT) infrastructure required for a successful e-government project is needed to consider the equipment required to process a service and connecting infrastructure that enables equipment to communicate with each other. The environment surrounding e-government systems also needs careful attention, where ICT infrastructure needs to be aligned with human capacity to use such technology (Abu-Shanab and Shehabat, 2018).

E-government projects face many challenges such as: technology and infrastructure needed in the country, adequacy of a legal framework and behavioral issues facing such projects from citizens' and

employees' views (Abu-Shanab and Shehabat, 2018). E-government is the cornerstone of reaching citizens and satisfying their service requirements. Such projects require significant changes in the way governments and their employees work, hence facing some resistance from public employees. One of the shapes of resistance can be in the form of resisting knowledge-sharing among e-government champions and experts or public employees. There are numerous considerations in terms of the required technology infrastructure that need attention for successful implementation of an e-government. E-Government is accessed through various technology platforms, including websites available via personal computers, mobile phones, call centres, digital televisions and public information kiosks. Some of these resources are readily available in South Africa and could be used to participate in e-government. The government needs to have a strong presence in the Information and Communication Technology (ICT) industry and invest in technology that makes e-government possible.

Application Service Providers (ASP) are needed to overcome the burden of offering e-government services to citizens (Bwalya and Mutula, 2014). Bwalya and Mutula (2014) highlighted one of the challenges for government as competing with the private sector in finding and retaining Information Technology (IT) talent because governments are not as financially sound as private companies which specialize in Information Technology. Application service providers are able to offer applications at reduced costs compared to what a company or government could provide for themselves internally.

Technology alone is not sufficient to ensure success of e-government without the human element to support it. The transition to e-government has challenges that go beyond technology. New forms of skill sets and leadership are also needed in this transition. The government needs to create the perfect infrastructure environment for e-government to increase citizen participation and involvement. The use of the internet gives an opportunity to increase citizens' political participation, flow of efficiency, social well-being, cost-saving which can stimulate productivity, reorganize and reshape governments into more open and efficient organizations (Anastasiadou, 2018). This can lead to an element of resistance toward the establishment of such initiatives. In addition, considering digital divide issues prevalent in South Africa and providing equal access to the platform requires numerous interventions aimed at equipping all citizens with the necessary skills training. These skills and digital divide issues contribute to a negative user experience which impacts negatively on the participation rate in e-government. Electronic voting has been considered as an option to simplify and reduce the cost of elections and speed up all the processes. It can increase engagement and turnout of citizens and even restore the relationship between citizens and political institutions (Boucher, *et al*, 2017).

Kim, Cho and Suh (2017) advised that government Information Technology (IT) programs can play an important role in ensuring that citizens possess a basic technical skill set needed to access specific e-government functions and assurance that IT programs are open to every citizen. This is believed to be due to their superior skills, resources and tendencies imparted to them at home and at school. With many governments having communicated strategies highlighting implementation plans for numerous e-Services initiatives, there are few outright successful implementations. Mawela et al (2017) indicate that 60-85% of e-Services projects fail, despite significant investments in these projects.

1.6.2.2 E-Government Participation in South Africa

For South Africa, the true value of e-government would be to enable ordinary citizens to exercise their democratic rights through an electronic means (Sibande and Thinyane, 2016). Rendering of government services and information to the public using electronic means allows government to deliver services to citizens when they need them. It can also improve the quality of such services. In South Africa, e-government has gained significant ground, and great strides have been made to use e-government to simplify government procedures, improve access to information by citizens and improve service delivery, as well as strengthening accountability and transparency (Shambare, 2019). The United Nations Development Programme (UNDP, 2018), in a recent report, argued that Information and Communication Technologies (ICTs) are a catalytic tool to promote services to the most borderline populations, while enhancing transparency and accountability. Moreover, new Information and Communication Technologies (ICTs) offer African governments new ways to deliver services more effectively, give citizens new ways of holding governments accountable and offer new ways for citizens to participate in government decisions. By improving government efficiency, e-government boosts economic growth.

Ana (2018) recently reported further improvements that the administration in Gauteng is investing in information and communications technology and e-government services as it pursues its goal of becoming a "smart" province. ICT-enabled public service delivery offers an opportunity to improve efficiency and access to public services; develops transparency and accountability of governments and empowers citizens to better participate in decision making processes. Statistics South Africa (2018) found that almost 60 percent of households in the Gauteng city region had direct access to the Internet, making it necessary for local governments to move towards providing on-line services.

Sibande and Thinyane (2016) discussed the success of MobiSAM, which was piloted in the Makana Municipality specifically for citizens to log service delivery issues via multiple platforms and facilitated communication between the local government and citizens. The South African government has established statutory bodies to co-ordinate implementation of e-Government projects. Amongst these are the State Information Technology Agency (SITA) and Government Information Technology Officers Council (GITO Council). SITA is responsible for the acquisition, installation, implementation and maintenance of Information Technology in the public sector. The GITO Council, which consists of national and provincial IT officers, is responsible for consolidating and coordinating IT initiatives in government, including e-Government, to facilitate service delivery.

Hart *et al* (2016) point out that the greatest opportunity for citizen participation is through mobile technologies. Due to the extensive mobile phone penetration in South Africa, opportunities exist to mitigate the effect that digital divide issues that would hamper traditional e-government platforms would have (Hart *et al*, 2016). A successful example of e-government service is the electronic filing of tax returns, which the South African Revenue Service (SARS) has implemented with a clear success record (SARS, 2018). SARS introduced its electronic filing initiative in 2001, in accordance with the government's broader e-Government strategy in the public service.

1.6.2.3 Barriers to Municipal Broadband Accessibility for E-Government

The South African broadband policy and the Universal Service and Access Agency of South Africa (USAASA) still fails to address the issue of affordability of Internet access so that all South Africans can enjoy access and become active, contributing citizens in the global economy and society. That said, the slow pace of rollout through the USAASA enabled municipalities and later through SA Connect, together with lack of affordable Information and Communication Technology (ICT) access, has resulted in the deployment of community-based networks, even in urban cities like Johannesburg, Pretoria, Durban and Cape Town (Constantinides, 2017).

Broadband services stimulate economic growth, for instance, reducing the cost of communication and increased access to information can make it easier for citizens to promote and participate in e-government services (Chisango and Lesame, 2017). Broadband services also promote social benefits, such as improved quality of education and improved quality and access to health services. However, affordability remains an issue of concern, especially in the Eastern Cape Municipalities that formed part of this study (Chisango and Lesame, 2017). It is also indicated in their studies that the Universal Service

and Access Agency of South Africa (USAASA) is still failing to fulfil its mandate of promoting universal access and service.

A municipality is an important entity in the local government domain that must carry out critical roles of efficient service delivery to all citizens in its area of authority. However, owing to lack of qualified personnel and technical and organisational abilities, many municipalities have not made a full commitment to develop a comprehensive strategic e-government plan to achieve progressive levels of e-government (Mawela, Ochara & Twinomurizi, 2017). The most important impulsion to improve e-government services is to deliver better services to citizens (Sayin, 2013). To present a supreme service quality, it is necessary to understand how citizens perceive and appraise e-governments services. Service delivery constraints are major challenge facing the South African government (Shambare, 2016). This problem permeates from local municipalities all the way to the national government. At the local level, ratepayers consistently complain about incorrect and inaccurate billing (Shambare, 2016). Often, these result in a service delivery protests.

Kanungo and More (2016) discuss e-government barriers as: the absence of security and privacy of information in government websites, lack of users' confidence to use e-government services, lack of partnership and collaboration between governmental sectors, the availability and reliability of internet connection, government employees' resistance to change to e-ways; lastly, lack of knowledge and ability to use computers and technology efficiently. Gumede (2019) identified barriers such as a lack of internet connection, lack of awareness and technical infrastructure that undermines e-government development in Africa. Furthermore, African countries have high levels of illiteracy, and large numbers of citizens are too poor to access technology.

African countries, even if they have e-government facilities, often do not have special support to make it accessible to the poor, rural areas and women - the most marginalized in society. Some African countries have an online e-government portal, which is not integrated with the whole government. In many cases, government departments and agencies are not linked to the online e-governmental portal. African governments will have to invest in Information and Communication Technology and telecommunications infrastructure, human resources and systems that can interactively problem-solve users' queries (Gumede, 2019). Joseph and Olugbara (2017) suggested that Municipalities will need to change towards an advanced level of e-government development to enhance the effectiveness of e-government practices.

Joseph and Olugbara (2017) assert that competence, awareness and motivation are important factors driving willingness to effectively use e-services to ensure that citizen competencies, in support of e-government initiatives, are well defined, acquired, developed and sustained for e-government design, delivery and operations. Additionally, awareness of the extent to which the society understands e-government initiatives, e-government privacy and security management is a concern. This is further motivated by the support provided for citizens to effectively participate in the e-government implementation activities. The connectivity or the ability of any technology component to attach to any other components inside and outside the organisational environment, as well as flexibility for easily and readily supporting a wide variety of hardware, software, communication technologies, data and core applications in an e-government environment is essential.

The research methodology for this study is briefly outlined in the section that follows. This methodology is fully described and explained in Chapter Five.

1.7 Research Methodology



Research methodology is seen as the approach used in the research process, and it also encompasses a body of methods that used in the research process (Collis and Hussey, 2009). Hofstee (2006) describes research methodology as the blueprint that explains how the researcher arrived at a conclusion, and it should give a pictorial view of the steps followed.

According to Vicki and Nataliya (2016), mixed method research is a process of research in which researchers integrate quantitative and qualitative methods of data collection and analysis to best understand a research purpose. A qualitative research method involves gathering a variety of resources that describe foreseeable, challenging instances and meanings in individuals' lives. It employs use of descriptive and interpretive methods of gathering and analyzing data (Marshall and Rossman, 2010). According to Brians (2011) and Babbie (2010), quantitative methods are designed to provide summaries of data that support generalizations about the phenomenon under study. In order to accomplish this, quantitative research usually involves few variables and many cases, and employs prescribed procedures to ensure validity and reliability. In quantitative research, the researcher aims to objectively measure the research topic at hand, using mathematics and statistics.

1.7.1 Research Paradigm

The paradigm that was used in this study was interpretivism, which in the belief of Williams (2000), supplements the qualitative method. Interpretive studies are mostly intended towards understanding the phenomena through meanings that people assign to them (Myers, 1997). A research paradigm is a framework of guidelines that explains how the research will be conducted. According to Hofstee (2006), academic research must have an underlying philosophical paradigm. This is defined as a pattern or a shared way of thinking to which the research is aligned. A variety of philosophical paradigms is available because of the different ideas, views and perspectives of the world (Collis and Hussey, 2009). This section discusses the research paradigm for this study, illustrated in Figure 1.3.

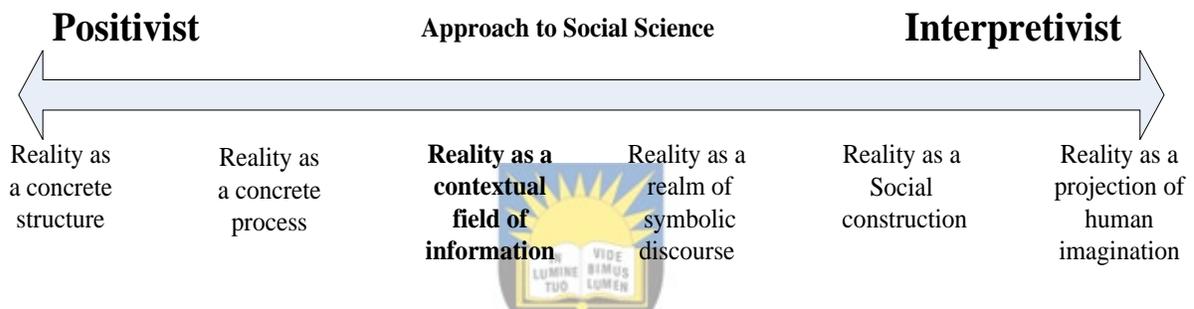


Figure 1.3: Continuum of Core Ontological Assumptions (Adapted from: Collis and Hussey, 2009)

As illustrated in Figure 1.3, the positivist and interpretivist approaches are two extreme research paradigms, with several research paradigms combining elements from these two extremes. Collis and Hussey (2009) explain that few people operate purely within any of these forms of research. Using a combination of the elements allows one to take a broader and often complementary view of the research problem or issue (Collis and Hussey, 2009).

This study is positioned towards interpretivism with a slight lean towards a positivist approach. Due to the subjective nature of the data collected from expert reviews, an interpretivist influence emerged in this study in line with the third stage (reality as a contextual field of information) of the continuum represented in Figure 1. 3.

The approach was based on inductive reasoning. In this case, the researcher begins with specific observations, or formulated research questions, from which patterns are identified. This leads to general conclusions or theories. According to Creswell (2014), an interpretive approach is best suited for three reasons:

1. Firstly, for research problems in which variables are unknown;
2. Secondly, where the literature review yields little information about the phenomenon under study; and
3. Thirdly, when the researcher needs to learn more from participants through exploration.

The above type of approach is best suited for this study because it requires an understanding of user behaviour on e-government services and to learn about technologies that influence their willingness or participation in municipal e-government systems, additionally, for citizens to see the broadband connection as an enabler to municipal e-government services. These methods are vital to outcomes of this study because of their ability to provide more information about the behaviour of users.

This study sought to explore experiences of BCMM employees and citizens in accessing e-government services in this municipality, with the purpose of uncovering the role of broadband adoption. Both BCMM citizens and employees are anticipated to shift from traditional ways of accessing the information to a new one.



1.7.2 Research Design

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This study used the mixed method approach to identify the state of broadband adoption for Buffalo City Municipality (BCMM) in accessing e-government services. Both qualitative and quantitative data was collected. The research design is Design Science, which was appropriate using the Design Science research guidelines in Table 1.1. The output of this study is a tangible assessment framework, and Design Science is well suited to research that concludes in an artifact such as the framework proposed through this research project.

Research methods refer to steps and techniques used in data collection, sampling and analysis (Collis and Hussey, 2014). This study reviewed current and available literature on broadband and e-government, including the analysis of frameworks, guidelines and other linked or related articles. This literature review informed formation of a research instrument (questionnaire) and consequently, the proposal of the framework. This framework was then evaluated by experts to verify its content. Table 1.1 discusses application of Hevener et.al's (2004) design science research guidelines that the study employed.

Table 1.1: Design Science Research Guidelines (Adapted from: Hevner, March, Park, & Ram, Design Science in Information Systems Research, 2004)

Guidelines	Description	Application
Design as an Artifact	Design Science research must deliver a feasible artifact in the form of a construct, a model, a method, or an instantiation.	This research project produces a framework to assist in overcoming barriers to broadband adoption for BCMM.
Problem Relevance	The objective of Design Science research is to improve technology-based solutions to key and relevant business challenges.	The technical complexity of e-government services creates a level of confusion in which citizens are unable to access the feasibility of their services.
Design Evaluation	The utility, quality and efficiency of a design artifact must be strictly established via well implemented evaluation methods.	Various techniques are used to evaluate success of the framework towards providing means of broadband adoption mainly for citizens in accessing e-government services.
Research Contributions	Effective Design Science research must deliver clear and confirmable contributions in the areas of the design artifact, design foundation, and/or design methodologies.	The contribution of this research is a framework for citizens and employees from BCMM to access their e-government services through broadband.
Research Rigor	Design Science research depend upon the application of rigorous methods in both the construction and evaluation of the design artifact.	Using questionnaires and expert review, the research project sought intensive rigor towards ensuring a credible output.
Design as a Search Process	The exploration for a real artifact requires developing available means to reach anticipated ends while sustaining laws in the problem environment.	Citizens and Employees are vital in establishing the relevance and practicality of the output towards seeking a solution to the problem area.
Communication of Research	Design Science research must be obtainable successfully both to technology-oriented as well as management-oriented audiences.	By presenting findings from this study at relevant conferences and publishing findings in academic journals relating to this problem area, exposure to the research project is exploited.

1.7.2.1 Data Collection Methods

This study used questionnaires and expert reviews as primary data collection mechanisms. The researcher gathered empirical data by means of questionnaires distributed to citizens and municipal employees, including Information and Communication Technology (ICT) employees and broadband task team members. This method assisted in overcoming barriers to municipality broadband adoption for e-government information by citizens. Responses were captured for both quantitative and qualitative analysis. BCMM citizens were the target population; however, the researcher gained from

the broadband task team and ICT employees with regards to current challenges and barriers impacting on broadband and e-government adoption.

In general terms, a 'questionnaire' is a research mechanism where the researcher gives the respondent an opportunity to express his or her views, once the respondent understands the theme of the dissertation, he or she can let thoughts roam freely, unencumbered by a prepared set of replies (Naoum, 2013). The citizen questionnaire (see Appendix B) and municipal questionnaire (see Appendix C) included a combination of questions relating to key aspects of e-government services, as defined from various sources in literature review chapters. Questionnaires used within this study were web-based and anonymous to inspire employees and citizens to be more truthful concerning their answers. Within the questionnaire, a Likert scale was used on some questions, while others required open-ended answers so that responses could be evaluated using mixed methods (qualitative and quantitative resources). A pilot study was conducted to test adequacy of this research instrument.

Data collection methods were used to formulate a framework for broadband adoption in BCMM to allow citizens access to e-government service. Expert reviews were used to validate and refine the framework developed. According to Klein and Richey (2007), expert reviews determine if data exists in support of components of the proposed model. In this respect, comment from experts was sought on the proposed research model. Six experts participated and provided comment to refine the framework.



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1.7.2.2 Population and Sampling Methods

This study involved citizens (as potential users of e-government), Buffalo City Metropolitan Municipality (BCMM) broadband task team members and Information and Communication Technology (ICT) experts and employees as population. Data from the citizens and employees is included in the discussion for data analysis purposes.

The term 'coding' is used to signify the process of taking segments of a text and labelling them according to meaningful categories (Babbie, *et al*, 2010). Coding was done using binary progression - MINITAB v17 statistical software, a process of identifying the connections between codes also stated. Interpretation of data in the analysis chapter is well stated and based on the research questions.

The Raosoft calculator was used to determine the sample of citizens to complete the questionnaire. The principle of saturation guided the sample of participants, thus an appropriate sample of seventy-five [75] people were selected as the population for the primary data collection component of the

study. The Raosoft calculator was used to determine the sample of sixty [60] citizens to complete the questionnaire and fifteen [15] BCMM employees, including broadband team members and ICT expert employees. The selected BCMM employees of the population were known to have the relevant knowledge, time and experience to participate.

Responses to each question developed the framework further based on the findings. Respondents were selected based on their appropriate knowledge and experience of the problem domain. Six experts were selected for final evaluation of the research findings. The following section describes the method used to analyze the responses.

1.7.2.3 Data Analysis Methods

Brymam (2015) defines data analysis as a stage that incorporates several elements which involves the application of statistical techniques to data that has been collected. Yin (2014) recommends that researchers analyze the question first and thereafter, evidence that addresses the question. Yin (2014) further suggested the use of analytic strategies such as computer assisted tools for data analysis.

For this study, the survey gathered both quantitative and qualitative data. Therefore, data analysis took into consideration both research methods in determining the type of data analysis to use (Curran and Blackburn, 2001). Furthermore, data was gathered from municipal employees, including experts in the field of Information and Communication Technology (ICT) and municipal citizens

The researcher used the Statistical Package for the Social Science (SPSS) to analyze data from questionnaires. Descriptive statistics were then employed to clarify the basic features of the data collected to help illustrate it in a summarized form. SPSS is a Windows based program that can be used to perform data entry, analysis and create tables and graphs (Arkkelin, 2014). SPSS is capable of handling large amounts of data and can perform statistical data analysis. Qualitative data collected from questionnaires was analyzed with the use of MINITAB v17 statistical software. This approach allowed for reporting experiences of participants gathered during the data collection process. Feedback from municipal employees, including ICT experts and municipal citizens, was integrated and it assisted in the establishment of the proposed framework.

1.7.2.4 Research Process

Table 1.2: Research Process (Source: Own Creation)

Research Questions	Research Objectives	Research Method Used
Sub-question 1: What barriers impact on the adoption of e-government in Buffalo City Metropolitan Municipality?	- To evaluate the barriers of e-government adoption within Buffalo City Metropolitan Municipality.	- Document Review - Questionnaires
Sub-question 2: What are the techniques available to ensure access to e-government within Buffalo City Metropolitan Municipality?	- To assess the techniques for accessing e-government services within Buffalo City Metropolitan Municipality.	- Document Reviews - Expert Review
Sub-question 3: What are the available technologies currently in the Buffalo City Metropolitan Municipality?	- To examine current technologies to support e-government service with Buffalo City Metropolitan Municipality.	- Questionnaires - Expert Review
Sub-question 4: What are the elements of a Buffalo City Metropolitan Municipality broadband adoption strategy?	- To analyse the elements of Buffalo City Metropolitan Municipality broadband adoption strategy.	- Design Science
Main-question: How can the barriers to broadband adoption be overcome in order to enable citizen's access to e-government in Buffalo City Metropolitan Municipality?	- To design broadband adoption framework for e-government in Buffalo City Metropolitan Municipality.	- Document Review - Questionnaires - Expert Review - Design Science

1.8 Delimitation of the Study

Hofstee (2006) clarifies that delineation offers a protection from criticism imposed by individuals questioning the exclusion of specific topics. This study focused on barriers associated with the e-government services, an issue with citizen participation in e-government recognized as being lack of connectivity, thus ensuring successful broadband adoption is critical to improve e-government access. The framework is intended to be advantageous for BCMM citizens to provide better service delivery for all through e-government systems. Furthermore, this study focused on local government municipality Category A (metropolitan municipalities) designation, which is the Buffalo City Metropolitan Municipality, in the Eastern Cape.

1.9 Ethical Considerations

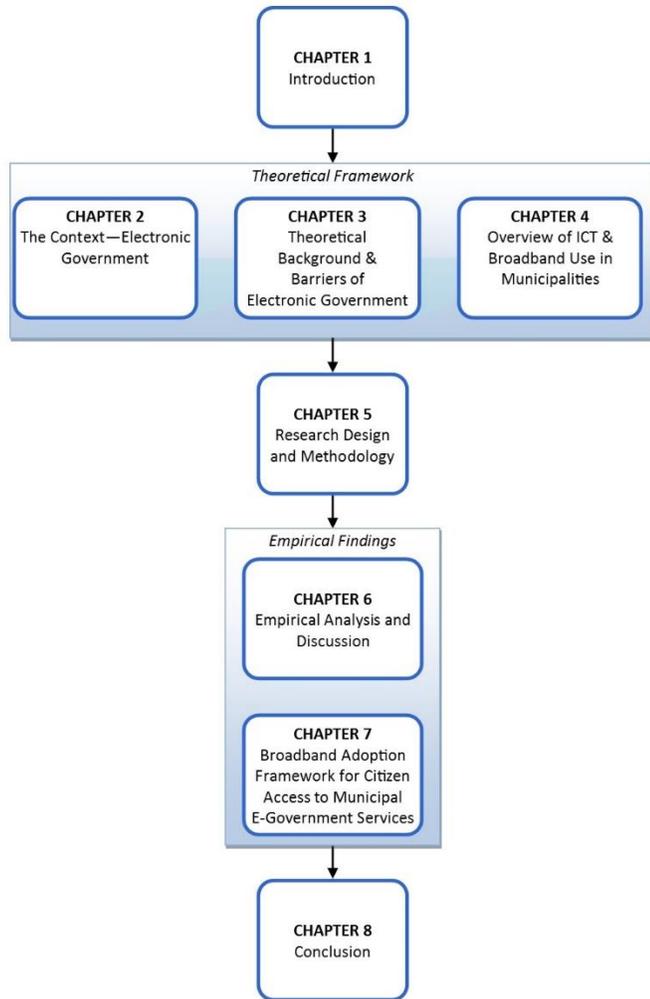
Research can comprise different individuals in different disciplines; therefore, principles to promote beliefs necessary to collaborate are important. According to Creswell (2013), ethical considerations in

research studies can be described as occurring prior to conducting the study, at the beginning of the study, during data collection, in data analysis, in reporting data and in publishing a study. People are entitled to confidentiality and are never to be studied without their permission. Privacy and confidentiality of their information is to be kept at all times. This study draws its participants from the employees and citizens of the Buffalo City Metropolitan Municipality. The researcher ensured and conserved the confidentiality and secrecy of information gathered from respondents. Therefore, the researcher received ethical approval (permission to conduct research) or ethical clearance (see Appendix A) from the University of Fort Hare.

1.10 Outline of Chapters

This thesis comprises eight chapters. Chapter one is an introductory chapter which provides an overview of the study. A brief background, problem statement, research objectives, significance of the study, a brief summary of the literature review, research methodology, delimitation of the study and ethical considerations are all discussed in this chapter. Chapter two to four contain the literature survey for this research project. Chapter five focuses on the research methodology including data collection, samplings and data analysis methods. Chapter six presents empirical findings and discussion on the analysis of the study. Chapter seven discusses the broadband adoption framework for BCMM. The last chapter, Chapter eight, provides a conclusion of the study.

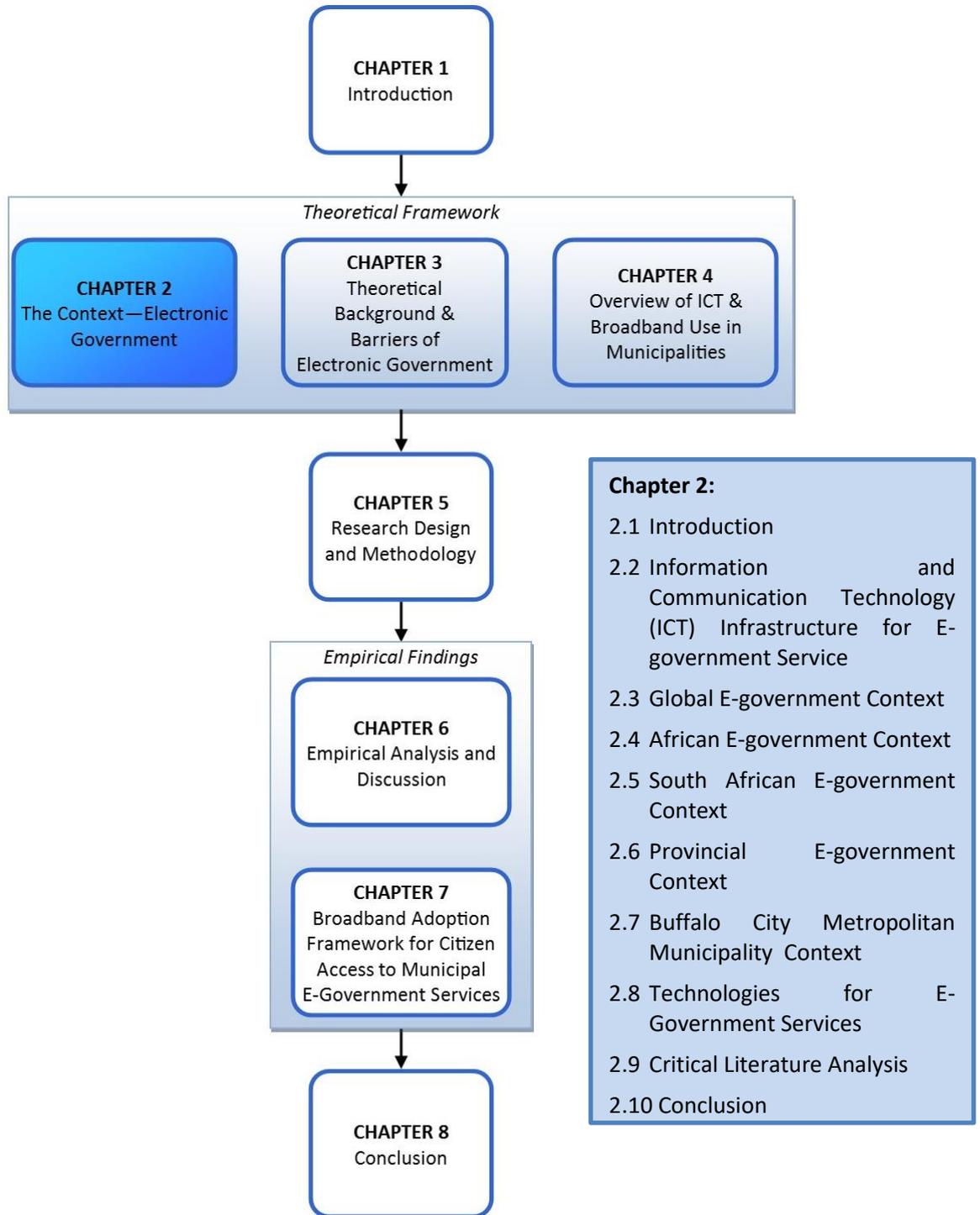
Figure 1.4 depicts the research chapter arrangement for this study.



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Figure 1.4 Research Chapter Arrangement (Source: Own Creation)

Chapter 2 : The Context – Electronic Government



2.1 Introduction

This chapter presents literature reviewed on the research topic. The selected literature helps to understand and address the research problem and research questions. The purpose of this study was to develop a framework for broadband adoption to enable BCMM citizen access to e-government service. The study was conducted within Buffalo City Metropolitan Municipality located in South Africa, specifically the Eastern Cape. It was further revealed that e-government initiatives at municipality level are quite influential in driving the e-government agenda in South Africa. E-government has been defined differently by many scholars listed below:

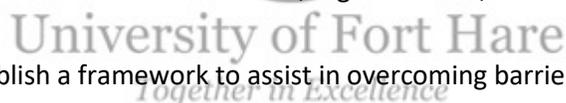
- The use of Information and Communication Technologies (ICTs) in the provision of public goods and services, commonly known as electronic government (e-government or e-gov), and it is a fast-developing phenomenon (Heeks, 2006).
- E-government refers to the use of any type of information and communication technology to improve services and operations provided to different parties such as: citizens, businesses, and other government agencies (Al-jaghoub *et al.*, 2010).
- The United Nations (2018) defined E-government as the use of Information and Communication Technology (ICT) and its application by the government for the provision of information and public services to the people.
- E-government means that public services provided by Public Administration (PA) institutions are handled electronically with the use of Information and Communication Technology (ICT) and as a strong tool for responsive government that facilitates access to information, freedom of expression, efficiency, productivity and social inclusion (Bwalya, 2018).

For the above mentioned definitions of e-government, the one that associates with this study is the use of ICT and its application by the government for the provision of information and public services to the people by United Nations (2018). It is worth noting that use of ICTs in public service delivery platforms is a relatively new movement that is extensive through countries all over the world (Mutula, 2014). Examples of e-government can be various services offered for citizens or business or between Public Administration (PA) institutions such as: e-procurement, filling tax returns, renew identification,

passport or driver's licence, apply for extracts from the criminal register or commercial register, all forms and applications, e-health, e-learning, e-participation and e-tolls.

E-government is comprised of four delivery models, which are government-to-citizen (G2C), government-to-business (G2B), government-to-government (G2G) and government-to-employees (G2E) (Thakur and Singh, 2013). Today, e-government is an inherent part of governments and public administrations worldwide since it is highly relevant for organizations to address their individual stakeholder desires and requirements. In this context, the implementation of e-government and its associated benefits is an exciting topic for citizens and is especially relevant for the economy since the availability of online public services is an important factor for global competition (Janowski *et al*, 2018). It is possible today for governments to meet these rising expectations due to advances in technology, analytics and connectivity (Berntzen and Johannessen, 2016).

Citizens care about public services and are dependent on these being delivered well. Having a citizen-centric public sector and e-government system is not necessarily about technology only, but using technology to build and provide better services. Additionally, Gil-Garcia (2013) highlighted that e-government projects frequently fail to deliver expected results in terms of outputs and outcomes, and failure appears to be related to numerous technical, organizational, institutional and contextual factors.



This study sought to establish a framework to assist in overcoming barriers to broadband adoption for Buffalo City Metropolitan Municipality in implementing e-government. Thus, this chapter provides the context of e-government and the context of the research problem in this study, which concerns e-government services and broadband adoption in Buffalo City Metropolitan Municipality (BCMM). This chapter first explores the infrastructure requirements for e-government. The context of e-government is then explored from a global, African, South African, Provincial and Local Municipality level. A variety of technologies that could be used for e-government are then briefly outlined before the chapter is concluded.

2.2 Information and Communication Technology (ICT) Infrastructure for E-government Services

2.2.1 Robust Information and Communication Technology (ICT) Infrastructure

According to Mawela et.al. (2017), rapid advances in Information and Communication Technology (ICT) infrastructure provide the means to get information to poor communities to improve their quality of life. ICT allows people to get an opportunity to interact with government using different forms of communication gadgets such as: Desktop computers, Laptops, Tablets, Self-service kiosks, Smart phones and any form of computer gadgets. As technology usage grows, it creates societal problems which need to be considered.

However, the challenge facing public sector executives is how to make government service easier, quicker, cheaper, more efficient and more responsive. South African Municipalities need ICT infrastructure, especially when it comes to bandwidth, physical installations, hardware and software that serve all citizens well. Gil-Garcia (2013) states that ICT infrastructure is one of the main challenges of e-government. One of the most basic requirements for successful e-government programs is that there should be robust ICT infrastructure in place. Furthermore, use of broadband technology is required to enable appropriate sharing of information and open new channels of communication and delivery of new services

2.2.2 Privacy and Security

Munoz *et al* (2017) highlighted that the adoption of e-government may encounter legal or policy barriers, privacy and security issues. Therefore, it is necessary to design applications that integrate privacy protection and minimize collection and retention of personal information. For e-government activities, service continuity is critical not only for the availability and delivery of services, but also to build citizen confidence and trust. However, the risk of fraud and misuse of sensitive data are concerns as well. The security or trust dimension is an important concern, although different levels of e-government have differing needs in this area.

Based on theories gathered by Bwalya and Mutula, (2014) on privacy and security, portals are unlikely to give sufficient assurance to security concerns of citizens, but e-government initiatives allow citizens to transact online and require them to provide more information to online information systems, thus

exposing them to hackers and viruses. Additionally, trust is a vitally important component of e-government projects; therefore, ongoing training to employees on computer security should be provided and government information must be backed up regularly (Munoz *et al*, 2017). It is conclusive that the government needs to foster a sense of trust by limiting sharing of personal identifiable information with entities to which citizens have not directly supplied that information (Bwalya and Mutula, 2014). Part of recommendations, when it comes to privacy and security, should be about educating and training citizens on the importance of privacy and familiarize citizens with design applications that integrate privacy protections. Moreover, continually assessing systems to make sure that security precautions are well implemented is vital. Citizens are likely not to use e-government services if they perceive that e-government processes are not formalized or legalized.

2.3 Global E-Government Context

E-government is gaining momentum in several countries because of its effectiveness and suitability across several public service contexts. It has enabled citizens to have greater access to information, promoted transparency, improved service delivery and increased public participation in government affairs (Alcaide-Muñoz *et al.*, 2017; Lindgren and Jansson, 2013; Zuiderwijk, Janssen, & Dwivedi, 2015). According to Wirtz *et al* (2014), most businesses and governments require consistent, sustainable implementation of e-government that is highly relevant for the economy since an unrestricted online availability of public services is regarded as an essential factor in international competitiveness. In this regard, e-government reflects an important starting point for satisfying these requests. Apart from that, governments aim to optimize efficiency and effectiveness through increased administrative productivity as well as substantial cost reductions.

2.3.1 Examples of Global E-government Initiatives

- I. European countries lead e-government development globally. The Americas and Asia share almost equal standing in high and middle e-government index levels whilst many African countries continue to struggle to improve their e-government standing (United Nations, 2018). Only four countries out of 54 in Africa score higher than the world average E-Government Development Index (EGDI) of 0.55, whereas 14 countries have very low EGDI scores below 0.25. For the first time in 2018, the contributor of E-Government Development Index (EGDI) scores improvement in all groups is development of online services, and that was a steady progress in

improving e-government and public services provision online. The number of countries providing online services using emails, Short Messages Service (SMS), Really Simple Syndication (RSS) feed updates, mobile applications and downloadable forms has been increasing in all sectors. For instance, up to 176 countries provide archived information online, compared to 154 in 2016 (United Nations, 2018).

- II. Amman, the capital of Jordan, has launched a Short Message Service (SMS) services portal aimed at increasing channels of communications between citizens and governments. It is now recognized as the most prevalent communication tool, with all segments of the Jordanian community, helping in enhancing the quality and efficiency of governmental services. It provides citizens with two types of services: 1) push messages by governmental institutions and departments such as reminders and awareness campaigns; and 2) pull messages that are sent by citizens as an SMS inquiry automatically responded to by the relevant governmental department (United Nations, 2014).
- III. Almarabeh and Adwan (2013) presented good progress when it comes to e-government services in Jordan where Jordanian government websites provide information on public policy, governance, laws, regulations, relevant documentation and types of government services provided, some links to ministries, departments and other branches of government. Citizens are able to obtain information on what is new in the national government and ministries and can follow links to archived information.
- IV. According to Asogwa (2013) the e-government progress in India confirmed that the Central Vigilance Commission (CVC) created a website where information relating to corruption in government offices is reported. By this, citizens are afforded an opportunity to make their complaint against public servants involved in bribery publicly.

Good progress has been made on Enhanced Information Services, where government websites deliver enhanced one-way e-communication between government and citizen, such as downloadable forms for government services and applications.

2.4 African E-Government Context

This section provides the current state of e-government within the African context. It gives specific examples and scenarios of e-government activities in respective countries. Overall, Africa is the region with the least capacity to introduce e-government initiatives. African countries which, according to the World Economic Forum (WEF, 2016), have the most advanced information and communications technology sectors are: Mauritius, Seychelles, Tunisia, South Africa, Cape Verde and Botswana and also ranks high in e-government capacity. The UN e-Government Survey has since 2016 regularly ranked Mauritius as the African country with the most developed e-government. Mauritius is now also sharing its knowledge with other African countries, such as Ghana. These initiatives help other countries to learn from one another.

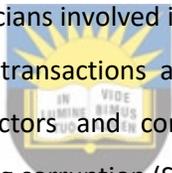
The Kenyan government has been expanding ICT-enabled services across public institutions (Jackson, 2015). As a result, there is rapid generation of electronic records across all government institutions, some of which are deployed for access and use through the e-government systems (IRMT, 2011). The need and demand for e-government in Kenya has been driven by a number of factors, including popular demand for public sector reforms, pressure for transparency and accountability in government, growing trends towards e-commerce and availability of technology, as seen in the growing connectivity to Internet and mobile technologies (Davies, 2014; Gathungu and Mungai, 2012). Manual systems and processes have been blamed for the thriving corruption in Kenyan institutions because of limitations in facilitating robust information sharing, including reporting of service delivery flaws. As a result, public entities have resorted to ICTs and e-government channels to provide mechanisms to control corruption and provide channels for enforcing transparency.

2.4.1 Examples of African E-government Initiatives

- I. In Nigeria, an e-pension system was used to collect biometrics of all pensioners in Nigeria covering 54 years (1960 – 2014). After the biometrics of 170, 000 pensioners were captured, thirty-five billion naira (N35, 000, 000, 000) was recovered from fraudsters, and a total of N187.3 billion recovered when it was carried in each pension office in Nigerian government ministries (Uwerunonye, 2013).
- II. According to Gumede (2018), Morocco has an online government portal where citizens can access government information, as well as post their views on government performance

through the portal. In 2010, Morocco introduced a requirement that corporate taxes be paid online and has introduced e-petitions, through online petitioning on bills, policies and regulations (Gumede, 2018).

- III. According to Ben Sta (2017), the Tunisian government is transitioning government from paper-based system to a paperless one. Public auditors are increasingly auditing information, data and services online. In 2011, the Tunisian government launched the beginning of an e-public procurement system for selected public procurement transactions, which would include purchasing and payments (Ben Sta, 2017).
- IV. Ezeani & Asogwa (2018) highlighted strategies for decreasing corruption through e-government Initiative in Sub-Saharan Africa, whereby all African leaders are required to pass and implement freedom of access to government information and increasingly support use of social media (Face book, Twitter, etc.) to campaign against corruption and mobilize citizens to put pressure on and expose politicians involved in corruption. African leaders should adopt e-procurement in all government transactions as a strategy to promote transparency and accountability in the public sectors and computerize all major government financial transactions as a way of decreasing corruption (Scholl and Ubaydi, 2017).



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Government departments, in some developing countries, publish information on websites as a first step towards e-government. Many of these websites are poorly designed and departments do not update or monitor the quality of information. Initially, online publishing of government information was targeted at attracting internal and external investments, but as the Internet penetration grew in urban areas, many government departments began to focus on delivering information and services to citizens and businesses (Bwalya, 2018).

Along with the above, e-government of developed countries adapted outdated technology and skipped some stages (Zhao *et al*, 2012). However, some African countries lack in e-government strategies. Rather than revamping together standalone e-government strategies, African governments have to put together e-government strategies linked to their country's industrial development plans. Based on the above literature of African e-government success initiatives, United Nations (2018) still showed that most African countries lag far behind their industrial and developing country peers when it comes to e-government progress. More than 30 percent of African countries are at the bottom of the world rankings on e-government capacity.

2.5 South African E-Government Context

E-government is simply in need of the Internet to provide public services on-demand. The latest United Nations e-Government 2018 survey indicated positive reflection for South Africa. According to United Nations (2018), e-participation refers to the practice of determined for the digital presence of all citizens within a country. In the period up until 2014, South Africa's e-Participation global ranking declined from 83rd position in 2012 to 97th position in 2014 (United Nations, 2018). Nonetheless, today, its global ranking stands at 39th position, the highest ranked African country in terms of e-government.

2.5.1 Examples of South African E-government Initiatives

- I. In Tshwane, e-government allows ratepayers to view and settle bills online on a municipality website, among other features, report statements, payments and electronic correspondence available at the click of a button anytime and from anywhere and a channel for customers to provide information to the city, such as uploading meter readings (e-Tshwane, 2018).
- II. The South African Social Security Agency (SASSA) has successfully used Information and Communication Technology (ICT) to speed up the processing and distribution of grants as well as streamline the process. The former minister of social development, Bathabile Dlamini, documented that the current payment solution makes provision for grant beneficiaries to inter-operate in the National Payment System (pin verification) and use biometric verification for transacting in the current service provider's infrastructure (South African Social Security Agency, 2017). Furthermore, South African Social Security Agency (SASSA) has the biggest ICT contract, namely, Social Pensions System (SOCPEN) worth R331m, for the information management system through which grants are processed (South African Social Security Agency, 2017).
- III. SARS introduced its e-filing initiative in 2001 (South African Revenue Services, 2018). The aim of the e-filing system is to facilitate electronic submission of tax returns and payments by taxpayers and tax practitioners. Taxpayers may, however, still submit their returns in the traditional paper-based way. E-Filing is aimed at improving operational efficiency to deliver a better and quicker service. There are a number of internal and external factors that have contributed to the success of SARS (South African Revenue Services, 2018). Externally, it enjoys

strong political support from government, as well as functional governance practices. In this regard, there is a zero tolerance approach to corruption within the department. There has been an increase in SARS revenue by over a R100 billion since its inception. Furthermore, SARS has simplified the tax return forms, making the process easier. The system has also helped SARS to understand the risk profiles of citizens and industry segments.

- IV. The e-Justice programme is designed to improve judicial processes. The Home Affairs National Information System (HANIS) programme is designed to streamline and integrate personal identification data across government departments through use of unique identifiers, and the National Automated Archival Information Retrieval System (NAAIRS) is designed to facilitate access to public archived records (Cloete, 2012).

Based on the above literature, South African e-government reveals positive developments in some provinces and few departments. Nevertheless, under-developed municipalities in South Africa are still in a process of delivering the government's promise and accountability to provide improved e-government services to all South African citizens.



2.6 Provincial E-Government Context

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A fast-changing world means that traditional approaches for collecting responses may be less effective today, so citizens will appreciate convenient, comfortable and quicker ways to stay informed about government, municipal services and community issues, and address their views on them (Linake and Scott, 2017). Technology, therefore, offers new opportunities for faster and cost-effective ways to distribute information, as well as reaching out and involving citizens.

2.6.1 Examples of Provincial E-government Initiatives

- I. Chemisto and Rivett (2018) used a software solution called Citizen Complaints Management System (CCMS) designed to manage fault complaints so that there can be better service delivery for communities and municipal officials. The CCMS software has been used since 2014 for logging fault information reported by citizens of two municipalities in the Eastern Cape of South Africa. Additionally, CCMS was attached to a toll-free telephone number to help municipalities to receive, record and manage daily fault reporting information from communities (Jacobs *et al*, 2016).

- II. Gumbo *et al* (2017) presented the model called 'TeleWeaver' developed in a real life setting in the Siyakhula Living Lab, a joint venture between Rhodes University and the University of Fort Hare in South Africa. The model offers creation of Broadband Islands as basic e-infrastructure units in a grass root fashion for nearby schools. On the back of successful rollout of mobile and fixed broadband technologies such as Long Term Evolution (LTE) and optical fibre networks, municipalities are computer-generated for technologists to develop and deploy smart applications that can enhance changes. This model was not the most efficient, and other models should be explored (Mzekandaba, 2017). With calls on the increase for municipal, regional and national frameworks to be developed that can help realise goals of evolving paradigms such as smart cities and the Internet of Things (IoT), this trend only continues to expand and take on more diverse forms (Bonino et.al, 2015).
- III. The Siyakhula Living Lab (SLL) is located in several villages in the Mbashe Municipality of the Eastern Cape Province of South Africa. The former Transkei was classified as a Homeland within the South African borders during Apartheid and systematically denied infrastructure and development. As such, the region, like some rural areas in South Africa, is characterised by lack of electricity, telecommunication infrastructure and poor road networks. Furthermore, service delivery in the area is poor and limited to basic education and healthcare (Gumbo et.al, 2017).
- IV. Qina's (2015) case study highlighted one of the challenges the Mooiplaas Community experienced in accessing their electronic payment system implemented by South African Social Security Agency (SASSA). His study was based on empowering public participation for effective and citizens' access to electronic system.

As noted above, the work done by these researchers (Gumbo et.al, 2017) in trying to introduce ICTs in poor communities, rural and not, offers hope of starting a righteous cycle that will make possible to have products and services present in those communities. However, this is a longer-term perspective, which is unsupportive of initial sustainability of the e-infrastructure.

In the Eastern Cape Province, Van der Waldt (2018) highlighted that there was widespread consultation amongst government departments and municipalities during the formulation of a Provincial Broadband Master Plan. This was seen as critical in raising awareness amongst communities and other concerns such as lack of effective engagement with stakeholders, inadequate resources and skills to successfully deliver the overall broadband project (ibid). Political, technical and administrative challenges do exist

to considerably hamper overall success of broadband projects. Zhao *et al* (2012) pointed out that limited access to Internet is mainly due to lack of telecommunications infrastructure in developing countries; therefore, the government must build more telecommunications infrastructure, ICTs and reduce the price of Internet access and open more access to citizens. Municipalities have a responsibility of transforming service delivery to meet the needs of all citizens, and this transformation depends on resources and processes enabled by information technology (IT) (SALGA, 2015). Some South African e-government projects fail due to lack of connection, awareness, citizen participation, human resource capacity and technology (Mawela et.al, 2017).

Use of Information and Communication Technology (ICT) in governments has introduced new forms of interaction that could enhance different types of relationships, including a government–public relationship where information is shared and exchanged. Therefore, local, provincial and national governments provide access to ICT solutions to offer effective government information and services, to achieve economic and social development and enable social inclusion. E-government projects have introduced several opportunities for online interaction, which subsequently empower citizens at various levels such as: information accessibility, political participation, influencing government decisions, linking groups to the broader community and making governments more accountable to their citizens.



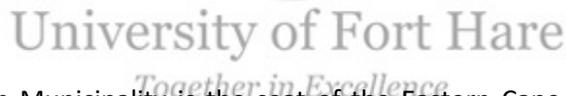
2.7 Buffalo City Metropolitan Municipality Context

Buffalo City is a metropolitan municipality situated on the east coast of Eastern Cape Province, South Africa. It includes the towns of East London, Bhisho and King William's Town, as well as the large townships of Mdantsane and Zwelitsha, as can be seen in Figure 2.1. It is surrounded by the Great Kei, Amahlati, Raymond Mhlaba and Ngqushwa Local Municipalities. It is bounded to the south-east by the long coastline along the Indian Ocean (BCMM IDPR, 2017/18).



Figure 2.1: BCMM Locality in South Africa

The municipality was established as a local municipality in 2000 after South Africa's reorganization of municipal areas, and is named after the Buffalo River, at whose mouth lies the only river port in South Africa (BCMM IDPR, 2017/18). On 18 May 2011, it was separated from the Amathole District Municipality and converted into a metropolitan municipality. Following local government elections held on 3rd August 2016, new areas from the surrounding local municipalities were incorporated into Buffalo City Metropolitan municipality, thus impacting on both the size of the population and land area (BCMM IDPR, 2017/18).



Buffalo City Metropolitan Municipality is the seat of the Eastern Cape Provincial Government. The Eastern Cape Province is the second largest province in land area in South Africa and covers 169, 580 square kilometers, which is 12.7% of South Africa's total land area. According to the Buffalo City Metropolitan Municipality annual report 2016-2017, the province has the third largest population of South Africa's Provinces, approximately 6,996 976 million people (Community Survey, 2016), which is about 12, 8% of South Africa's people. The province is generally seen as one of the two poorest in South Africa. There are two major urban metropolises within the Province, Nelson Mandela Bay Metropolitan and Buffalo City Metropolitan Municipality. The Eastern Cape population has reduced from 14% (Census 2001) to 12,8% (Community Survey 2016) of the country's population (BCMM IDPR, 2017/18).

New areas have been incorporated into BCMM from Great Kei, Amahlathi and Ngqushwa Local Municipalities. In total, 24 469 people and 6 567 households were incorporated into Buffalo City Metropolitan Municipality (BCMM IDPR, 2017/18). According to the Community Survey 2016, the total population of Buffalo City Metropolitan Municipality is 834 997, with about 85.40% of these being black

Africans, followed by 6.90% Whites, 6.70% Coloureds and 0.90% Indian/Asian, as illustrated in Figure 2.2. These ratios have remained consistent over previous Censuses and Community Survey of 2007, except for the ratio of Whites that has dropped slightly and is now almost equal to the ratio of the Coloured population (BCMM IDPR, 2017/18).

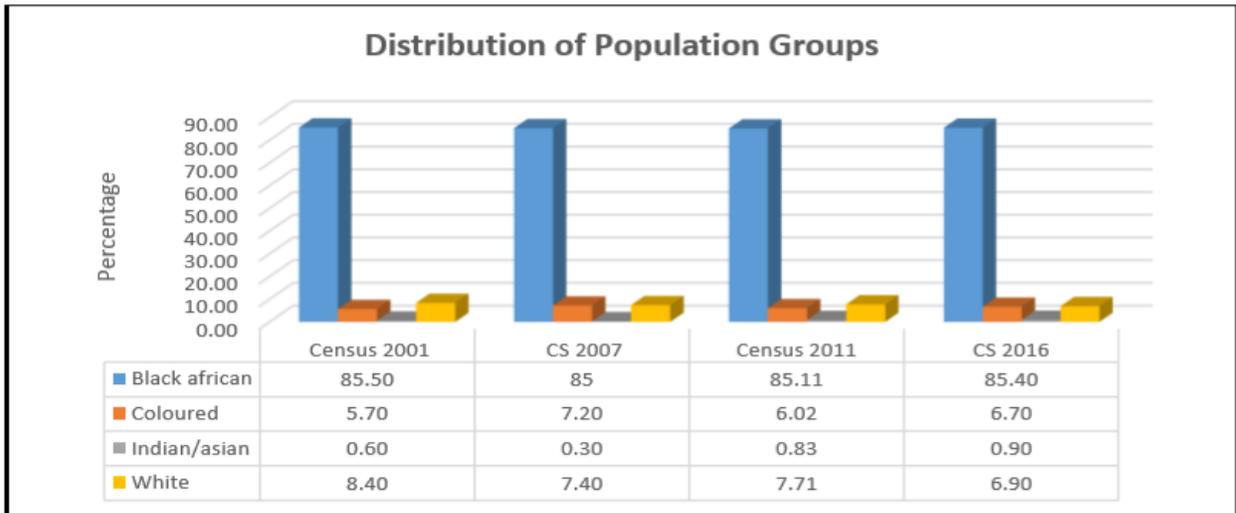


Figure 2.2: Distribution of the overall population groups in BCMM

The graph in Figure 2.2 shows the distribution of the population and the majority race in BCMM. This helps to confirm how services are being deployed to Black African citizens. Of note, it is very important to know the distribution and target group, for internet connection purposes.

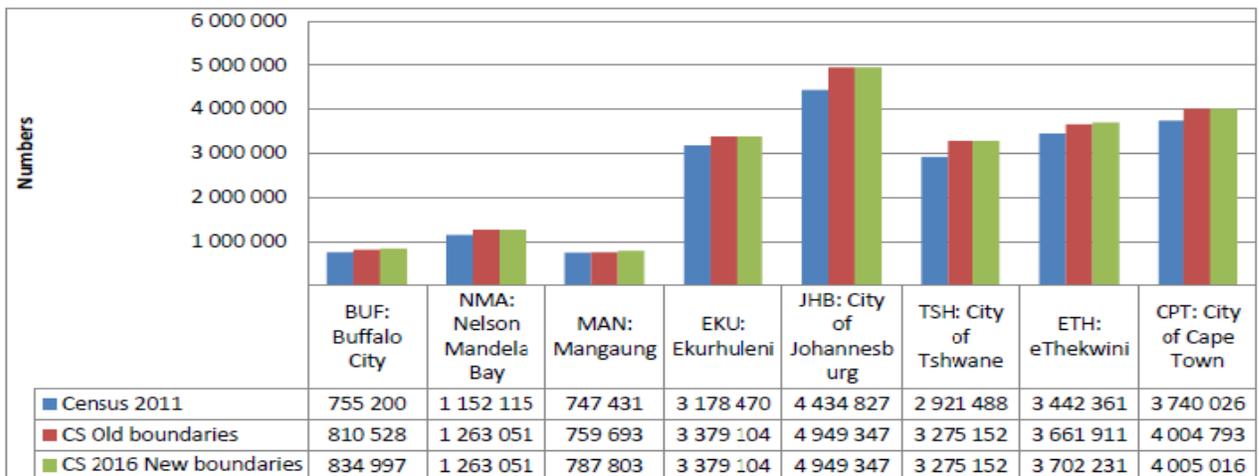


Figure 2.3: Distribution of population changes in Metropolitans of South Africa

Figure 2.3 shows the population distribution of all metropolitans, indicating how each was affected population wise with the new demarcations. BCMM shows an increase from 810 528 as per the old boundaries to the new 834 997, inclusive of all the new areas (BCMM IDPR, 2017/18).

2.8 Technologies for E-Government Services

Zhao *et al* (2012) argue that development requires building an interagency network of systems, networks, software i.e. free or open source, hardware and organisation, which is important in early stages of implementing an e-government. The success of e-government requires a well-defined and well formulated, forward-looking and system-thinking strategy and implementation of that strategy. The following are a few technologies mainly used for e-government for better service delivery.

2.8.1 International Business Machines (IBM) Technologies

Each day, mobile technologies grow one step closer to becoming the primary means of interaction and communication among employers, family and friends, customers, governments and their citizens. International Business Machines (IBM) created the concept of Mobile First technologies government leaders to reinvent how organizations interact with citizens, businesses and employees; as a result of this technology, citizens are able to pay for parking by using smart phones (Nguyen *et al*, 2015).

In one of the reviewed studies, it is proved by Sharjah (2012) that IBM projects vary from assisting networks of entrepreneurs and small businesses trying to grow and reach export markets to adoption of new and smart technological ideas by private and public sectors. According to Sharjah (2012), an international team of IBM employees chosen for the company's Corporate Services Corps program to volunteer their expertise in support of e-literacy and social development in the Emirate of Sharjah. At the Sharjah e-Government Directorate, a team helped refine a national strategy for promoting e-services of the Sharjah government to residents.

Mobile platforms such as smartphones and tablets are replacing traditional channels such as mail, phone and computer as the primary tool that citizens use to engage with government. On the government side, employees are using more mobile technologies as platforms to collect data, process information and engage with citizens.

2.8.2 Use of Web 2.0 Technologies

Digital government environments have seen significant transformation over the last decade and currently, they continue to embracing technologies such as Web 2.0 that will not only enhance participation, transparency and integration but also speed up the pace of innovation (Sivarajah, *et al*, 2014). For government, digital transformation means focusing on leveraging technology to increase efficiency. These attributes can be broken down into being:

1. *Useful*: For citizens, better engagement through digital transformation comes down to the interaction and the experience being useful. By being useful, the interaction delivers value to all citizens — they have the ability to pay a bill, get a permit, request a service, or apply for a program across multiple devices and touchpoints. Digital transformation efforts allow any citizen to engage with government programs across multiple devices, channels, and touchpoints while receiving the same level of services (Sivarajah *et al*, 2014).
2. *Usable*: Digital transformation means being usable for citizens so that they can easily find and access the value of government. For example, if a government agency provides citizens with the ability to pay a utility bill online or through an app, but the process requires setting up a new account and approval from the agency, then it is not usable, as a process, without those impediments. A government agency can remove those impediments by using a single digital access point and sign-on that confirms appropriate identity and links citizen with relevant services. This allows accessing appropriate information already held by other agencies in a cloud environment to fulfil the informational requirements of the new account, streamlining approval using analytics to identify potential problems and separating problems from other cases that can be easily approved (Sivarajah *et al*, 2014).
3. *Efficient*: Critical to government is leveraging technology for improved operational efficiency. This is accomplished through digital transformation of processes and services, including reducing the number of people interacting with a process, reducing duplication of data gathered and storage of that data, using analytics to streamline monitoring, identifying outliers to established parameters, replacing paper records with digital processes and giving government employees digital tools that allow for immediate interactions (Sivarajah *et al*, 2014).

Web 2.0 technologies and associated applications facilitate collaboration and enable the shift from service oriented architectures (SOAs) to Web oriented architectures (WOAs), which has a substantial impact on the ability to transform internal government operations and services (Mahmood, 2014).

2.8.3 Cloud Computing

Nanos *et al* (2019) define cloud computing as the delivery of different services through the Internet and resources that include tools and applications like data storage, servers, databases, networking and software. Cloud computing is a popular option for citizens and e-government services for a number of reasons, including cost-savings, increased productivity, speed and efficiency, performance and security. Nanos *et al* (2019) further pointed out the following types of cloud computing:

1. Software-as-a-service (SaaS) involves licensure of a software application to customers. Licenses are typically provided through a pay-as-you-go model or on-demand. This type of system can be found in Microsoft Office's 365 (Nanos *et al*, 2019).
2. Infrastructure-as-a-service (IaaS) involves a method for delivering everything from operating systems to servers and storage through IP-based connectivity as part of an on-demand service. Clients can avoid the need to purchase software or servers, and instead procure these resources in an outsourced, on-demand service. Popular examples of the IaaS system include IBM Cloud and Microsoft Azure (Nanos, *et al*, 2019).
3. Platform-as-a-service (PaaS) is considered the most complex of the three layers of cloud-based computing. PaaS shares some similarities with SaaS, the primary difference being that instead of delivering software online, it is actually a platform for creating software delivered via the Internet (Nanos, *et al*, 2019).

Cloud-based software offers companies and government from all sectors a number of benefits, including the ability to use software from any device either via a native app or a browser. As a result, users can carry their files and settings over to other devices in a completely seamless manner (Nanos, *et al*, 2019). Cloud computing is far more than just accessing files on multiple devices; users can check their email on any computer and even store files using services such as Dropbox and Google Drive.

2.8.4 Internet of Things and Localization Based Technologies

Internet of Things, or connecting of physical devices and buildings embedded with electronics, software, sensors and network connectivity that can collect and exchange data, is both a source of information for government and a channel for citizen engagement. Internet of Things devices can collect a variety of information that can be fundamental to a program, measure performance of a program or be the interaction point with the citizen. IoT technologies aim to deliver high coverage and low power communication solution, and they are unable to support high data rate required by various applications in local levels (Zafari and Gkelias, 2019).

Traditionally, Global Positioning System (GPS, Wireless Fidelity (WiFi) and Global System for Mobile (GSM) technologies are used for localizing users. Google Maps Mobile for mobile phones primarily uses GPS and WiFi for localization. Localization has recently witnessed an increase in interest, due to the potential wide range of services it can provide by leveraging Internet of Things (IoT) and global connectivity to improve services provided to users (Zafari and Gkelias, 2019).

2.8.5 Mobile, Radio and Television



The use of community radio and television is for information-sharing and public service broadcasts. Jere (2012) found that there are differences in individual ICT services required by rural users, but most ICT services in need reduction mainly in areas of health, education, entrepreneurship, agriculture and employment creation for rural people. These services require ICT devices and infrastructure that includes computer peripherals, mobile phones, radios, televisions and wireless infrastructure, mobile infrastructure, satellites and broadcasting infrastructure.

Radio or television broadcasting peripherals are useful in broadcasting information in rural areas. On occasion, community members gather to listen to or watch programmes, videos, movies and the latest news in their area over the radio and television, so utilizing these devices can benefit many people (Jere, 2012). Additionally, use of mobile phones in rural areas requires mobile infrastructure and mobile services for electronic transactions; sensor-based systems and navigation services could also increase the need for chip-enabled devices.

2.8.6 Community Labs and Thusong centres

Gumbo *et al* (2017) described a model conceptualized in the Siyakhula Living Lab in the Eastern Cape (EC) South Africa (SA) and partially implemented through an integration platform named "TeleWeaver". The model behind TeleWeaver is an adaptation of the classic Internet business model - whereby users of services do not directly pay for the services they use. Therefore, this model is especially relevant currently in South Africa because of the announcement by the government to pilot connecting to internet government facilities, including schools in poor district municipalities.

Thusong Mobiles provide government services on-the-go and visit specific areas for a day or two where services can be accessed by communities. Centres offer free internet, training facilities and business centres. Former Minister of Communications, Nomvula Mokonyane, said, "We aim to ensure that through Integrated Mobile Outreach Services and other GCIS platforms government will maximize the reach and access to government services, during Thusong Service Centre Week".

The Thusong programme has been reaching about six million beneficiaries every year, and during 2017, a total of 74 activities were implemented and aimed to improve the Public Service. Thusong Service Centres are one-stop centre for access to government services and information to potential sponsors and stakeholders across all spheres of government (DoC, 2017).



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2.8.7 Social Media

The growth of social media and its usage has been witnessed in some sectors. Nowadays, social media has become one of the effective means of communication. Social media include various channels such as Email, SMS, Facebook, Twitter and WhatsApp. Kheryadi's (2018) investigation shows that 82% of subjects are actively communicated through WhatsApp and increasing communication skills with their people, while 74% like to share new information and lastly, WhatsApp makes it more comfortable to communicate with one another. WhatsApp allows people to share information without limitation; using 3G internet data and WI-FI, they can message each other through images, video calling and voice audio (Kheryadi, 2018).

Governments worldwide are beginning to connect Internet and related Information and Communications Technologies (ICTs) in an effort to address citizens' wish for greater information access, institutional transparency, participative decision-making and access to public services. One

channel through which these objectives are being followed is social media, which include off-the-shelf networking sites, such as Facebook, microblogging services, such as Twitter and information dissemination platforms, such as YouTube (Porumbescu, 2016).

2.9 Critical Literature Analysis

There is evidence of current literature in the research study that researchers have covered information available on e-government and ICTs within different areas. The available literature helped to understand the current state of ICT developments within the context of the study. The available literature explains the state of e-government projects in many continents, including Africa. There is literature showing ICT projects, infrastructure and resources available in certain areas. The available literature has exposed current initiatives underway in respective areas to improve service delivery to citizens.

Within the African space, there is evidence of supporting literature on current projects and ICT developments meant to improve services. However, there is less literature on the adoption of broadband infrastructure and citizens' views on how current broadband initiatives are supporting citizens. This is evident from very limited literature, especially from the area under study and South Africa in general. Limited literature is available on factors that influence broadband infrastructure adoption in developing countries. The study considered other relevant studies on the topic from all over the world and contextualised that to satisfy the research context.

2.10 Conclusion

The main challenge of introducing e-government in developing countries is lack of a well-planned strategic plan. In this sense, developing countries' governments should understand the potential of ICT in introducing changes to domains far beyond structural tools. Developing countries are facing huge difficulties in developing technological capacity, allocating sufficient financial resources and adjusting institutional context accordingly. In this regard, successful e-government projects is not simply linked to technologies to be introduced to public sector entities; political and social changes are required alongside electronic media.

This chapter provided insight into the research context, namely, e-government services operating throughout the world, Africa and developing countries. The chapter concluded by exploring the e-

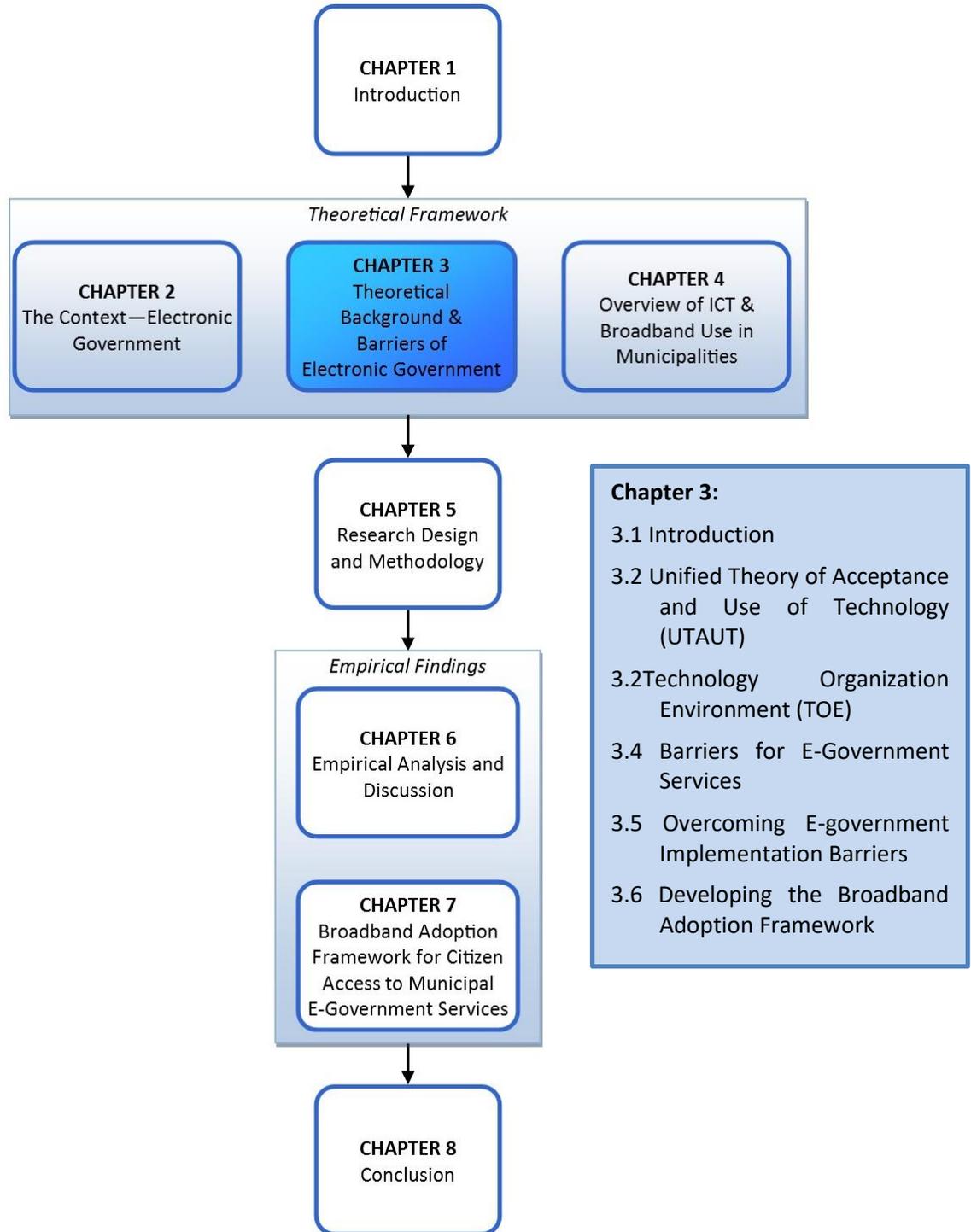
government services provided using Information and Communication Technologies (ICTs), resources currently deployed to ensure government operations continue in developing countries.

It is clear that the world and developing African countries are making effort through e-government initiatives, countries and cities are connected and technologies are used. Nevertheless, there are still barriers hindering e-government implementation. The next chapter introduces the theoretical base for the study and unpacks barriers to e-government success.



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Chapter 3 : Theoretical Background and Barriers of Electronic Government



3.1 Introduction

The purpose of this chapter is to provide insight on theoretical background using the Unified Theory Acceptance and Use of Technology (UTAUT) and shed more light on Technology-Organisation - Environment (TOE). Additionally, it serves to enlighten more on the barriers for e-government services using different factors affecting e-government services and later, identifying ways to overcome the mentioned barriers. This is to ensure that the organisation and government applies technologies to improve knowledge around broadband and increase employee production when using e-government service. Once this is performed, a decision could take place and only then the decision to implement broadband could be taken. By doing so, this may reduce costs which may occur if broadband is implemented without any evaluation steps.

In the previous chapter, it was revealed that broadband is a new technology that allow citizens access to e-government and provides high quality public sector services via digital channels to improve cost-efficiency for the municipality. As such, there is need for a better understanding of theories behind its adoption to help categorise relevant factors influencing adoption. The review of broadband adoption literature demands the necessity to be open to different methods of technology to understand relevant aspects.



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Technology adoption delivers development of different models related to Information Technology (IT) and Information Systems (IS) diffusion. Amongst numerous behavioral models employed in studies considering consumer adoption of technology, the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh, *et al* (2003) has developed to become one of the best known, being widely employed in technology adoption and diffusion research (Williams et al., 2015). On the other hand, the Technology-Organisation-Environment (TOE) Framework specifically relates to technology adoption.

In the development of these theories, many studies were completed to explain users' behaviour and technology acceptance in the adoption process. Moreover, many of them theorize behavioural intention as the key dependent variable in enlightening acceptance of technology. According to Ajzen (1991), these behavioural intentions are understood as motivational factors that explain willingness of people to implement behaviour.

This study sought to propose a framework for adoption of broadband by Municipal e-government services. This chapter is relevant to the study in that it helps develop the theoretical basis for studying factors that influence adoption of broadband by Municipal e-government services. This chapter reviews the above-mentioned theories and various barriers to e-government adoption.

3.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

This study sought to overcome barriers to broadband adoption in Buffalo City Metropolitan Municipality (BCMM) to enable citizen access to e-government. UTAUT was chosen to determine the factors that influence or restrict citizen's intention to use and adopt technology, specifically broadband, in e-government services as a tool for citizen engagement. Despite the emerging use of technology as a tool for citizen engagement, the main focus is on the citizen (McGee, Rosemary & Carlitz, 2013). The model was chosen because it is comprehensive and consolidates eight different acceptance models, namely: Theory of Reasoned Action, the Technology Acceptance Model, the Theory of Planned Behavior, the Model of PC Utilization, the Motivational Model, the Social Cognitive Theory and the Innovation of Diffusion Theory. The UTAUT model has proven to be more accurate and comprehensive in predicting use, acceptance and adoption of technology than any of the other eight models when used separately.

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It was revealed that performance and effort expectancy, social influence and facilitating conditions have a positive impact on the use of the ICT. This research used interpretivism, with a slight lean towards positivism to describe the UTAUT model in the context of citizen engagement (Williams, *et al*, 2015). Therefore, in order to contribute toward filling these research problems identified in the literature chapters, this study analysed the adoption of broadband for municipality e-government systems by employing the UTAUT as a core model and examining moderating effects of age, gender, and frequency of Internet use on the relationships between citizens. Below is a discussion on identified researchers who used the UTAUT model.

The UTAUT model has been widely used in studying e-government and other technologies. For example, Mujtava and Pandey (2012) examined the number of the State Governments that introduced measures to integrate ICT and associated tools into their governance processes. The UTAUT model used for E-District benefits by Rana *et al.* (2015) to include faster processing of citizens' cases, appeals and grievances, an effective electronic workflow system, better and faster decision-making services for

district administrations, improvement in the efficiency of the workforce, post-delivery evaluation for further improvement and faster service delivery to citizens.

Hung *et al* (2013), in the field of e-government and public administration, analyzed users' acceptance of mobile government services in Taiwan and discovered that attitude is a critical factor that affects behavioral intention. Mansoori *et al* (2018) declared the intention to build a strong ICT-based infrastructure for delivery of quality services through e-government to make the Abu Dhabi Government more effective and efficient in delivering modern services to its diverse customer-base along a multitude of delivery channels services. Abu Dhabi Government offered e-service ranges for City Guard initiative, which enables citizens to report cases and incidents to the contact centre via a smart phone app and the e-citizen programme, which seeks to increase computer literacy amongst citizen.

Chemisto (2018) used UTAUT to examine the adoption and use of a software solution called Citizen Complaints Management System (CCMS) designed to manage fault complaints so that service delivery between communities and municipal officials can be improved. Lastly, Lu and Nguyen (2016) used the unified theory of acceptance and use of technology (UTAUT) model with the Information system success model (IS success) and explanatory model of e-filing adoption. Their paper involved actual taxpayers of the e-filing system to examine structural relationships among factors of performance expectancy, effort expectancy, social influence, information quality, system quality, service quality and intention to use by using Statistical Package for the Social Science (SPSS 20).

Table 3.1: Previous studies that have used the UTAUT Model

Author (s)	Domain
Mujtava and Pandey, 2012	ICT
Hung <i>et al</i> , 2013	M-government
Rana <i>et al</i> , 2015; 2016	E-District / E-government
Mansoori <i>et al</i> , 2018	E-government / E-service
Lu and Nguyen, 2016	E-filing
Chemisto, 2018	E-government

UTAUT is the most appropriate theory based on the fact that the use of e-government entails adoption of technology. The researcher, at this particular point, explored direct elements of the adoption of e-government services appropriated from UTAUT, and for that purpose, defined dimensions as Service Expectations and Facilitating Conditions. As a matter of nature, citizens and government processes for the adoption of technology are different and follow different forces at work. In addition, connection between citizen and government technology adoption recommends a state of interdependence that UTAUT shows as difficult to frame.

According to Venkatesh *et al*, (2003), the following are definitions of UTAUT dimensions:

1. *Performance expectancy* is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance. The relatively high performance expectancy of the e-government service users group can be seen as allowing citizens to avoid waiting in long queues and dealing with uncooperative staff in municipality offices. In the e-government services and broadband technology context, performance expectancy advocates that the use of broadband technology for municipal e-government services be useful because it enable citizens to have quick access to information.
2. *Effort expectancy* is defined as the degree of ease associated with the use of the system. In this respect, the respondents share their attitudes towards e-government services in Buffalo City Metropolitan Municipality (BCMM). This indicates that citizens are willing to participate e-government services, considering the expected effort to use them. In this context of effort expectancy in the use of e-government service in BCMM, it is likely that effort expectancy most strongly affects behaviour during the initial and early stages of broadband adoption for accessing e-government services in the citizen's content, and the effort expectancy will drop over time as the user becomes more experienced.
3. *Social influence* is defined as the degree to which an individual perceives that important others believe he or she should use the new system. The findings show that adopters of e-government services in Buffalo City Metropolitan Municipality (BCMM) are socially influenced. The social influence is a key factor in acceptance and adoption of technology. However, it should be noted that social influence is considered less significant among e-government service users group in this study than performance and effort expectancies. In the e-government service context, the construct puts forward that social influence (e.g. citizens, employees and ICT

experts from BCMM) will affect citizen's intention to willingly accept the use of broadband adoption in accessing BCMM e-government services for the benefit of citizens.

4. *Facilitating conditions* are defined as the degree to which an individual believes that an organization and technical infrastructure exist to support use of the system. The findings show that lack of awareness, proper training and guidelines influence acceptance and adoption of broadband for e-government services by BCMM citizens. Therefore, the government should run rigorous advertising campaigns to ensure that people are aware of and use services. Where there is no training, regular advertisement and support for municipality e-government services and inadequate technology skills may be a barrier.

The motivation to define UTAUT was based on the dispute that many of the concepts of the existing theories are similar in nature; therefore, it was reasonable to incorporate them to create a unified theoretical base (Venkatesh, et al, 2003). By doing so, initiators of UTAUT wished that future studies would not need to search, gather and incorporate constructs from numerous different models but instead could apply UTAUT to gain an understanding of variety of challenges related to IS/IT adoption and diffusion. The Unified Theory of Acceptance and Use of Technology (UTAUT) theory is used to determine the key factors that influence use and acceptance of broadband as a tool for citizen engagement and participation.



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3.3 Technology-Organization-Environment (TOE)

The TOE framework describes how technological innovation adoption occurs at the firm level (Tornatzky and Fleischer, 1990). The TOE theory states that in addition to qualities of an innovation, there exist these broader contexts that influence innovation adoption, implementation and use. The TOE framework serves as an important theoretical perspective for studying contextual factors (Tornatzky and Fleischer, 1990). It presents three elements of a firm's context that influence the process by which it adopts and implements technological innovations: organizational context, technological context and environmental context (Tornatzky and Fleischer, 1990). TOE includes ease of use and usefulness of the individual in accepting the technology services (Gangwar *et al*, 2015; Awa, Ojiabo and Emecheta, 2015).

The TOE framework has been widely used in studying e-government and other technologies. For example, Pudjianto and Hangjung (2009) examined the influences of technological, organisational and

environmental factors affecting e-government assimilation in developing countries using the TOE framework. Moreover, Abdallah and Fan (2012) applied the TOE framework to explore determinants affecting e-government adoption in Sudan. Furthermore, Pudjianto, Hangjung, Ciganek and Rho (2011) discovered factors affecting e-government integration in Indonesia with the TOE framework.

In India, a study was conducted on mobile government usage by citizens (Shareef *et al*, 2012). The study includes ease of use, usefulness, potential advantage, trust, technology reliability, credibility and security and suggested that the mobile government should be based upon ease of use, security, potential benefits and reliability of the technology. Musawa and Wahab (2012) applied the TOE framework to examine factors affecting electronic data interchange adoption by Nigerian SMEs. Furthermore, Van Huy, Rowe, Truex and Huynh (2012) extended the understanding of e-commerce by identifying factors that distinguish adopter firms from non-adopter firms using the TOE framework.

Krishnana et al (2017) contributed to the theoretical study on e-government by emphasizing roles of the TOE to contextual factors on the government’s willingness to implement e-participation and e-government maturity, including providing suggestions for practice in managing e-government maturity by improving the government’s willingness to implement appropriate e-participation dimensions and further leveraging effects of TOE’s contextual factors on the government’s willingness to implement e-participation and e-government maturity. Lastly, Zhang and Xiao (2017) included social media technology applications for government in the public sector as part of the fifth wave of information and communications technology adoption. They discovered that academic interest in social media in the government sector has been increasing the key technological, organizational and environmental factors that affect assimilation of social media in local government agencies.

Table 3.2: Previous studies that have used the TOE framework

Author(s)	Domain
Bose and Luo, 2011	Green IT Initialization
Shareef <i>et al</i> , 2012	M-government
Yang, Ng, Kankanhalli and Lim, 2013	Healthcare Information System / Adoption
Ifinedo, 2011	Internet / E-Business
Pudjiant <i>et al</i> , 2011	E-government /Assimilation
Troshani, 2011	HRIS
Mueller, B. and Urbach, N., 2013	Information Systems
Krishnana et al, 2017	E-government
Zhang and Xiao, 2017	E-government / Social media / Assimilation

The study revolves around citizens of the BCMM; therefore, it is important to focus on an individual basis rather than group. Subsequently, it is important to include the individual and technology factor in the study to analyze the acceptance of electronic government services adequately.

In view of the above, the TOE framework was deemed suitable for this study as it offers a comprehensive view to study technological, organisational and environmental related issues to convince citizens to participate in an e-government. Subsequently, some e-government services are designed for use in the citizens' everyday life; this study also used TOE framework to predict citizen's engagement to e-government services in BCMM.

3.4 Barriers of E-Government Services

As described in previous chapters, interest in e-government has grown significantly within the Information Technology (IT) industry (Gumede, 2019). However, adoption of broadband for e-government systems in South African municipalities has been dramatically slower compared to other countries (Van der Waldt, 2018). For e-government in South Africa, which provides the context for this study, it is important to leverage benefits that broadband adoption could contribute to their municipalities and citizens. However, a number of issues influence the relative ease with which municipal employees and municipal citizens are able to assess readiness of their e-government services for such a technology.

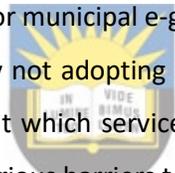
The greater South African e-government services stands the risk of falling behind the innovation of other municipalities in countries which are making progress to adopting broadband. The problem or risk specifically being addressed in this study is that e-government services are not capable of measuring their own services for willingness to migrate to broadband. This is evidenced by Gumede (2019) that African governments will have to invest in Information and Communication Technology (ICT) and telecommunications infrastructure, human resources and systems that can interactively problem-solve citizens queries. Furthermore, Joseph and Olugbara (2017) suggested that municipalities will need to change towards an advanced level of e-government development to enhance the effectiveness of e-government services.

It is argued that local government is at the forefront of understanding citizens' needs, and it is the delivery arm of government. It is the requirement of municipalities to ensure that there is an improvement in services for underdeveloped communities. The Internet ideally increases participation

in the policy process, and citizens and public agencies save time and paperwork through electronic service delivery. However, there are a number of barriers that potentially hinder e-government adoption.

Digital solutions give an opportunity for municipal managers to empower government agents to promote a better life for citizens (Goldsmith and Crawford, 2014). Departments that use predictive policing, for example, not only enable an efficient management of resources and workforce, but also empower field agents to make the best possible decisions. Rana et al (2015) highlighted that providing relevant information and services to citizens in real time increases ability of the government to target appropriate services for specific populations and use of these services by citizens, which is still a challenge across the world.

There has not been sufficient research into use of broadband adoption for municipal e-government, especially, in rural municipal e-government services. Therefore, this study targeted to fill this gap to establish structured adoption processes for municipal e-government services. By doing so, the success rate of adoption may improve. Finally, by not adopting measures to reduce operating costs, such as broadband, costs may rise to the point at which services need to be priced at levels which are not supportable. This section describes the various barriers to e-government implementation.



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3.4.1 Technological Factors

Mimbi and Kyobe (2017) identified the most significant technological challenge as computer security. Essential information Technology (IT) standards to achieve citizens' needs and to pass up any hardware and system barriers might delay the e-government services. Permanency of e-government services is important for availability and service delivery, as well as for building citizen confidences (Kim, Cho and Suh, 2017). Furthermore, privacy is a core challenge to e-government implementation and acceptance; it concerns sharing information among participating government agencies and exposing or mishandling private information.

Stability of e-government services is important for service delivery as well as for building citizen confidence, broadband adoption and bringing connectivity to underserved areas to ensure sustainability. Those without access cannot learn essential computer skills, cannot access information that can provide economic opportunities and cannot share in the benefits of e-government (Van der Waldt, 2018).

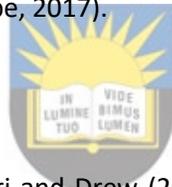
3.4.2 Political Factors

Mawela et al (2017) added that the implementation of e-government services needs considerable financial investment. As a result of lack of available financial resources, top leadership gradually lose interest in implementing e-government. Transparency to citizens implies understanding how government decisions are made, but lack of transparency inhibits the public from actively participating in government and raising questions or protesting against unfair or misguided decisions (Alshehri and Drew, 2011).

3.4.3 Economic Factors

Countries implementing e-government have struggled to develop a basic infrastructure to take advantage of new technologies and communications tools. Some government municipalities, even if interested, do not have the infrastructure necessary to immediately deploy e-government services throughout their regions (Mimbi and Kyobe, 2017).

3.4.4 Social Factors



Social barriers were identified by Alshehri and Drew (2011) as critical weaknesses to e-government implementation. Furthermore, they pointed to two key elements of social barriers, which are digital divide and culture. Bwalya and Mutula (2014) understood the digital divide as a term used to refer to a state of unequal access to digital technology within or between countries. It is the gap between those who have access to ICTs/ICT infrastructure and those who do not. People who do not have internet access will be unable to benefit from online services, which form an important barrier to e-government (Alshehri and Drew, 2011). Trust is a vitally important component of e-government services. Without trust, citizens who may already be doubtful of using technology may avoid use of online services that ask for detailed personal information. People who do not have internet access will be unable to benefit from online services, which forms an important barrier to E-government.

3.4.5 Organization factors

Successful implementation of e-government should involve restructuring existing organizational model, roles, responsibilities, training and employees' needs, thus limited employee training may be a considerable challenge (Alshehri and Drew, 2011). Inefficiency of increased outputs or goal attainment

with the same resources or with lower resource consumption (Harrison et al, 2012) is a challenge. Trust in organizations regarding the online environment can hinder the level of internet experience, organizational reputation, quality of previous online transaction experience and perceived website quality.

3.5 Overcoming E-government Implementation Barriers

Municipalities need to be aware of all barriers they may face in implementing e-government through broadband. It is, therefore, crucial that municipalities understand these challenges before they implement broadband (Mkhize, 2016).. Table 3.3 provides a view of barriers and authors' recommendations on improving e-government.

Table 3.3 Recommendations to E-government Barriers

Barriers	Recommendations	Authors
1. Infrastructure Development	<ul style="list-style-type: none"> • Develop projects that are compatible with the nation's telecom infrastructure. • Use public access kiosks and mobile centers if telecommunication density is low. • Introduce telecom competition and lift regulations on wireless and other digital technologies to accelerate their deployment. • Establish an action framework at the beginning of the process to allow for a rational and coordinated investment effort down the road. 	<ul style="list-style-type: none"> • Bwalya and Mutula, 2014
2. Law and Public Policy	<ul style="list-style-type: none"> • Consult with stakeholders to assess how existing laws may impede the desired results. • Give legal status to online publication of government information. • Clarify laws and regulations to allow electronic filings with government agencies. • Reform processes by simplifying regulations and procedures. 	<ul style="list-style-type: none"> • Mkhize, 2016
3. Digital Divide	<ul style="list-style-type: none"> • Provide communal access through village computer centers or kiosks. • Combine access with training. • Provide motivations to the private sector to donate equipment and training. • Emphasize local language and content tailored to different communities. • Use for-profit entrepreneurs to build and sustain access points in small communities. 	<ul style="list-style-type: none"> • Kim, Cho & Suh, 2017 • Doong and Ho, 2012
4. E-Literacy	<ul style="list-style-type: none"> • Ensure that content is in local languages and that interfaces are easy to use. 	<ul style="list-style-type: none"> • Sharjah, UAE, 2012

	<ul style="list-style-type: none"> • Develop applications that use speech or pictures in addition to, or instead of, written text. • Include an educational component in E-government projects. Provide aides at access points who can train citizens in basic computer skills. 	
5. Accessibility Governments	<ul style="list-style-type: none"> • From the outset, design applications that accommodate the disabled, such as an audio option for the blind. • Establish as a legal requirement that the government must adopt technology to assist the disabled. • Set performance criteria and measure progress. 	<ul style="list-style-type: none"> • Gumbo <i>et al</i>, 2017 • Gumbo, 2019
6. Trust	<ul style="list-style-type: none"> • Map key internal and external partners and build a strategy to keep open lines of communications. • Start with short-term projects that yield early results. This helps build trust and could help point to areas for larger scale ventures. • Strong leadership can help build confidence in programs 	<ul style="list-style-type: none"> • Porumbescu, 2016
7. Privacy	<ul style="list-style-type: none"> • Educate and train government officials on the importance of privacy. • Design applications that integrate privacy protections. • Follow “fair information practices”. Minimize the collection and retention of personal information. • Limit access to personally identifiable information, do not automatically allow employees to tap into databases of personally identifiable information. 	<ul style="list-style-type: none"> • Bwalya and Mutula, 2014
8. Security	<ul style="list-style-type: none"> • Designate a senior official responsible for computer security. • Continually assess systems to make sure that security precautions are being implemented. • Backup information regularly and store backups in a separate location. • Provide ongoing training to employees on computer security. • Evaluate performance of system managers in obeying to sound security practices 	<ul style="list-style-type: none"> • Doong and Ho, 2012 • DTPS, 2016 • DTPS, 2017
9. Transparency	<ul style="list-style-type: none"> • Post online rules, regulations and requirements for government services (such as requirements for obtaining a license) to minimize subjective actions by officials. • Highly-placed public officials can expedite transparency and accountability efforts by making their offices positive examples of openness. • When putting services online, give citizens the ability to track the status of their applications. • Train civil servants and provide incentives to reform. 	<ul style="list-style-type: none"> • Ramli, 2017

	<ul style="list-style-type: none"> Integrate transparency and process reform to simplify regulations and procedures. 	
10. Interoperability	<ul style="list-style-type: none"> Map and assess existing record systems. Identify and reform regulatory schemes that make interaction with the government onerous. Use common standards throughout the government to shorten development time and ensure compatibility. Adopt a common IT infrastructure for the government. 	<ul style="list-style-type: none"> Bwalya and Mutula, 2014
11. Education and Marketing	<ul style="list-style-type: none"> Develop publicity and training campaigns that will engage the public about E-government initiatives. Conduct research to ensure that online services respond to actual needs and that the implementation suits the target audience. 	<ul style="list-style-type: none"> DTPS, 2016 DTPS, 2017
12. Permanent availability	<ul style="list-style-type: none"> Design applications according to need. Consider relevance, usability, language compatibility and affordability. Encourage cooperation between departments and with the private sector in collecting, storing and utilizing data but proceed continuously with personally identifiable information. 	<ul style="list-style-type: none"> Shambare, 2019 DTPS, 2017

Table 3.3 shows examples of recommended initiatives that could be put in place to address barriers to implementing e-government services.

E-government in South Africa is still in the formative stage of development (DTPS, 2017). With advances in technology improved, access needs to be created for citizens, particularly in rural municipalities and a supportive telecommunications policy needs to be in place. Internal efficiencies need improvement not only from a technological point of view but also from a people perspective. In order for the recommendations mentioned in Table 3.3 to be operationalized, e-government should focus on implementation guided by the citizen focused on Batho Pele principles in terms of online service delivery, improved service delivery, enhanced internet connection and customer service.

Access to public services is a necessary part of e-government, but not sufficient. Facilitating, broadening and deepening openness and citizen involvement is fundamental to e-government, including evaluating effectiveness or success of e-government through participatory dialogue and interaction. Such participation can either be unnoticeable, one-time participation or ongoing participation by individuals or community groups (e.g. "citizen steering committees" for e-government projects).

These challenges are important in formulating the proposed framework; however, the study focuses more on broadband adoption. This chapter lays the foundation for the proposal of a framework in overcoming e-government implementation barriers using broadband adoption. E-government barriers above are linked to Technology Organisation Environment (TOE) Framework. Additionally, steps of the Innovation-Decision model are incorporated to provide a means of determining progress toward adopting broadband for municipal e-government service.

3.6 Developing the Broadband Adoption Framework

This section lays the foundation for the proposal of a framework to overcome adoption issues encountered when using e-government services. The proposed Broadband Adoption Framework for e-government services is based on the TOE framework.

The TOE is briefly described below, and barriers identified in the previous section are aligned to this framework. In order to provide a means of assessment of e-government service, phases of innovation-Decision Model are incorporated into the proposed framework. Thus, the proposed framework provides a phased approach for addressing adoption of broadband for e-government services. The research process comprises identification of key theory, which addresses application of new technologies at an organisational level. A maturity step process provides phased barriers to the broadband implementation approach to implementing the model.

Literature on the TOE model (Tornatzky and Fleischer, 1990) mentioned in Chapter 1 (sub-heading 1.6.1.2) and depicted in Figure 1.2 can be described as a framework which examines the process of how municipality or organisation goes about adopting and implementing technological innovations. The adoption and implementation process is assumed to be largely influenced by various contexts namely: technology, organisation and environment.

3.6.1 Application of Barriers to the TOE Model

Primary e-government barriers found in literature were: Security, Trust and Privacy; Infrastructure Development; Legal Issues, Law and Public Policy; Connectivity, Internet bandwidth; Cost and Public Participation. In order to determine means of overcoming these barriers, they are aligned to three views of the TOE model (technology, organisation and environment). The three contexts aim to

characterize constraints and opportunities encountered when considering technological innovation. This is shown in Figure 3.1.

With regards to the technology itself, deficiency in proper broadband standards and connectivity infrastructure remain key technology challenges to be addressed, including security, trust, privacy and organizational concern. Availability of service is outside of the organisation control and managed by third party network or internet service providers. The legislative controls around broadband are relatively undeveloped, and there is no control of the organisation. Finally, Internet bandwidth, participation and cost remain major concerns that organisations are unable to directly influence.

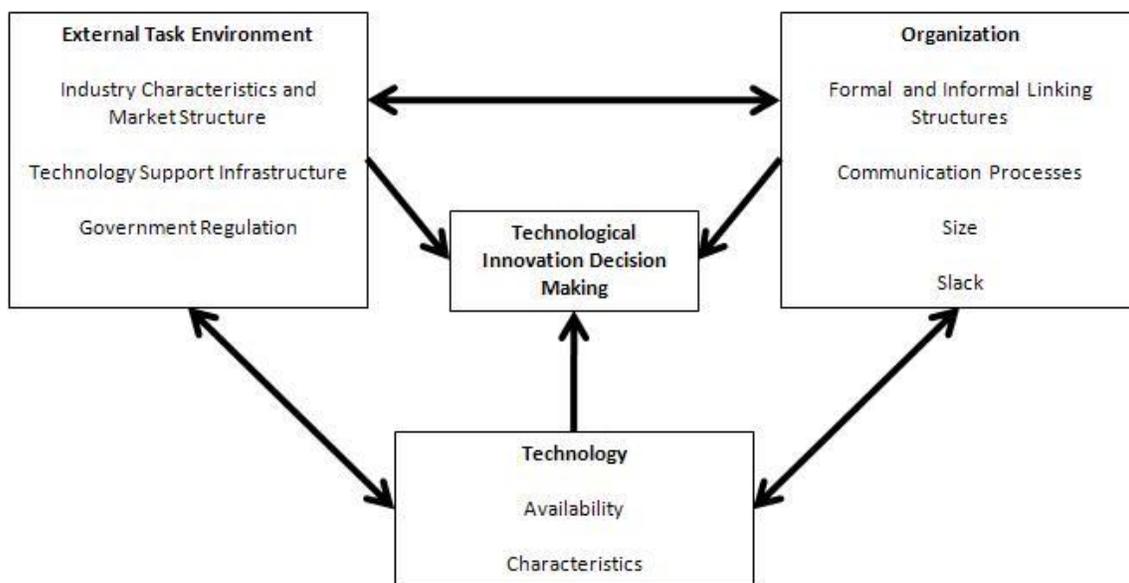


Figure 3.1: The TOE Theoretical Framework (Tornatzky and Fleischer, 1990)

While this classification of barriers of e-government broadband adoption into the TOE framework provides a structure way of understanding key reasons for failure, to provide a means of assessing of willingness of e-government service using broadband, the innovation-decision model is discussed and integrated into the framework. This model is described in the following section.

3.6.2 The innovation-decision making process for adoption

The Innovation-decision making process is shown in Figure 3.2 and is used to enlighten steps of the process in which individuals or groups of people adopt an innovation, such as broadband. The innovation-decision making process is believed to consist of the following stages:

1. *Knowledge*: At this stage, individuals become more aware of the innovation (broadband) and begin to develop a better understanding of its abilities;
2. *Persuasion*: Here, individuals will start developing either a satisfactory or unsatisfactory attitude towards the innovation (broadband);
3. *Decision*: A decision is prepared to either adopt or reject the innovation (broadband);
4. *Implementation*: This entails putting the innovation (broadband) into practice or use; and
5. *Confirmation*: This is the review stage after implementation, whereby individuals evaluate the results of the innovation-decision already made (i.e. accepting or rejecting the adoption of broadband) (Rogers, 2003).

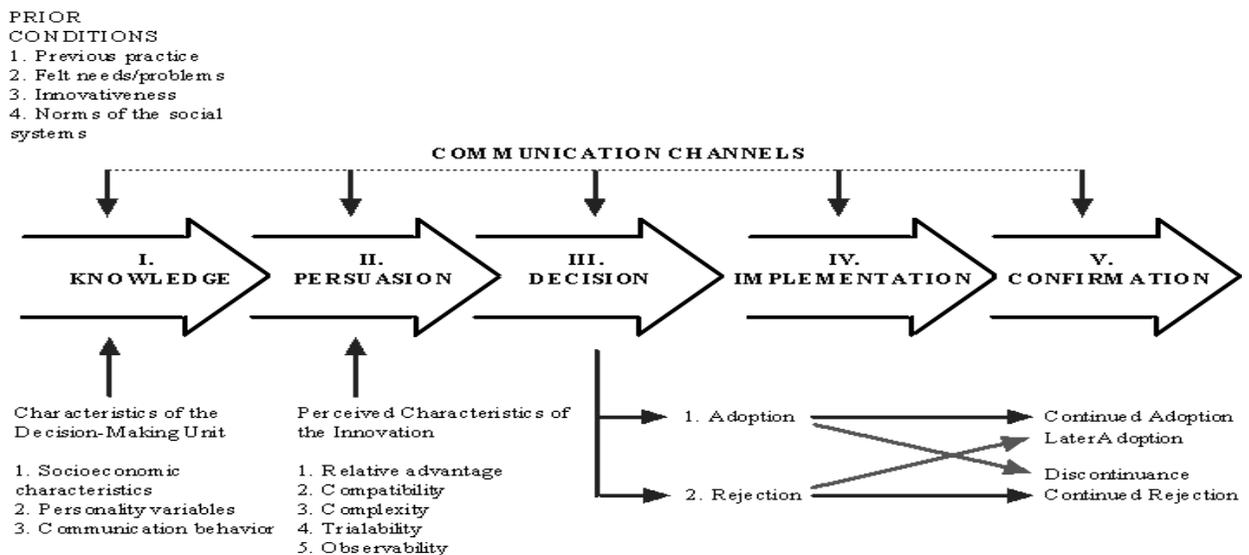


Figure 3.2: A Model of Stages in the Innovation-Decision Process (Rogers, 2003)

This model is incorporated into the framework as a measure of development towards the adoption of broadband. This delivers a structured and logical set of steps to measure development of such adoption. The model provides a logical and efficient set of steps to follow through the adoption of a new innovative technology.

3.7 Conclusion

The purpose of this discussion was to that edify that organisation and government apply techniques and technologies to improve knowledge around broadband and increase employee production when using e-government service. Once this is performed, a decision could take place and only then the decision to implement broadband could be taken. By doing so, this will reduce costs which may occur if broadband is implemented without any evaluation steps.

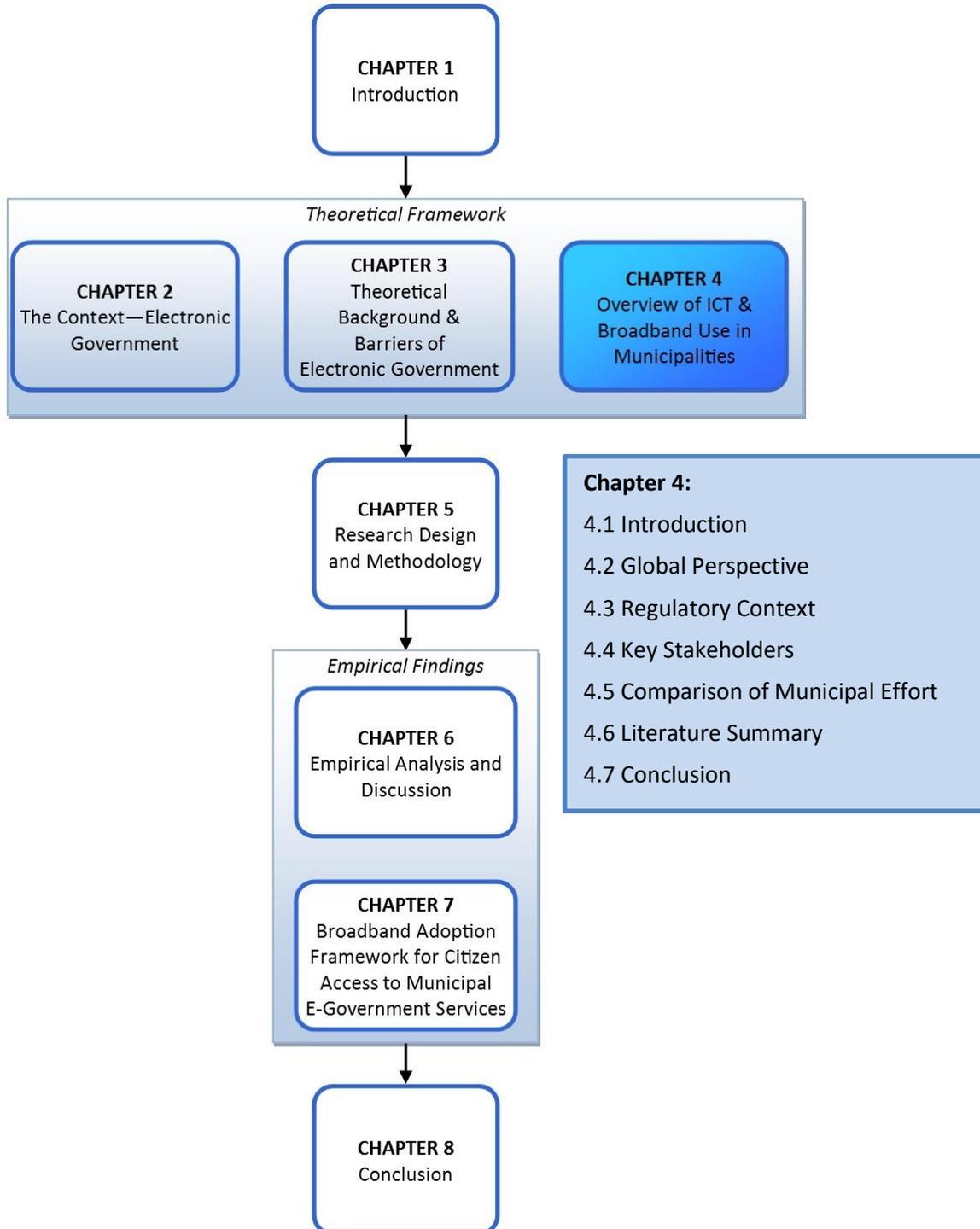
Acceptance of technology by municipalities and government is essential to researchers. Profound understanding of the theory behind technology adoption delivers a better understanding of the underlying influences and difficulties that lead to use rejection or acceptance of a particular technology. The discussion presented research into factors likely to affect user acceptance of broadband technology using UTAUT as the underlying theory in an organizational setting. The TOE framework was reviewed in this chapter and it was revealed that these theories were frequently applied in developed countries and that each theory has some restrictions.

The TOE model is relevant for this study as it highlights adoption at an organisational level, which is Buffalo City Metropolitan Municipality. The other model such as Unified Theory of Acceptance and Use of Technology is more focused on the individual (Oliveira and Martins, 2011), and was also considered for this study. This chapter is relevant to the problem as knowledge of technology adoption theories and their underlying influences serve as a theoretical base for successful broadband adoption. The next chapter focuses on technology available for accessing e-government services for municipalities.



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Chapter 4 : Overview of Information and Communication Technologies and Broadband Use in Municipalities



4.1 Introduction

As mentioned in Chapter 3, the UTAUT model widely used in studying e-government and other technologies, is important for the inclusion of the technology factor in the study to analyze the acceptance of e-government services, especially for the benefit of citizens. The purpose of this chapter is to provide a clear perception of Information and Communication Technology (ICT) summary and usage of broadband or internet connections currently available in South African municipalities for e-government services.

Chapter 4 contributes to the understanding of the research context in terms of unpacking the key aspects necessary for e-government implementation. This chapter briefly outlines the global perspective of e-government, regulatory context and key stakeholders. Comparison of municipal efforts into e-government sum up the literature review.

4.2 Global perspective - South African ICT Rankings

It was reported by Pazvakavambwa (2018) that the Global IT spending growth began to turn around in 2017, and continued growth is expected over the next few years. However, the Bell Med Information Technology Ltd (BMIT) report said that it is noting an increase in the growth of SA's IT market. It forecast that growth can reach R149.4 billion by 2021. Further, it revealed in 2017, that the country's IT market grew by 5.3% to R111 billion driven by, among others, digital transformation, IT security and automation.

Of note, criteria for identifying ICT projects include increased productivity in terms of quantity and quality of ICT implementation, better cost effectiveness in terms of duration, complexity and possible reduction or duplication of tasks and improved service delivery. Furthermore, ICT re-training and reorientation should be a continuous part of the development plan for public servants and ICT literacy has to be part of the general education curriculum. Digital inclusivity must permeate solutions formulated as part of the e-government programme. An example would be that citizens get general ICT training at general service centres, such as a Multi-purpose Community Centre (MPCC's).

The Internet, along with various other Information and Communication Technologies (ICTs) ,has drastically changed operations of municipalities, private business, government and the non-profit

sector. These organisations have chosen to apply Information and Communication Technologies (ICTs) to survive in an increasingly dynamic, demanding and complex world (Mawela, et al, 2017).

South African public sector governments have undertaken to embark on major investments in ICT in the form of Internet technologies with a view to taking advantage of benefits that can be derived from expanding the different channels used to provide services to its citizens. It is critical for providers of services such as e-government to find, identify and understand customer value that can be derived from a particular set of services to ensure maximum customer satisfaction and retention, as well as how service delivery platforms and systems can exploit customer differences from their similarities (Jacobs et al, 2016).

Understanding current capabilities and designs towards involvement of South African municipalities and communities in the design process and co-designing as a means of representing needs and capabilities of all stakeholders during the design process (Chemisto, 2018), offers an opportunity to achieve a better service delivery.

There are Information and Communication Technologies that assist in achieving economic development and human satisfaction in harmony with the environment. These sustainable technologies advance development by reducing risk, cost effectiveness, process efficiency and creation of products or services that are environmentally friendly and benefit humans.

According to Jacobs (2016), current governments employ the most modern forms of ICT such as the use of Internet and satellites to deliver efficient and effective services to citizens. Throughout the world, public organisations are introducing e-government services to enable citizens to access government information to be able to file tax returns, renew licenses and update records from different locations via an Internet connection. The World Economic Forum (WEF) Global Competitive Index (GCI) 2016 report indicates that SA has seen an overall improvement raking from 56 to 49 out of 140 countries. There is also a significant improvement on the Network Readiness Index (NRI) from 75 to 65. Poor infrastructure, shortage of ICT resources and poor internet connection were the main discouraging factors of success of e-government services.

The idea of this section was to understand the impact of different technologies and views of citizens on what technology could do for them. Slight improvements shown in Figure 4.1, especially in ICTs, may perhaps be essential for e-government services in achieving better service delivery for all.

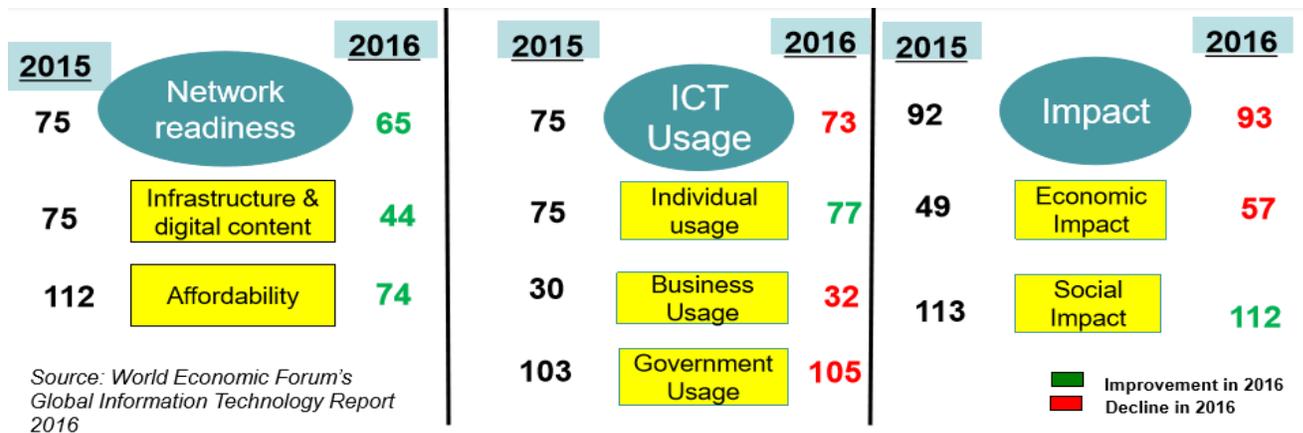


Figure 4.1: WEF Global Competitive Index (WEP, 2016)

The increase in the rank is mainly due to increased uptake of ICT, especially higher internet bandwidth and improvement in innovation, which establishes the South African (SA) economy as the region's most innovative. However, the country needs to make significant improvements on government usage and social impact sub- indexes (WEP, 2016). Today, ICTs are important in all sectors in enabling access to e-government services and sharing of ideas through use of the internet, leading to positive improvements in low-resource communities.



4.3 Regulatory Context

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The National Development Plan (NDP) sets two time-bound ICT-related goals for South Africa: (i) 100% broadband penetration by 2020, and (ii) the adoption of a full e-government approach by 2030. South African digital divide continues in terms of constraints of low level infrastructure penetration and affordability (DTPS, 2016) and the emphasis on investment in ICT is mainly metropolitan, meanwhile there is huge infrastructure shortage in rural areas (Mkhize, 2016). Mkhize goes on to reveal that the South Africa's National Broadband Policy, "SA Connect", is intended to extend broadband infrastructure and services to the most marginalized communities of South Africa by 2020. Government at different levels have mediated in various programmes e.g. Gauteng on-line, eThekwini and Oliver Tambo (Eastern Cape). In doing so, one of the premises of government is that these interventions may promote and support its ability to undertake e-government services. The NDP states, "a new policy framework will be needed to realize the vision of a fully connected society" (NPC, 2011). The ICT policy for South Africa, currently at Green Paper stage, is meant to be the broad, overarching policy that will

set the context and direction for broadband and eGovernment plans. South Africa initiated a review of all existing ICT policies in 2012 and published the National Integrated ICT Policy White Paper in 2016.

According to DTSP (2016), it is an e-government strategy that requires citizens to have Internet access, and become digitally literate to ensure suitable usage of government services provided online (DTSP, 2016). Within the South African context, Uys and Pather (2016) postulate that only 21.4 percent of South African households have access to a computer while 10.8 percent of households have access to Internet at home in spite of growing spending on ICT related infrastructure (Uys and Pather, 2016). The state of inequality extends to access to and use of ICTs.

The extent of the Digital Divide is underscored by Dalvit *et al* (2014) who point out that in spite of language barriers, poor literacy and skills and users' attitudes toward ICT, the majority of poor citizens in South Africa will only be able to make meaningful use of ICT by 2020 (Dalvit *et al*, 2014). Thakur and Singh (2013) agree on the failure of ICT programmes at local municipality level in South Africa caused by lack of users' acceptance because for decades, e-government initiatives have been developed from the perspective of the government (Thakur and Singh, 2013).



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4.4 Key Stakeholders

The National Development Plan (NDP) advocates that technology can be the answer to some of the biggest challenges facing the country and that state-owned entities need to improve their role in advancing key national objectives. Entities such as the State Information Technology Agency (SITA) and Telkom and Broadband Infraco are a strategic part of ICT delivery. The overarching vision of the White Paper is to ensure that all citizens realize opportunities and benefits of actively participating in the global ICT system and create a digital society (DTSP, 2016). The following are key stakeholders for successful ICT systems and e-government services.

4.4.1 Broadband Infraco

The Broadband Infraco mandate is to expand availability and access to Broadband Infrastructure (Broadband Infraco Act No 33 of 2007). The nature of operations for Broadband Infraco (BBI) is to ensure that high capacity connectivity and bandwidth requirements for specific projects of national interests are met. Furthermore, it serves to enable regional connectivity, implement projects of

national interest and develop strategic partnerships. Table 4.1 highlights the completed fibre rollout and capital project rollouts per province and POP site optimization for the period of 2015 -2016.

Table 4.1: Completed Fibre rollouts and POP site optimization per province (Broadband Infraco Act 33 of 2007)

Province	Completed fibre roll out Km (April - Dec-2015)	Completed fibre roll out Km (Jan-Aug 2016)	Total completed fibre roll out Km (April 2015-Aug 2016)	In progress Km (Aug 2016)	Completed POP/Customer site optimisation (April - Dec-2015)	Completed POP/Customer site optimisation (Jan-Aug 2016)	Total completed (April 2015-Aug 2016)	In progress (Aug 2016)
Eastern Cape	31,96	52,64	84,60	28,50	3	3	6	2
Western Cape	313,05	7,25	320,30	10,50	3	1	4	1
Gauteng	253,59	0,00	253,59	0,00	4	0	4	0
Limpopo	63,59	5,71	69,30	0,00	2	1	3	0
Mpumalanga	119,16	4,74	123,90	8,00	2	1	3	1
North West	99,07	2,63	101,70	11,70	2	1	3	1
Northern Cape	2,43	5,50	7,93	3,50	0	1	1	1
KZN	140,37	6,80	147,17	0,00	7	1	8	0
Freestate	0,43	4,87	5,30	4,90	1	1	2	1
National	1023,65	90,14	1113,79	67,10	24	10	34	7

Table 4.1 shows that infrastructure includes wireless networks, broadband connectivity and mobile infrastructure and should be open-ended to accommodate future advances in technology and allow standardization of communication protocols and fibre installation. This enables deployment of global ICTs and allows access to e-government services anytime and anywhere within rural communities. The slight growth of the internet in the provinces has also been followed by an increased populations within the communities. As technology changes and becomes too complicated for the majority of citizens, there is need for a better and faster internet connection i.e. broadband that could help citizens to make use of e-government services anytime, anywhere.

4.4.2 State Information Technology Agency (SITA)

The State Information Technology Agency is governed by the State Information Technology Agency Act (1998), as amended. The Agency is responsible for provision of IT services to Government. The Act separates the Agency's services into mandatory and non-mandatory services (DTPS, 2016). SITA's mandate is to improve service delivery to the public through provision of information technology, information systems and related services in a maintained information system security environment to departments and public bodies and promote efficiency of departments and public bodies through use of information technology (SITA, 2016). Government services require much more flexibility and high performance i.e. the need for fibre. Figure 4.2 presents drivers for Government Departments and Clusters (DTPS, 2016).

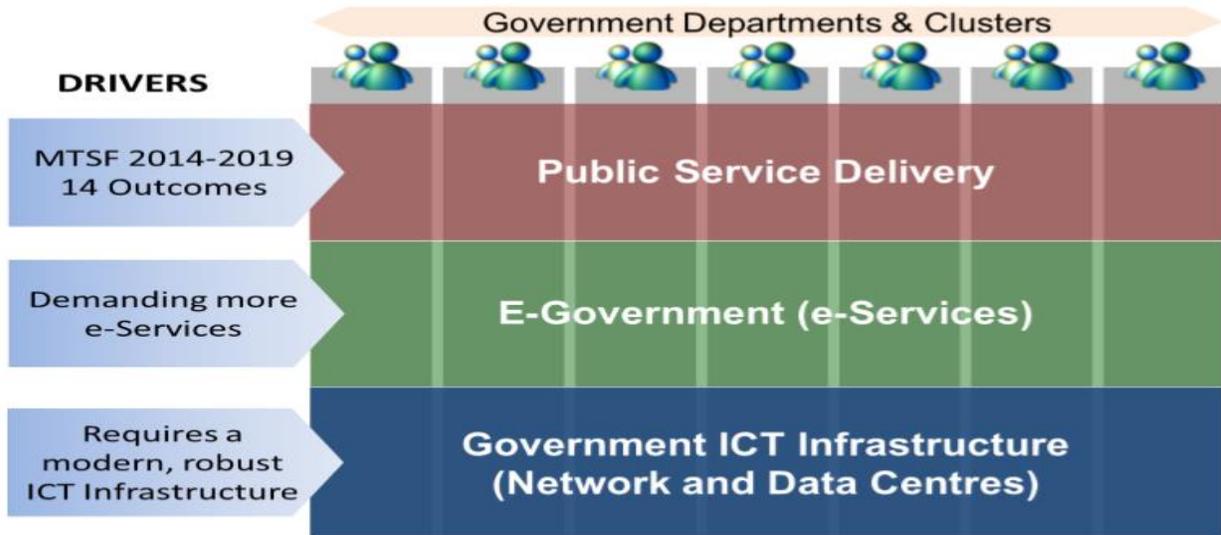


Figure 4.2: presenting the drivers for Government Departments and Clusters (DTPS, 2016)

Figure 4.2 explains some of the SITA’s demand side initiatives as establishment of voice and video services for government departments and development of e-government services as part of SITA’s strategic initiatives. The following are SITA initiatives presented using charts from 2015 – 2016. Upgrading links connected to the SITA network make it easier and more cost effective to upgrade.

4.4.3 Universal Service and Access Agency (USAASA)

The USAASA was established in terms of section 80 of the Electronic Communications Act (ECA) No. 36 of 2005 as statutory body. The mandate of operations for USAASA is to promote universal service and access in under-served areas (DTPS, 2016). The following are results of USAASA Broadband Projects from 2013 and 2014.

4.4.3.1 USAASA Broadband Projects from 2013/14

It has been identified in one of DTPS (2016) performance plan documents that USAASA spent 21 Million rand on Broadband projects at Local Municipalities such as: Msinga (KZN) and Emalahleni (EC), both local municipalities project jobs were completed. Furthermore, over 57 access facilities from schools for mainstream and for Persons with Disabilities to clinics and municipal buildings were connected to ICT services (DTPS, 2016) under these municipalities: Emalahleni – 25 Clinics, three schools, three Municipality offices, SMMEs. Msinga had 24 Clinics, four schools, one Education District office and SMMEs.

4.4.3.2 USAASA Broadband Projects from 2014/15

USAASA spent 43 Million rand on Broadband projects at Local Municipalities: designated broadband sites were Ratlou (NW) and Joe Morolong (NC) jobs where were completed. Over 63 access facilities from schools for the mainstream and for Persons with Disabilities to clinics to municipal buildings connected to ICT services for Ratlou (18 Clinics and 8 schools) and Joe Morolong (27 Clinics and 10 schools) were connected. USAASA aligned its projects with SA Connect. The Vhembe District Municipality in Limpopo was connected to Broadband in the 2015/16 financial year. Five Towers were upgraded and live. These were up to 10 Mb/s Broadband Access for the following facilities: 17 Clinics, one school for persons with disabilities and one police station.

Chief Albert Luthuli in Mpumalanga was connected to Broadband in the 2015/16 financial year. Eight Towers were constructed and are live; these were up to 10 Mb/s Broadband Access to the following facilities: 21 Clinics and one school.

4.4.4 National Electronic Media Institute of South Africa (NEMISA)

The National Electronic Media Institute of South Africa was established as a non-profit institute of education by the Department of Communications in terms of the Companies Act (1973). NEMISA offers national certificates and short courses in television production, animation and radio production. The institute's programmes are structured to enhance market readiness of students in a wide range of broadcasting disciplines (DTPS, 2016). Department of Communication (DoC, 2019) showcased an event on ICTs as an enabler for the social inclusion of persons with disabilities to improve persons with disabilities' access to computer services using readily available tools. These are readily available assistive Microsoft technologies to assist persons with visual, hearing, speech and physical and intellectual disabilities.

Benefits from these partnerships included these entities extending the reach for e-Skills development and greater expansion to rural and peri-urban communities, which increased the roll out and uptake of e-skills.

4.4.5 Fixed and Mobile Broadband

According to BMI-T (2015), Fiber to the Home (FTTH) could reach more than 360,000 active subscriptions in South Africa by 2019, with the majority of growth coming from subscribers in

residential suburbs, where much of the recent action has been focused. FTTH deployment has shifted from gated estates to suburbs. BMI-T analysed plans and implementation status of all the key players. Example: 448 areas across South Africa = 368 suburbs and 80 gated estates. These areas contain more than 500,000 houses, with the number of ‘houses passed’ increasing with deployment over the forecast period. The following are the number of areas by FTTH deployment status Telkom versus Other players

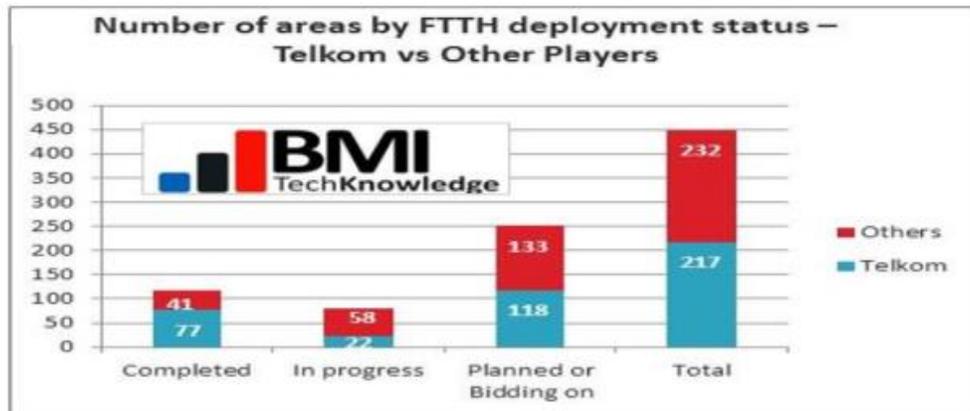


Figure 4.3: Number of areas by FTTH deployment status – Telkom vs. Other Players (BMI-T, 2015)

Figure 4.3 shows the number of areas covered with Telkom FTTH technologies. This shows the mobile Broadband connectivity against the percentage of population with access to 3G coverage 2016 – 98% and percentage of population with access to LTE coverage 2016 – 53%.

4.5 Comparison of Municipal Efforts

Broadband is a big ICT expenditure item at municipal level. Table 4.2 lists some major broadband-related projects being rolled out in four of the major metros (Peters, Smit, and Smith, 2016).

Table 4.2: Broadband-related projects major Metros (Peters, Smit, and Smith, 2016)

Metropolitan Municipality	Status
<ul style="list-style-type: none"> City of Tshwane, in partnership with an NGO Project Isizwe 	<ul style="list-style-type: none"> The first metropolitan to roll out free Wi-Fi to poor communities and educational institutions through the installation of fully managed free internet zones (FIZ). The first phase provided capacity to 25 000 users in Hatfield, Church Square, Soshanguve, Mamelodi and the CBD. In 2015 about 600 additional Wi-Fi hot spots were rolled out, prioritizing institutions of learning.
<ul style="list-style-type: none"> Ekurhuleni Wi-Fi network 	<ul style="list-style-type: none"> From 2014 rolling out Wi-Fi access services network and an ICT operations centre to ensure the fibre and wireless grid is properly connected, maintained and monitored.

	<ul style="list-style-type: none"> The network aims to provide Wi-Fi services for the city's employees, households and businesses by 2016.
<ul style="list-style-type: none"> City of Johannesburg 	<ul style="list-style-type: none"> The project aims to offer full WAN accessibility, VPN services, and bring internet to all of the City of Johannesburg buildings in the region. This metro also rolled-out of 1000 Wi-Fi hotspots in 2016. A build, operate and transfer contract was signed with Ericsson who set up a company (BWired) to operate the network for 12 years. Ericsson then ceded the contract to Citi Connect. In August 2014, City of Johannesburg terminated the agreement with Citi Connect, claiming non-compliance. Settlement terms are not resolved and the project is not complete. Developed a pothole application which enables residents to take a picture of a pothole and upload into the application with the location details.
<ul style="list-style-type: none"> City of Cape Town broadband infrastructure 	<ul style="list-style-type: none"> Expenditure of up to R140-million in 2013/2014 and R180-million per year for the next three years Amount budgeted for the rolling out of dark fibre broadband infrastructure.
<ul style="list-style-type: none"> City of Cape Town-Khayelitsha / Mitchells Plain 	<ul style="list-style-type: none"> About R100-million spent The rolling out of a wireless mesh broadband network over the next three years.

Table 4.2 provides a high level summary of broadband initiatives within the South African metropolitan. The table provides information for five major Metropolitans, but these statistics help to understand the current state of broadband connectivity. Even though not all Metros are included, the information is relevant to the study and helps to understand what the research focus area should prepare for in terms of the broadband roll out.

4.6 Literature Summary

As argued in Chapter One, e-government services in South Africa often failed to deliver the expected results in terms of satisfying its citizens. This failure appears to be related to numerous technical, organizational, institutional and contextual factors (Gil-Garcia, 2013). This is attributed to ineffective and inefficient e-government services in most of South African Municipalities (Van der Waldt, 2018). Furthermore, it was observed from literature chapters that access to e-government services due to poor internet connections, poor infrastructures, lack of awareness and lack of public participation also restricts the level of communication between governments, municipalities and citizens. Thus, all the barriers mentioned are viewed as contributing factors to ineffectiveness and inefficiency of municipal e-government services, and the resultant negative effect, especially to citizens. Of note, Information

Technology (IT) is instrumental in facilitating inter-organisational relationships, in particular online services for sharing and access government information, it is appropriate to ensure that IT is leveraged for maximum benefit. Thus, the objective of this study was to produce a framework to assist in overcoming barriers to broadband adoption for Buffalo City Metropolitan Municipality to enable citizen access to e-government.

It is highlighted in the South African Local Government Association (SALGA, 2017) document that in order for cities to participate and remain competitive, municipalities need to have a three-legged broadband agenda, namely: to get affordable abundant bandwidth everywhere; get everyone online; and use the platform to better deliver public goods and services for citizens. Additionally, rationalization of software in Local Government including: Promotion of Geographic Information System (GIS) tools and systems benefit to municipalities with regards to data presentation development of shared services strategy that specifically looks at IT Infrastructure platforms development of a SALGA Smart Cities Development Framework. Additionally, it is interesting to note that the South African Local Government Association (SALGA) has recommended that municipalities place ICT directly to municipal managers (SALGA, 2017) to ensure that municipalities are encouraged to consider the structure of their ICT departments for the purposes of service delivery and development.

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The SALGA document 2017 -2022 stated that technological interventions utilising smartphones, mobile networking, cloud computing and Global Positioning System (GPS) have enabled user-centric application developments in the arena of urban mobility. Information and Communication Technologies can be used to help spaces become competitive and overcome challenges such as traffic congestion, environmental protection and infrastructure pressures.

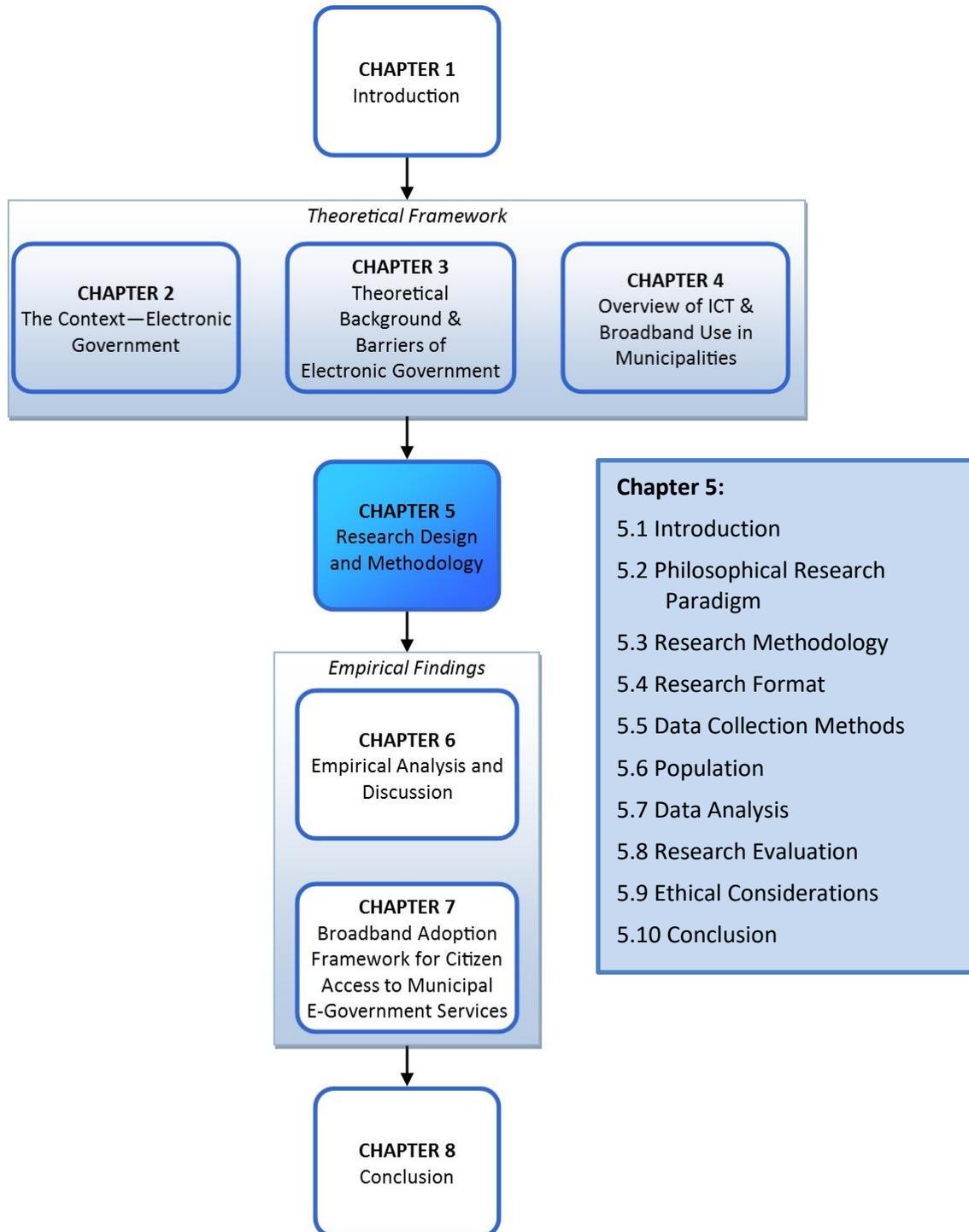
4.7 Conclusion

This chapter has provided the last part of literature considered critical for the research. The chapter builds from previous related chapters and provides information on current ICT developments in respective of South African Metropolitans. Having outlined the theoretical and empirical background for this study in chapters two, three and four, this chapter gives related information on key stakeholders involved in championing broadband connectivity. The chapter that follows describes the research methodology for the study.



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Chapter 5 : Research Design and Methodology



5.1 Introduction

This Chapter summaries the study's research methodology. The research method applied was influenced by research objectives. By describing the theoretical aspects of the chosen method, the aim of this chapter is to illustrate how the study was conducted and how the results were derived. This chapter is important as it displays the link between the chosen method and how it enables research objectives to be addressed. This chapter details the selected research methodology, the approach to the study and provide a clear plan or direction of the research design, details regarding the sample and population, means of data collection and data analysis. The research design is intended to provide a framework for conducting the research.

This study was conducted within the interpretivist paradigm and follows qualitative and quantitative approaches consistent with this paradigm. The Design Science methodology, which aims to create and evaluate IT artifacts, was followed in this study. In this study, the artifact is a framework for broadband adoption by citizens in the BCMM e-government. Methods used to collect empirical data for this study were participant web-based questionnaires and expert reviews. The study reviewed current and available literature on broadband and e-government, including the analysis of frameworks, guidelines and other related articles. This literature review informs the proposal of the framework.

This chapter details the selected research methodology for this study. First, the philosophical research paradigm is described. Additionally, the chapter explains the chosen research methodology outlined and the research format discussed. The primary and secondary data collection methods, population of the study and data analysis methods follow, and the chapter concludes with a discussion of how credibility of the study can be evaluated and its ethical considerations.

5.2 Philosophical Research Paradigm

In any research, the researcher seeks to find out new knowledge or facts in a systematic or organized manner to increase knowledge (Saunders, Lewis & Thornhill, 2009). This section discusses the research paradigm appropriate for this study.

A research paradigm can be defined as a way of viewing the research material on hand (De Vos, Strydom, Fouche, & Delpont, 2005). Likewise, Oates (2006) defines a research paradigm as a pattern, model or shared way of thinking that underlies any research undertaking. Additionally, a paradigm

refers to a set of general philosophical assumptions about the nature of the world (referred to as ontology) and how we understand it (referred to as epistemology) which are shared by researcher working in that area (Maxwell, 2005).

Often in IT disciplines, researchers concentrate on creating IT artifacts and do not consider the underlying research philosophy (Oates, 2006). This is problematic, as the research methodology is underpinned by a particular research philosophy. The researcher, therefore, needs to decide within which paradigm the research project will be conducted to determine the correct methodology to embrace.

Maxwell (2005) makes four important points about selecting research paradigms thus:

1. It is important to select an appropriate research paradigm to guide research design decisions and justify these decisions.
2. Using an established paradigm allows the researcher to use an appropriate approach to research of this nature.
3. It is possible, and often necessary, to adopt aspects of different paradigms.
4. Choosing a paradigm involves assessing which paradigm best fits the researcher's assumptions and methodological preferences.



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The four points above were considered in selecting the research participants. More so, consideration of the research approach selected and used for this study was guided by the four points above.

As De Vos, Strydom, Fouche and Delport (2005) point out, each discipline accommodates a variety of competing paradigms. The important point here, is that all scientific research is conducted within a paradigm, the choice of which is determined by paradigms appropriate to that discipline and the nature of research undertaken.

Oates (2006) recognizes three philosophical paradigms in IT research, namely: positivism, interpretivism and critical research. Meanwhile, Collis and Hussey (2009) limit the discussion of paradigms to positivism and interpretivism. Vaishnavi and Kuechler (2008) motivate for inclusion of Design Science as an emerging research paradigm in IT disciplines. Thus, sections below outline the

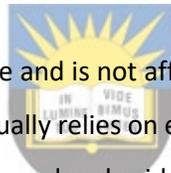
positivist, interpretivist, critical and Design Science research paradigms. This is followed by a comparison of the fundamental differences between paradigms and motivation for selection of an appropriate research paradigm for this study.

5.2.1 Understanding Positivism

The positivist paradigm is considered the oldest research paradigm and is the traditional approach for scientific studies (De Vos, Strydom, Fouche, & Delport, 2005). Collis and Hussey (2009) acknowledge, it is an approach still widely accepted in social science studies (including IT research that considers environmental and behavioural aspects). According to Oates (2006), the positivist approach is based on two assumptions:

1. The world is ordered and regular, not random; and
2. The world can be investigated objectively.

Thus, social reality is singular and objective and is not affected by the act of investigating it (Collis and Hussey, 2009). The positivist approach usually relies on experiments to look for evidence of cause and effect (Oates, 2006). Hypotheses are developed and evidence collected from these experiments is used to confirm or refute the hypotheses.



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Positivistic studies can be characterized by the following (Oates, 2006):

1. *The world exists independently of humans*: There is a physical and social world that exists to be studied, captured and measured;
2. *Measurement and modeling*: This world is observed and measured and models hypotheses or theories;
3. *Objectivity*: The researcher acts as an impartial observer, and the facts are discovered independently of the researcher's personal values and beliefs;
4. *Hypothesis testing*: The research is based on empirical testing of hypotheses which are either confirmed or refuted;

5. *Quantitative data analysis*: Mathematical modeling and statistical analysis provide a logical and objective means of analyzing observations and results; and
6. *Universal laws*: Positivist researchers aim to produce generalizations shown to be true, regardless of the researcher and occasion.

As positivist research is objective and not influenced by the researcher, results achieved can be repeated by a second researcher who undertakes the study (Olivier, 2004). This is contrasted by the interpretivist paradigm, which is subjective and relies on the researcher's social context. This paradigm is described next.

5.2.2 Understanding Interpretivism

According to Collis and Hussey (2009), the interpretivist paradigm emerged in response to criticisms of positivism. The interpretivist paradigm can be traced to German sociologist, Max Weber and German philosopher, Wilhelm Dilthey (De Vos, Strydom, Fouche & Delpont, 2005). This paradigm aims to understand IT as a practice constructed and developed by humans (Oates, 2006). Thus, interpretivism seeks to understand the social context of IT.

Interpretivism does not aim to prove or disprove hypotheses as is done in positivist research, but rather to identify, explore and explain how factors in a social setting are related and interdependent (Oates, 2006). In the context of this study, the social setting is inter-organisational relationships in an automotive supply chain. Therefore, factors relating to effective and efficient operation of these inter-organisational relationships are studied in this research project. Thus, interpretivist studies aim to create a rich understanding of a unique context, such as the automotive supply chain.

Interpretivist studies can be characterised by the following (Oates, 2006):

1. *Multiple subjective realities*: There is no single version of the truth, as each person perceives the world in a different way;
2. *Dynamic, socially constructed meaning*: Language and shared meanings are used to transmit the understanding of reality, and these differ across groups and time;

3. *Researcher reflexivity*: Assumptions, beliefs, values and actions of the researcher inevitably affect the research process. Researchers, therefore, need to acknowledge their influence on research;
4. *Study of people in their natural social settings*: People are studied in their natural setting and not an artificial environment. Additionally, the researcher's previous understanding or expectations must not be imposed on the participants of the study;
5. *Qualitative data analysis*: There is a strong preference in this paradigm for generating and analyzing qualitative data; and
6. *Multiple interpretations*: researchers usually arrive at more than one explanation of their study, but discuss and motivate the explanation that appears most relevant.

As interpretivist research is relatively subjective in comparison to positivism, it can be influenced by the researcher's beliefs, values and actions (Olivier, 2004). This is contrasted by critical theory which is reliant on the economic, political and cultural influences. Critical theory is defined in the next section.

5.2.3 Critical Theory

Critical theory seeks not only to study and understand society, but to critique and change society (De Vos, Strydom, Fouche & Delpont, 2005). This paradigm was influenced by Marxism and informed by the presumption of class conflict. Thus, De Vos, Strydom, Fouche and Delpont (2005) define critical theory as providing a framework for approaching research as political.

Critical research goes beyond merely understanding IT practice to challenge power structures and assumptions about the development and implementation of IT artifacts (Oates, 2006). Researchers in this paradigm also view social reality as created by people, with the addition of economic, political and cultural influences that shape this view of reality.

Critical research studies can be characterised by the following (Oates, 2006):

1. *Emancipation*: Critical researchers do not just aim to understand and explain, but also to empower people;

2. *Critique of tradition*: Critical researchers do not accept the status quo, but rather challenge existing patterns of power and taken-for-granted assumptions;
3. *Non-performative intent*: Critical researchers focus on maximizing profits and enhancing a manager's power and control;
4. *Critique of technological determinism*: Critical researchers reject the notion that people need to adapt to technology, but rather argue that people and society should shape the way technology is created; and
5. *Reflexivity*: As with interpretivist research, critical researchers acknowledge the influence their own values, beliefs and actions influence the research.

Critical researchers criticize interpretive research for failing to analyze patterns of power and control that regulate views of reality (Oates, 2006). Design Science is increasingly adopted as a complementary research paradigm in IT research. This emerging paradigm is outlined in the next section.



5.2.4 Design Science

Vaishnavi and Kuechler (2008) motivate the inclusion of Design Science as an emerging research paradigm in IT disciplines. According to Hevner, March, Park and Ram (2004), there are two paradigms relevant to IT research, namely, behavioural science and Design Science. The Design Science paradigm has also been referred to as the socio-technologist paradigm (Vaishnavi and Kuechler, 2008).

Behavioural science develops and verifies theories that explain and predict human or organizational behavior, while Design Science extends human and organizational capabilities through creation of artifacts (Hevner, March, Park & Ram, 2004). Thus, this paradigm is important for IT research which inherently incorporates people, organisations and technology.

Design Science is fundamentally a problem-solving paradigm which ensures that knowledge and understanding of a problem domain are achieved through the building and application of an artifact (Hevner, March, Park & Ram, 2004). Having defined each of the relevant research paradigms, the following section compares these paradigms and justifies selection of positivist and Design Science paradigms for this study.

5.2.5 Selecting an Appropriate Research Paradigm

The positivist approach was historically recognized as the norm for IT research (Oates, 2006). For this reason, interpretive and critical approaches are often judged harshly. However, interpretive research has been adopted more frequently in recent years, with Design Science emerging recently as a dominant paradigm in many research areas. Critical research is less well known and accepted than other philosophical paradigms within IT research (Oates, 2006).

According to Brinkkemper (2010), when comparing paradigms defined previously, it is necessary to consider the philosophical assumptions that underpin these paradigms, namely:

1. *Ontology*: This assumption describes the nature of reality;
2. *Epistemology*: This assumption explores the nature of knowledge and what constitutes valid knowledge; and
3. *Axiology*: This assumption studies the role of values.

Brinkkemper (2010) further provides a summary of the contrasting assumptions in the positivist, interpretivist and Design Science paradigms in Table 5.1.

Table 5.1: Research Assumptions (Adapted from: Brinkkemper, 2010)

Perspective	Research Approach		
	Positivist	Interpretive	Design
<i>Axiology</i> : what is of value	Truth : universal and beautiful; prediction	Understanding : situated and description	Control : creation, progress (i.e. improvement), understanding
<i>Ontology</i> : what concepts exists?	A single reality. Knowable, probabilistic	Multiple realities, socially constructed	Multiple, contextually situated alternative world-states. Socio-technologically enabled
<i>Epistemology</i> : what do we know?	Objective: dispassionate. Detached observer of truth	Subjective: values and knowledge emerge from the researcher-participant interaction	Creative: objectively constrained construction within a context. Iterative circumscription reveals meaning
<i>Methodology</i> : what is the scientific process?	Observation, quantitative, statistical	Participation, qualitative, hermeneutical, dialectical	Developmental, measure artifactual impacts on the composite system

This study inclined towards a positivistic approach, which is strongly linked to quantitative data collection and is characterised as repeatable and objective. However, due to the subjective nature of the design science methods used in this study, an interpretivist influence emerged in line with the third stage (reality as a contextual field of information) of the continuum represented in Figure 5.1. Collis and Hussey (2009) point out that the researcher needs to choose a methodology that reflects the philosophical assumptions of the chosen paradigms. A research methodology is an approach to the process of research and incorporates a body of methods. Since the study adopted the mixed approach, both positivistic and interpretive approaches were considered. These were to satisfy quantitative and qualitative research techniques. On the other hand, the need for a design science approach was also highlighted. This was instrumental in formulating the proposed framework.

5.3 Research Methodology

The purpose of this study was to develop a framework for broadband adoption to enable BCMM citizens' access to e-government service. For this purpose, Design Science was used to produce an artifact (the framework). Collis and Hussey (2009) point out that the researcher needs to choose a methodology that reflects the philosophical assumptions of the chosen paradigm. A research methodology is an approach to the process of research and encompasses a body of methods. The qualitative, quantitative and mixed methods are discussed in the following sections



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5.3.1 Quantitative Research Methods

Brians (2011) and Babbie (2010) enlighten more on qualitative and quantitative research methods as follows:

This research aims to objectively measure the topic at hand, using mathematics and statistics. In quantitative research, researchers are most likely to be analyzing raw data with the help of a spreadsheet software program like Microsoft Excel, or a statistical package like SPSS. To facilitate this type of analysis, data will need to be gathered in a structured format. Quantitative research is often conducted using market research methods like surveys and experiments, which are best at collecting structured data.

Specific strengths of using quantitative methods to study social science research problems are:

1. It allows for a broader study, involving a greater number of subjects, and enhancing the generalization of the results;
2. It allows for greater objectivity and accuracy of results. Generally, quantitative methods are designed to provide summaries of data that support generalizations about the phenomenon under study. In order to accomplish this, quantitative research usually involves few variables and many cases, and employs prescribed procedures to ensure validity and reliability;
3. It applies well established standards so that the research can be replicated, analysed and compared with similar studies;
4. It can summarize vast sources of information and make comparisons across categories and over time; and,
5. Personal bias can be avoided by keeping a 'distance' from participating subjects and using accepted computational techniques.



5.3.2 Qualitative Research Methods

Qualitative research methods involve gathering of a variety of resources that describe foreseeable, challenging instances and meanings in individuals' lives. It employs the use of descriptive and interpretive methods of gathering and analyzing data (Marshall and Rossman, 2010).

Unlike quantitative research, qualitative research is typically unstructured and exploratory in nature. In this case, the researcher is not interested in determining objective statistical conclusions or in testing a hypothesis, but rather in gaining insights about a certain topic. Common qualitative research techniques include interviews and observation.

Since data is unstructured, imagine handwritten notes from a meeting where it can be tricky to draw conclusions and presenting findings. In the case of interviews, the moderator may simply take some time to write up key points heard in the meeting, and then present those key points to interested parties.

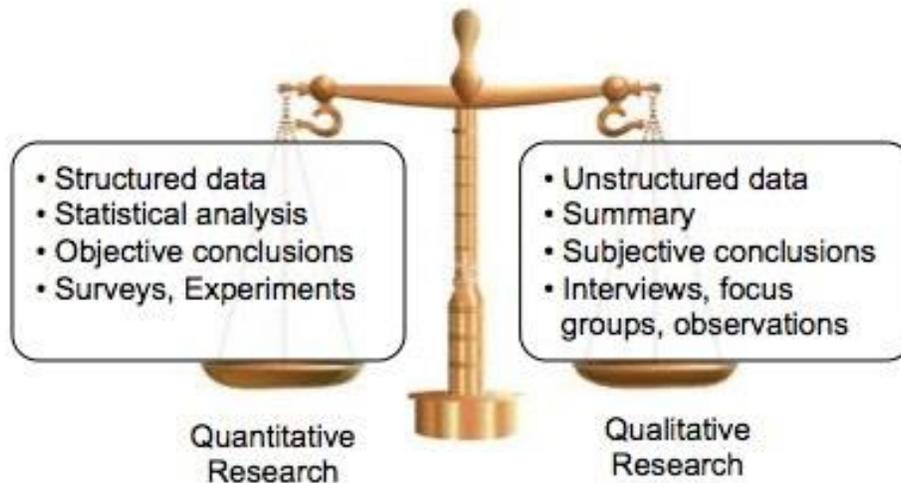


Figure 5.2: Quantitative and Qualitative Research Methods

5.3.3 Mixed Methods

According to Vicki and Nataliya (2016), mixed method research is a process of research in which researchers integrate quantitative and qualitative methods of data collection and analysis to best understand a research purpose. By using a technique referred to by Yilmaz (2013) as “Mixed Method”, a combination of qualitative and quantitative research methods that shall be applied in one research project, as depicted in figure 5.3

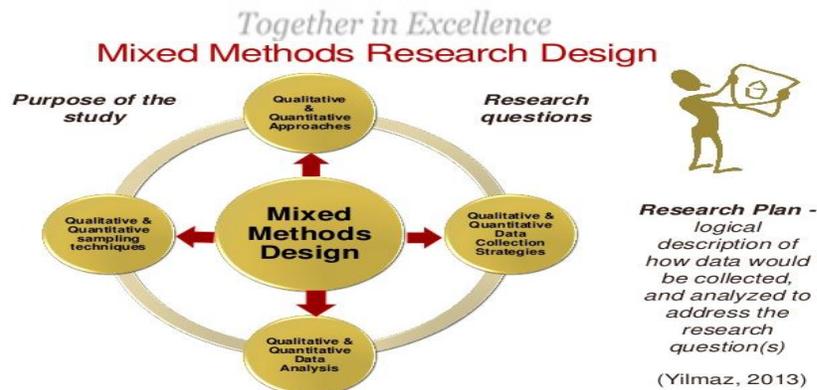


Figure 5.3: Mixed Method illustrated

As described in the previous section, this study aligns with both the Interpretivist and Design Science paradigms. Thus, selection of a mixed approach and the Design Science research methodology is appropriate. Additionally, the Design Science approach is characterized as iterative. Both the Design Science methodology and Framework are discussed in the sections that follow.

5.3.4 Design Science and Framework

The ultimate goal of Design Science research is to create and evaluate IT artifacts to solve identified organizational problems (Hevner, March, Park & Ram, 2004). The research methodology chosen for this research project is Design Science. Hevner, March, Park and Ram (2004) explain that Design Science focuses on creating and evaluating Information Technology (IT) artifacts which have been designed to solve real organisational problems. The Framework Method was developed by researchers, Jane Ritchie and Liz Spencer, from the Qualitative Research Unit at the National Centre for Social Research in the United Kingdom in the late 1980s for use in large-scale policy research (Ritchie, Lewis, Nicholls, Ormston, 2013).

The creation of the artifact, a framework in the case of the study, allows for understanding of the problem addressed and confirms feasibility of the solution (Hevner, March, Park, & Ram, 2004). The four categories of artifacts can be designed as follows (Hevner, March, Park, & Ram, 2004):

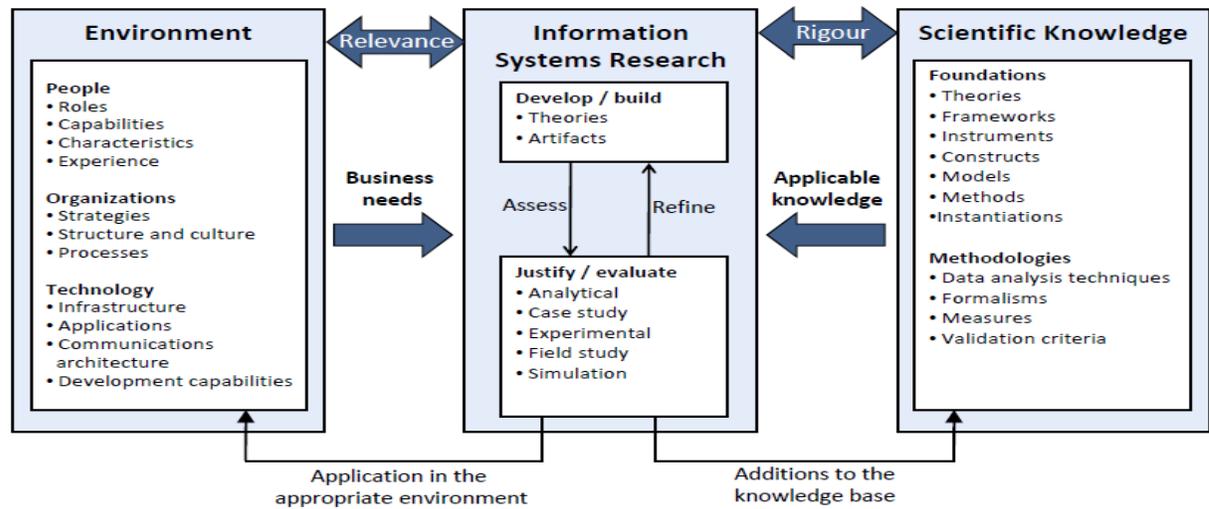
1. *Constructs* provide the language in which problems and solutions are defined and communicated;
2. *Models* are used to represent the real world situation while aiding understanding of the problem and solution;
3. *Methods* define processes and provide guidance to solve problems; and
4. *Instantiations* show that a construct, models or methods can be implemented in a working system.

Hevner *et al* (2004) delivered an illustration on Business Informatics Research Framework in figure 5.4, aimed at assisting researchers with the process of understanding, executing and evaluating research.



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Business Informatics Research Framework



(based on Hevner, 2004)

Figure 5.4: Business Informatics Research Framework (Adapted from: Hevner *et al*, 2004)

In their research framework Hevner, March, Park and Ram (2004) recognize the impact of the environment and existing knowledge base on IT research. The environment refers to the context of the research, for example, the automotive supply chain. This environment is composed of people, organizations and technology, which together define the business problem (depicted as business need in Figure 5.4). The knowledge base is composed of existing theories and methodologies used in the development of the research artifact. Considering the business need (environment side) and existing theories and methodologies (knowledge-base side), IT research is conducted in two stages, namely build and evaluate (Hevner, March, Park & Ram, 2004).

This study adopted Hevner, March, Park and Sam's (2004) seven guidelines. As pointed out by Hevner, March, Park and Sam (2004), these guidelines provide a base point for conducting Design Science research. None of the guidelines are viewed as mandatory steps, and it is up to each researcher to decide when, where and how to apply each of the guidelines to a specific research project. These guidelines, description and their application in this research project, are described in Table 5.2.

The output of this research project is noticeable assessment framework. Design science is well suited to research that ends in an artifact such as the framework proposed throughout this research project.

Table 5.2: Design Science Research Guidelines (Adapted from: Hevner, *et al*, 2004)

Guidelines	Description	Application
Design as an Artifact	Design Science research must produce a viable artifact in the form of a construct, a model and method.	This study is to develop a framework broadband adoption model to enable citizen access to BCMM e-government services.
Problem Relevance	The objective of Design Science research is to develop technology-based solutions to important and relevant business problems.	In this study, the problem under investigation is that ineffective and inefficient of e-government operations, poor internet connections, poor infrastructures, lack of awareness and the lack of public participation for e-government services. A solution is sought in terms of the use of the technology (broadband) in this context.
Design Evaluation	The utility, quality and efficacy of a design artifact must be rigorously demonstrated via well executed evaluation methods.	The Framework is evaluated through applicable data gathering and analysis techniques (as discussed in 5.5 below).
Research Contributions	Effective Design Science research must provide clear and verifiable contributions in the areas of the design artifact, design foundation, and/or design methodologies.	The contribution of this study is the design of the Framework which is expected to offer a valuable insight into how to use broadband technology appropriately in order to make municipalities more competitive and satisfactory.
Research Rigor	Design Science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.	In terms of rigor, the study employed valid data gathering and analysis techniques, and the model was evaluated using expert review.
Design as a Search Process	The search for an effective artifact requires utilising available means to reach desired ends while satisfying laws in the problem environment.	The research questions were answered using a combination of existing theories, content analysis of literature. This guideline was satisfied through the use of participants' responses to ensure applicability to the problem domain. Additionally the iterative nature of the search process is achieved through the use of the Delphi technique.
Communication of Research	Design Science research must be presented effectively both to technology-oriented as well as management-oriented audiences.	This guideline will be satisfied through the writing of a research paper outlining the contribution of this study.

Table 5.2 shows the design science elements and details about each of them. The table gives a link between each design science guideline and how it was considered and applied in this study. Within the

restrictions of the design science guidelines the research was designed to address each guideline step. In order to accommodate the iterative nature of the Design Science methodology, the Delphi technique is used in the evaluation of the research artifact (model). The Delphi technique is described in the section that follows.

5.3.5 Delphi Technique

Several proponents of Design Science research stress the need for rigorous evaluation of the artifact produced in the research project. Generally, this is shown to be an iterative process, thus the Delphi technique was adopted in this study to ensure credibility of the research model.

Collis and Hussey (2009) define the aim of the Delphi technique as gathering opinions from carefully selected experts. The same statement is supported by Piderit (2009). Experts are sent questionnaires while responses are sent back to the researcher, who then collates the responses and seeks further feedback on the results. The process stops when the research question is answered, a consensus is reached or sufficient information has been exchanged (Skulmoski, Hartman, & Krahn, 2007). In order to understand the applicability of the Delphi technique to this study, it is necessary to consider the origins of the method.

The original Delphi method was developed in the 1950s, characterized by four key features (Skulmoski, Hartman, & Krahn, 2007):

1. Anonymity of Delphi participants: allowing for free expression of opinions, and responses to be assessed on merit;
2. Iteration: allows for the refinement of results over a number of rounds;
3. Controlled feedback: allows for the opportunity to clarify responses received; and
4. Statistical aggregation of group response: allows for quantitative analysis and interpretation of data.

Skulmoski, Hartman and Krahn (2007) identify ten factors that should be considered when employing a Delphi technique:

1. Methodological choices: The classical Delphi technique is typically used as a quantitative technique. However, in modern methods, the Delphi technique is often applied to interpretive, qualitative studies. This study is interpretive by nature;
2. Initial question – broad or narrow: Typically, questions sent to participants are initially broad, open-ended questions, with subsequent rounds being focused, specific questions. This approach was used in this study;
3. Expertise criteria: Participants in a Delphi study should meet four criteria: (i) knowledge and experience relevant to the research; (ii) capacity and willingness to participate; (iii) sufficient time to participate and (iv) effective communication skills. These four criteria have been met by experts engaged in the review of the research model;
4. Number of participants: The number of participants in the Delphi study is dependent on the goal of the study. This study made use of a sample of six experts in the field;
5. Number of rounds: The number of rounds is also dependent on the nature of the study. This study made use of four rounds of review;
6. Mode of interaction: The classic Delphi technique made use of pen and paper and was delivered through the mail. Electronic means have provided much improvement, and thus was the mode of interaction chosen for this study.
7. Methodological rigor: This factor is satisfied when the researcher follows a particular research process and provides sufficient motivation for the process followed. This is done in this chapter;
8. Results: Analysis techniques appropriate for the type of data collected must be used. Data analysis techniques are discussed in Section 5.7;
9. Further verification: Most researchers recommend further study to refine and verify results. However, in this study, the Delphi technique is used to verify results from other techniques;

10. **Publication:** Results of the Delphi technique should be adequately discussed and incorporated into the research. This is done in Chapters Seven and Eight.

The most important consideration (from the above factors) is the selection of respondents for a Delphi study. Hsu and Sandford (2007) acknowledge that participants must be experts in the field of study. Additionally, it is noted that the majority of Delphi studies make use of a sample size between 15 and 20 respondents (Hsu & Sandford, 2007). However, smaller sample sizes are expected where a research area is characterized by a few specific experts.

The Delphi technique employed in this study took the form of an expert review to evaluate the research artifact. Hartman and Baldwin (1995) also made use of a Delphi technique to validate the research outcome. In this study, a sample size of six experts was used to review the research model. This is consistent with Hsu and Sanford's (2007) guideline. The next section describes the research format for this study.

5.4 Research Format



This section aims to describe how the research was performed. The research was designed to combine elements aligned to the design science guidelines as per Hevner *et al.*, (2004). Five research formats are identified by literature, namely: descriptive, explanatory, evaluative, predictive and explorative. The following distinctions can be made between these formats:

1. *Descriptive:* Descriptive research provides a detailed analysis of a phenomenon and the context (Oates, 2006). This type of research presents evidence of interesting and significant patterns in data (Mouton, 2001);
2. *Explanatory:* Explanatory research seeks to explain why outcomes occurred (Oates, 2006). This type of study generally arises where a researcher encounters a known problem, but seeks more information on this problem (De Vos, Strydom, Fouche, & Delport, 2005);
3. *Evaluative:* Evaluative research provides evidence for the impact of certain interventions (Mouton, 2001);

4. *Predictive*: Predictive research aims to generalize by predicting phenomena on the basis of hypothesized, general relationships (Collis and Hussey, 2009). Thus, the solution to a problem in one study can be generalized to similar studies; and
5. *Exploratory*: Exploratory research is used to help a researcher understand a research problem where there is little literature about the topic (Oates, 2006). The need for this type of study is in a new area of research (De Vos, Strydom, Fouche & Delport, 2005).

Since this study examines existing literature as secondary data and data obtained from participant questionnaires and expert reviews as primary data, the descriptive approach is most applicable.

The logic of research can be classified as either inductive or deductive. Deductive research involves the development of a theoretical structure that is then tested empirically (Collis and Hussey, 2009). This form of reasoning involves the deduction of particular instances from general inferences. Inductive reasoning involves the development of theory from empirical observations, where generalized conclusions are achieved (Collis and Hussey, 2009).

The approach in this study is based on inductive reasoning. In this case, the researcher begins with formulated research questions from which patterns are identified. This leads to general conclusions. For this study the conclusions were recommendations based on a framework for the selection and use of IT to enable citizens to access e-government through broadband. Having discussed the research purpose and logic, data collection methods employed to gather primary and secondary data for this research project are discussed in the next section.

5.5 Data Collection Methods

There are numerous data and information collection techniques relevant to researchers. There are different sources of data to choose from when conducting research, namely primary and secondary data. In order to answer the research questions and meet the research objectives, it was decided that the data collection would contain of both primary and secondary resources.

Primary data collection is referred by Myers (1997) as being unpublished and is generally a gathered information from the participants of an organisation. Secondary data collection referred to any previously published materials. The primary data collection methods used within this research project

was questionnaires and expert reviews. The secondary data collection method used is that of literature review.

5.5.1 Primary Data Collection Methods

Web-based questionnaires (Survey Monkey) were the primary data collection method used within the research project. The following section describes the web based questionnaires used.

5.5.1.1 Web-based Questionnaire

Oates (2006) states that a questionnaire is a pre-defined set of questions assembled in a pre-determined order, which respondents are then required to answer, thereby providing the researcher with data that can be analysed and interpreted. The aim of a questionnaire is to elicit the respondent's opinion in order to address the research problem (Collis and Hussey, 2009).

The reason for this questionnaires to be chosen it is because information can be effectively gathered from large number of citizens and employees within a short period of time at a lower cost as well (Whitten and Bentley, 2008). There is, however, Research Design and Methodology, so risk of few non-response may be misunderstood. In order to address this questionnaire was circulated to suitable respondents. As previously mentioned the questionnaire was web-based. www.surveymonkey.com was used for both the pilot and primary questionnaires. This service provided the following benefits over traditional mail-based survey or email-based surveys:

1. It was accessible over the internet from any location;
2. Respondents could take the survey at any time;
3. Respondents could use their computer, laptop, smart phone and tablet to respond;
4. Survey monkey automatically stored responses; and
5. The results are saved and available for download for easy analysis.

The questionnaire included a combination of questions relating to the key attributes of e-government services as defined from multiple sources in the literature review section. It was anonymous, in the hope of encouraging citizens and employees to be more honest concerning to their answers. Close-

ended questions (in the form of a Likert scale) and Open-ended question were used in order to produce responses that can be evaluated using mixed methods.

A link to the questionnaire for 60 citizens of BCMM and another link to 15 BCMM employees including broadband team and ICT employee. On the 60 citizen participant contacts, 56 responses were received and 10 received for BCMM employees out of 15 distributed. The results from the questionnaires are detailed in the next chapter, Chapter Six. These primary data collection methods aided to contribute towards creating the research output framework.

5.5.1.2 Expert Review

In order to evaluate the research model, expert reviews were conducted. This took the form of an informal survey to obtain feedback from the identified experts on the model. This data collection technique corresponds to the Delphi Technique discussed previously. Thus, an iterative means of refining the research model was undertaken. The research model was sent to a total of six experts in order to refine the model. These experts were e-government scholars.

5.5.2 Secondary Data Collection Method

Data collected by another person is called *secondary data*. The secondary data collected for this study involved an extensive and thorough literature survey of internet sources, frameworks, methodologies, journal articles, past research, reports and books. Secondary data was used throughout the research process, including the creation of the research instrument, writing of the theoretical chapters and contributed to the formation of the framework. All efforts were made to ensure that the content of the research remained as modern as possible. All secondary data is referenced to ensure that the original author is credited, and all references are listed in full at the end of this research project.

5.6 Population

The participants were chosen according to convenience sampling. A convenience sample is simply “an easy to get sample” (Wuensch, 2003, p.3). The Raosoft calculator was used to determine the sample of citizens to complete the questionnaire. The principle of saturation guided the sample of participants. An appropriate sample of seventy-five [75] people were selected as the population for the primary data collection component of the study. The Raosoft calculator was used to determine the sample of sixty [60] citizens to complete the questionnaire, and fifteen [15] members of BCMM employees including

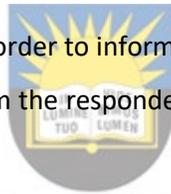
broadband team and ICT expert employees. The selected BCMM employees of the population were known to have the relevant knowledge, time and experience to participate.

The questionnaire population consisted of sixty-six [66] respondents over questionnaire process. Responses to each question developed the framework further based on the findings. Respondents were selected based on their appropriate knowledge and experience of the problem domain. Majority of the participants responded at a very good rate and the researcher considers the response rate as acceptable.

As mentioned in the above paragraph, six experts from employee respondents were selected using convenience sampling for final evaluation of the research findings. The following section describes the method used to analyse the responses.

5.7 Data Analysis

Data from the questionnaire was used in order to inform the creation of the research framework. The qualitative and quantitative feedback from the respondents was summarised and incorporated in the refined solution.



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The following tools were used to perform data analysis of the web-based questionnaire results:

1. The Raosoft Calculator: was used to determine the sample of citizens to complete the questionnaire;
2. Statistical Package for the Social Science (SPSS): was used to analyse the data from questionnaires, i.e. performing data entry, creating tables and graphs; and
3. MINITAB v17 statistical software was used for data collected from participants to be analysed.

For quantitative data, SPSS was considered for the data analysis. This was also supported by the Monkey Survey Analytics tool for the data that was collected from online responses. Additionally, coding was done using binary progression - MINITAB v17 statistical software, a process of identifying the connections between codes also stated. For qualitative data, all questions were classified and grouped accordingly. The classification of the data was based on the experts' feedback and supported

by current literature studies. The interpretive approach was applied where own understanding of the broadband adoption factors were classified and categorized accordingly.

5.8 Research Evaluation

Oates (2006) outlines the research evaluation as a set of measurement parameters for assessing the quality of finding in positivistic and interpretive research. The following characteristics must be established for the evaluation to be credible. These are provided in Table 5.3.

Table 5.3: Quality in Positivist and Interpretivist Research

Positivism	Interpretivist
Validity	Trustworthiness
Objectivity	Confirmability
Reliability	Dependability
Internal Validity	Credibility
External Validity	Transferability

The interpretivist criteria apply to this research as follows:

1. *Trustworthiness*: With respect to the Delphi technique employed, the trustworthiness of the experts used to refine the research model was evaluated;
2. *Confirmability*: This criterion has been met through the use of multiple data collection techniques culminating in the expert review in order to confirm the outcome of the research;
3. *Dependability*: Dependability is established through the use of literature from recognized authors and the contribution from experts in the field of study;
4. *Credibility*: Credibility has been achieved through the use of multiple data collection techniques, and the use of expert review; and
5. *Transferability*: Transferability has been achieved as the research model can be applied to other inter-organisational settings with similar characteristics.

Through the application of these five criteria, the research project can therefore be considered credible.

5.9 Ethical Considerations

According to Hofstee (2006), ethical standards are essential to follow to as they promote the research aims such as knowledge truth and avoidance of error. In light of this, University ethical clearance was granted for this research project (see Appendix A) Research can involve different people in different disciplines, therefore standards to promote values that are important to collaborate work are essential. Ethics such as accountability, trust and mutual respect are included in these standards. The researcher agreed to confirm any resolution with the assistance of the university ethics committee where necessary.

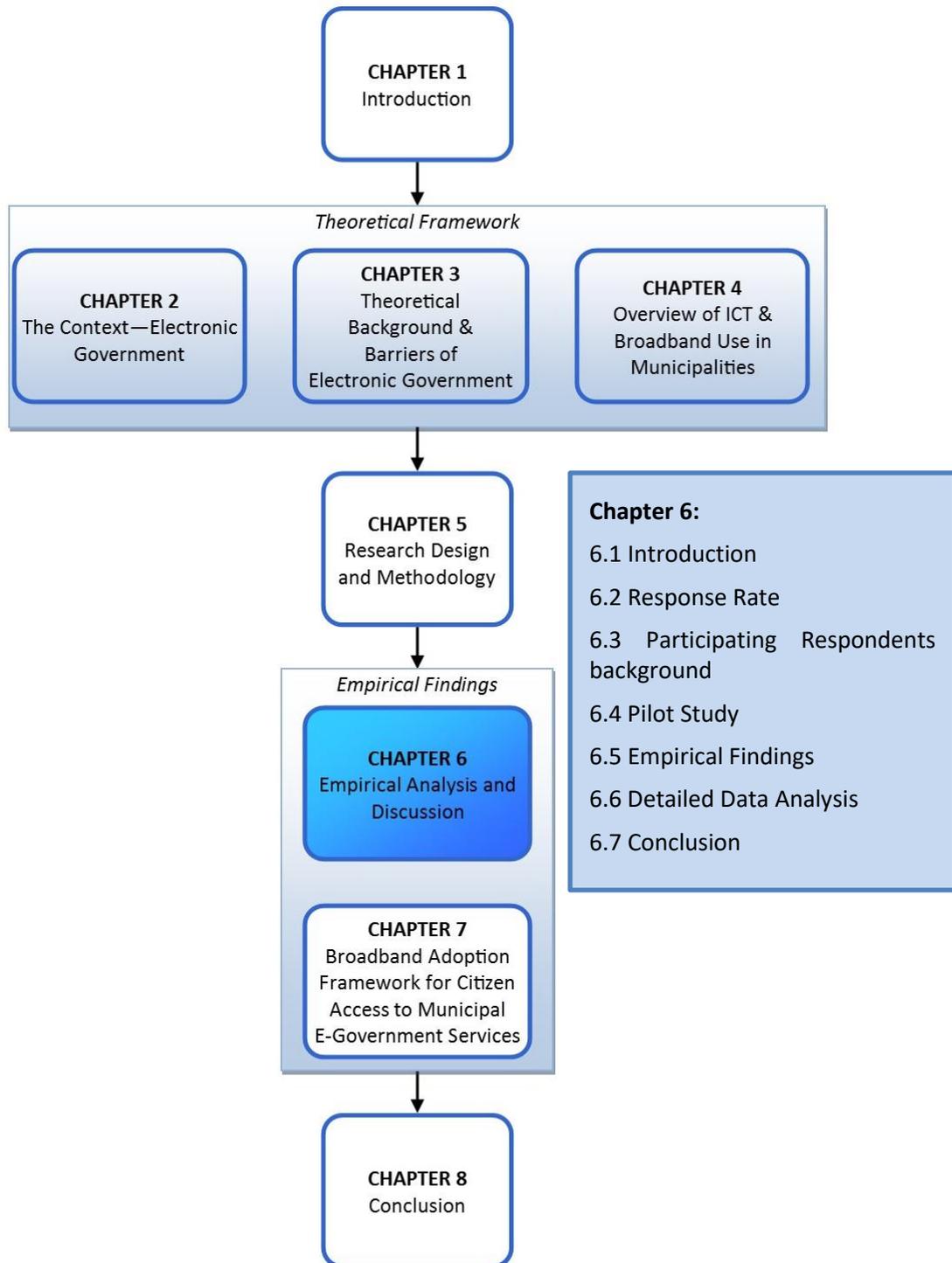
5.10 Conclusion

This chapter detailed the research methodology employed for this study. A discussion of the key research paradigms applicable to IT/IS research was provided. This study was conducted within interpretivism with a slight lean towards a positivist approach, with an important influence from the Design Science paradigm.

The research methodology applicable was described, namely the mixed methods approach as this is consistent with the slight lean towards positivist paradigm adopted for the study. The Design Science Methodology was described and evaluated as applicable to this study.

The research format was promoted as having a predictive purpose and making use of inductive reasoning. The data collection methods employed were described and justified. These methods are participant web-based questionnaires and Delphi study. Secondary data in the form of a literature review was also utilized. The population for collection of the data and the means of analysing the data were outlined. The chapter concluded with an evaluation of the credibility and integrity of this study. The chapter that follows details the data collected using the methods described in this chapter.

Chapter 6 : Empirical Analysis and Discussion



6.1 Introduction

The purpose of the empirical component is to explore some perceptions found within the literature review of the study. Such perceptions can be put to the research context employees and citizens. Furthermore, the chapter is to also discuss the result of the semi-structured questionnaire responded to by sixty-six 66 participants. The importance, basis and intention of the study were provided to the respondents prior to the commencement of the study. The respondents were also given the assurance that all the data they gave was used for the purpose of the research and the identities of the respondents were kept confidential. Employees and citizens have to make e-government services as an essential part of their needs in order to overcome the problems of service delivery effectively in the global municipality level.

Different authors in the literature chapters provide different explanations for how e-government systems can improve the better service delivery through broadband systems. While the secondary data used in this study provides an insight into the different theories and strategies in this field, the questions asked from the participants of this study are aimed at gaining an understanding into the barriers to broadband adoption for Buffalo City Metropolitan Municipality in implementing e-government.

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The data collected in this study was analysed in order to draw meaning from it. Illustrations were made that were used to meet the objective of this study by comparing, evaluating and identifying trends from the primary data collected together with the secondary data. The objective of this study is to develop causal framework to assist in overcoming barriers to broadband adoption for Buffalo City Metropolitan Municipality in implementing e-government.

Cautious consideration was given to identifying questions from the questionnaire that would make the most or least contribution in meeting the objective of this study during the process of analyzing the data collected. This will certify that the findings and recommendations made are based on the most relevant data collected. All contributions made by the participants were given equal value during analysis.

The following sections provide details of the criteria used for comparing data, and an in-depth discussion of the findings from the analysis of data. The next section introduces the participating individuals.

6.2 Response Rate

Two questionnaires (Appendix B) were designed as the primary data collection instrument for this study. The first questionnaire was directed to citizens of BCMM consisting of 22 questions and the second questionnaire was directed to employees of BCMM consisting of 28 questions. The first questionnaire was mainly based on the UTAUT model as it focused more on the adoption of broadband by the citizens. The second questionnaire was mainly based on broadband adoption strategies and the plans from the municipality point of view. This was to understand what are the plans and strategic initiatives from the BCMM staff. The participants had to be separated as the data collected needed to cover separate aspects i.e adoption factors and broadband roll out strategies. Questions directed to both citizens and employees comprised of the information about the citizens or employees in general, barriers that impact adoption and access to e-government services, the techniques available to access e-government services as well as technologies that are currently available in BCMM. The collected data was grouped according to the information needed to address the research questions, this allowed for a more structured approach during the data analysis phase of the study. The questions were categorized as follows:

1. General background information about the citizens or employee;
2. Barriers that impact adoption;
3. Access to e-government services;
4. Strategies and techniques available to access e-government services; and
5. Technologies that are currently available in BCMM.

A combination of table summaries and graphs were used to display the participants' responses. The baseline against which the findings of this study were compared are provided in the review of relevant literature conducted in Chapters 2, 3 and 4. The literature review also acted as guide to provide direction for this study. This chapter also aims to explore what was discovered in the review of literature phase compared to what was revealed by the primary data collection process (questionnaire) of this study.

The background of participating citizens or employees as provided by the various respondents will be provided in the following section.

6.3 Participating Respondents Background

According to Oates (2006), it is common to get a response rate of 10 percent, thus the response rate achieved is considered acceptable. The 15 employees and 60 citizens in the Buffalo City Metropolitan Municipality were invited to participate in the study. There were 10 respondents (employees) representing a 67% response rate and 56 (Citizens) from the Buffalo City Metropolitan Municipality representing a 93% response rate. Babbie and Mouton (2010) still retain that a response rate of 50% can be considered as being satisfactory for analysis and reporting. Moreover, Naoum (2013) also point out that the type of questionnaire will affect the number of people who respond and that a response rate of 30% for questionnaires that are emailed would be reasonable. It is fair to conclude that the response rate was satisfactory, taking into account the difficulty to find respondents willing to share information.



The questionnaire was distributed through www.surveymonkey.com and via a link on personal email. The questionnaire was distributed to citizens and employees in BCMM, and a total of 66 answered. In total, 66 survey respondents were used for analysis. There were 56 (Citizen) and 10 (employees), 93% citizen's responses and 67% employee's responses received to the questionnaire. The respondents adopted a range of e-government services and broadband adoption. The reliability of the research instruments was examined by using Statistical Package for the Social Science (SPSS).

The survey included other questions concerning the relevant background of the participants. These questions were related to, for example, gender, Internet usage, proficiency knowledge and previous usage of e-government services. Citizens at Buffalo City Metropolitan Municipality (BCMM) were selected as a survey population because they are among the community population for whom the Internet has become part of a daily routine. Furthermore, this population will be the main users when BCMM e-government services are fully implemented. For that reason, their approaches and perceptions are significant to measure and improve e-government services.

It was important to be able to understand the responses in relation to the role that each respondent had at the BCMM. The researcher assured the participants that the information they provided would be kept anonymous during the analysis stage of the study. Specific questions asked about the general

background of the participants. One of the question provided in the employee questionnaire was intended to establish the position role for each of the respondents. The Table 6.1 shows the positions of all the employee respondents in their organisation. The most responses were acquired from Information Technology positions who contributed to fifty percent (50%) of the responses. Twenty percent (20%) of the respondents were executive positions. Lastly, there was thirty percent (30%) response rate respectively from technical positions. The following table clearly shows the role of the employee respondents:

Table 6.1: Positions of Employee Respondents

What is your position at Buffalo City Metropolitan Municipality?

		Frequency	Percent %	Percent	Cumulative Percent
	Executive Position	2	20.0	20.0	20.0
	Information Technology Position	5	50.0	50.0	70.0
	Technical Position	3	30.0	30.0	100.0
	Total	10	100.0	100.0	

6.4 Pilot Study

The purpose of this pilot study was to ensure that the questionnaire was a refined research instrument. The pilot study made use of a number of colleagues. This step was used to refine the questionnaire to ensure the most appropriate responses were elicited by this research instrument.

Improving the quality of the questionnaire is also a contributing factor to the high response rate achieved in this study (Oates, 2006). From the pilot study it was determined that some questions required further explanation in order to gather the expected responses. The questionnaire was adjusted accordingly.

6.5 Empirical Findings

Oates (2006) states that a questionnaire is a pre-defined set of questions assembled in a pre-determined order, which respondents are then required to answer, thereby providing the researcher with data that can be analysed. The aim of a questionnaire is to produce the respondent's opinion in order to address the research problem (Collis and Hussey, 2009).

For this study, questionnaires were sent to municipal citizens and municipal employees participants in Buffalo City Metropolitan Municipality (BCMM) in the Eastern Cape. A link to a web-based questionnaire was emailed to the participants with detailed instructions for completion of the questions

This section of the study will convey the discussion and analysis of the observation of respondents relating to the four research sub-questions stated in question 1. This will provide a greater understanding of the barriers faced by Buffalo City Metropolitan Municipality (BCMM) citizens with regards to access of e-government services and the use of broadband connectivity in this regard.

6.5.1 First Research Sub-question

What barriers impact on the adoption of e-government in Buffalo City Metropolitan Municipality?

This sub-question is to ascertain the barriers which impact on the adoption and access to e-government services. Furthermore, to evaluate the barriers of e-government adoption within BCMM. A detailed discussion of this findings to the first research sub-question is provided in Figure 6.1:

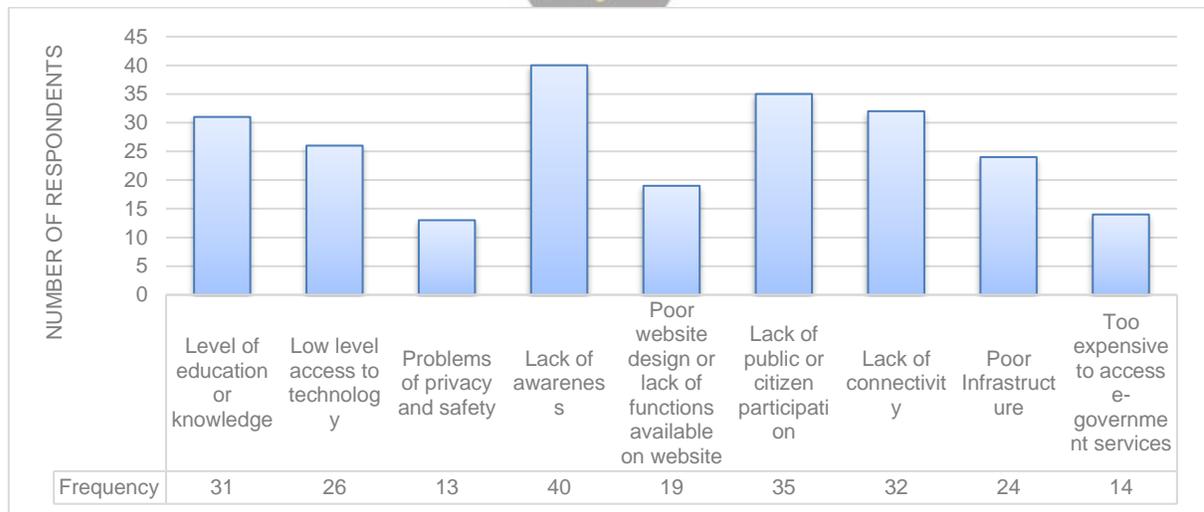


Figure 6.1: Results on challenges faced by BCMM citizens in using e-government services

Both respondents (employees) and (citizens) were asked to state how they use and access e-government services on the list that was given, and also given a chance to add their own additional view that was not in the list. This question was positioned to discover the challenges encountered when using e-government services for their day to day activities in BCMM. The purpose was to explore these

results against other results of other questions listed. The results showed in the following Figure 6.1 and Table 6.2 could reveal instances in which citizen respondents are unaware (lack of awareness (71%)) that they are already making use of e-government services due to the lack of education or knowledge (55%) which could also be the results to the lack of public and citizen participation (63%), also lack of connectivity displaying (57%) as adding to the mentioned barriers.

Table 6.2: Challenges in using e-government services for BCMM citizens

Major challenges in using e-government services for BCMM citizens	Frequency	Percentage
Level of education or knowledge	31	55%
Low level access to technology	26	46%
Problems of privacy and safety	13	23%
Lack of awareness	40	71%
Poor website design or lack of functions available on website	19	34%
Lack of public or citizen participation	35	63%
Lack of connectivity	32	57%
Poor Infrastructure	24	43%
Too expensive to access e-government services	14	25%

Furthermore, from the employee respondent point of view the results confirmed that the lack of awareness and lack of public or citizen participation is still a challenge which resulted to 90%. The 70 % of the employee respondents state that there is also a lack of internet connectivity, hence the aim of this study could assist in overcoming this challenges by the use of broadband connectivity. The Table 6.3 serve to confirm the identified problems from employee respondents.

Table 6.3: Major challenges of adopting e-government technologies at BCMM

Challenges	Frequency	Percentage
Level of education or knowledge	6	60%
Low level access to technology	6	60%
Problems of privacy and safety	5	50%
Lack of awareness	9	90%
Lack of public or citizen participation	9	90%
Lack of connectivity	7	70%
Poor Infrastructure	6	60%
Too expensive to access e-government services	6	60%

This also confirmed by the results from the questionnaire as 60% of the respondents that low level access to technology hinders the municipality from achieving their goals. Therefore, it can be concluded that technology is another component in assuring the access of citizens to e-government services.

From table 6.2 and 6.3, the researcher could also conclude by saying both respondents stated the same top barriers as highlighted from the tables 6.3, which could answer to our main purpose of this study.

It was discussed in the literature that lack of trust impacts the e-government services negatively. This is confirmed by the results from the questionnaire as 57 % of the citizen respondents and 70 % of the employee respondents that lack of trust with e-government services hamper the municipality from achieving the desired results. Therefore, it can be concluded that trust is another major component in assuring the safety access of citizens to e-government services. Technical issues also seem to be another concern looking at 63% of the citizen respondent and 70% of the employee respondent. This is illustrated graphically in Table 6.4:

Table 6.4: Lack of trust results and technical issues – results from Citizens

Privacy and safety concerns are relevant when using e-government services	Frequency	Percentage
Lack of trust.	32	57 %
Municipality Policies are clearly implemented.	8	14%
Municipality Policies are clearly implemented.	8	14%
Limited bandwidth and speed.	29	52%
Technical issues.	35	63%
Signature authentication is very crucial to e-government services.	21	38%
Decreased data integrity for database not accurate enough and not up to date to prevent fraud and unauthorized access.	25	45%
Unreliable Certification Authority.	7	13%

Table 6.5: Lack of trust and technical issues - results from Employees

Problems of privacy and safety when using e-government services		
	Frequency	Percentage
Lack of trust.	7	70%
Municipality Policies are not clearly implemented.	1	10%
Limited bandwidth and speed.	7	70%
Technical issues.	7	70%
Signature authentication is very crucial to e-government services.	1	10%

Decreased data integrity for database not accurate enough and not up to date to prevent fraud and unauthorized access.	6	60%
Unreliable Certification Authority.	2	20%

In this section it was discovered that quite a number of barriers highlighted that needed a speedy resolution.

The aim of this study is to overcome barriers to broadband adoption in BCMM to allow citizen access to e-government, and the use of e-government services and broadband connectivity in achieving this. In order for citizens to have a good trust information sharing of e-government services, it was important to find out from citizens and employees the barriers that impact e-government adoption.

The highest aspects that they indicated as the main barriers were the lack of trust, lack of awareness and education, technical issues, low level access of technology, lack of public or citizen participation, lack of connection and lastly poor infrastructure. This clearly shows that the mentioned barriers impact on the adoption of e-government service in Buffalo City Metropolitan Municipality (BCMM).

The next section addresses the second research sub-question which addressed the techniques aspects of the study.



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6.5.2 Second Research Sub-question

What are the techniques available to ensure access to e-government services within Buffalo City Metropolitan Municipality?

The purpose of this sub question was to assess the techniques for accessing e-government services within Buffalo City Metropolitan Municipality (BCMM) and find out the better solution on broadband adoption in order to meet the critical needs of the community in accessing e-government services.

Most of the employee respondents at BCMM has indicated by (90%) and in the findings that they are familiar with electronic government (e-gov) services and the remaining employee respondents of (10%) is not familiar with e-government service. This showed at least positive results, and there was a follow-up question on that where the respondents had to choose the tasks that they are accomplishing for e-

government services. The following tasks were given for employee respondents for them to choose and the results are as follow:

Table 6.6 : Listed techniques or tasks for e-government services – results from employee respondents

Tasks for e-government services	Frequency	Percentage
Information Services (public service directory, guide to administrative procedures, public registers and database).	3	30%
Transaction Services (email contact with civil servants, politicians, and others).	6	60%
Communication Services (electronic submission of forms, tax fillings, applications for licenses or permits).	6	60%
Online payments (Municipal bills, municipality rates, etc.)	6	60%
Retrieving and sending electronic advertisement to BCMM employees and community at large	1	10%

10% of the employee respondents indicated that there is a lack of community engagement as it showed in the table 6.6 that retrieving and sending electronic advertisement to BCMM employees and citizens has not be taken place that much, this will mean that, there is a need for a better solution on advertisement in order to meet critical needs of community in accessing e-government services. 30% of the employee respondents also indicated that sharing information services such as public service directory, latest guide to administrative procedures, public registers and database is still poor. This could be the cause of the barriers already been highlighted on the finding. As for citizen 18 % respondents indicated that they have never used any tasks mentioned, nonetheless the reason for that could be the lack of awareness and education. 32% citizen respondents also showed the closer results to employee respondents that information sharing service is still underprovided. The results for the above discussion is in the Table 6.7.

Table 6.7: Listed techniques or tasks for e-government services – results from citizen respondents

Are you familiar with electronic government (e-gov) services?	Frequency	%
Information Services (public service directory, guide to administrative procedures, public registers and database)	18	32%
Transaction Services (email contact with civil servants, politicians, and others).	19	34%
Communication Services (electronic submission of forms, tax fillings, applications for licenses or permits).	35	63%
Online payments (Municipal bills, municipal rates, etc.)	33	59%
None of the above	10	18%

The Table 6.8 provides the distribution of the perception of citizen and employee respondents regarding the adoption of broadband as a better strategy or solution in meeting the critical needs of citizens in accessing e-government services. In this regard, 45% of citizen respondents disagree that they access the municipality information services through the availability of broadband internet. The results are shown in the Table 6.8.

Table 6.8: Citizen Respondents Results – Availability of broadband Internet

	Agree	Disagree	Strongly agree	Strongly disagree
We access the municipality information a services through the availability of broadband internet.	22 (39%)	24 (43%)	9 (16%)	1 (2%)

With regards to employee respondents, 60% “strongly agree” and 40% “agree” on broadband adoption as a beneficial strategy to measure the critical needs of citizens when accessing e-government services.



Table 6.9: Broadband adoption for BCMM can provide a beneficial access to measure the critical needs of citizens

Frequency	Percent	Percent	Cumulative Percent
4	40.0	40.0	40.0
6	60.0	60.0	100.0
10	100.0	100.0	

The other question to employee respondents was for them to ratify whether agree or disagree that using e-government systems can be integrated into the broadband capability to provide real time information or data. In this regard, 80% of employee respondents “agree” and “strongly agree” which showed that in deed this can solve the problem. The Table 6.10 summarizes their responses:

Table 6.10: Using e-government systems can be integrated into the broadband capability to provide real-time information or data.

	Frequency	Percent	Percent	Cumulative Percent
Agree	5	50.0	50.0	50.0
Neither agree nor disagree	2	20.0	20.0	70.0
Strongly agree	3	30.0	30.0	100.0
Total	10	100.0	100.0	

The next section explores findings that address the third research sub-question enlightening on the available technologies currently used in the study.

6.5.3 Third Research Sub-question

What are the available technologies currently in the Buffalo City Metropolitan Municipality?

In this sub-question, the aim is to examine the current technologies to support e-government adoption within BCMM and to improve what is already there when it comes to technological aspects of e-government implementation for the benefit of the community.

This study proposes is to produce a framework for broadband adoption model to enable citizen access to BCMM e-government services. The respondents were asked questions that aimed at establishing the technologies used for e-government services and their effectiveness in order to ensure the better performance and the reliability in internet connection. The survey results indicated that most of employee respondents (100%) often use the internet connection in their workplace and they are familiar with electronic government service. The respondents were asked also about the ICTs that they are using. The results are indicated in the Table 6.11.

Table 6.11: Respondent Results – ICTs Used

Which ICTs are you using?				
		Frequency	Percent	Cumulative Percent
	Mobile Phones	6	60.0	100.0
	Computers	8	80.0	100.0
	Laptops	10	100.0	100.0
	Tablets	2	20.0	100.0

The survey results in Table 6.12 indicate that, there is a need to improve in access to technology in order to access e-government services. The citizen respondents indicated (98%) “strongly agree” and “agree”, this showed that the best technologies would eliminates the problems encountered when using e-government services for citizens.

Table 6.12: There is a need to improve in access to technology in order to access e-government services.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Agree	19	33.9	33.9	33.9
	Neither agree nor disagree	1	1.8	1.8	35.7
	Strongly agree	36	64.3	64.3	100.0
	Total	56	100.0	100.0	

The questionnaire findings further emphasize that citizens can be able to find and access a range of current, archived government and municipality information. In this regard, employee respondents (90%) “strongly agree” and “agree” in this point.

Table 6.13: The current and archived government and municipality information.



		Frequency	Percent	Valid Percent	Cumulative Percent
	Agree	25	44.6	44.6	44.6
	Disagree	11	19.6	19.6	64.3
	Neither agree nor disagree	12	21.4	21.4	85.7
	Strongly agree	7	12.5	12.5	98.2
	Strongly disagree	1	1.8	1.8	100.0
	Total	56	100.0	100.0	

Improvement on the available technologies should assist to the technological aspects of e-government implementation and broadband connection in achieving the better service delivery for all.

The next section addresses the forth research sub-question which addressed the elements of municipality broadband adoption strategy.

6.5.4 Fourth Research Sub-question

What are the elements of the Buffalo City Metropolitan Municipality broadband adoption strategy?

The aim of this sub-question was to analyse the elements of Buffalo City Metropolitan Municipality (BCMM) and focus at the decision of entering broadband market as an infrastructure enabler for this municipality in order to engage in service operation and customer demand for e-government services.

Survey questions were asked, which linked to the availability of broadband when accessing e-government services from the respondents. “With your experience of using e-government systems, which benefits do you believe you have realized using e-government”? Benefits were listed, and one on the list was about the use of broadband “Effective systems will go a long way towards a better service delivery through broadband connectivity”. The other question was listed under the Likert Scale “We access the municipality information a services through the availability of broadband internet”. The employee respondents indicated to (70%) of their contribution in this regard.

Table 6.14: Effective systems through broadband connection

Do you find this system as more in improving services and beneficiary for the community?		Frequency	Percentage
Effective systems will go a long way towards a better service delivery through broadband connectivity.	7	70%	
Cost savings which can stimulate productivity.	6	60%	
Innovation.	3	30%	
Economic growth and social well-being.	6	60%	
To increase transparency and accountability for the speed which data can be collected and shared.	7	70%	
High level of trust on government	4	40%	

In the Table 6.14, it clearly shows the highest percentage when it comes to the effective systems for better service delivery through broadband connectivity. This will mean that there is a huge consideration of using broadband as a favorable internet connection for citizen’s access to municipal e-government services.

The decision of entering broadband market as an infrastructure provider could be a good policy strategy for Buffalo City Metropolitan Municipality (BCMM) in engaging service operations and citizen’s

demands for broadband services. Observing on better or improved technologies for e-government through the use of broadband connection, this could provide the best ever results for service delivery in BCMM. As it is indicated in the Table 6.15, this could indeed benefit the citizens and employees of Buffalo City Metropolitan Municipality (BCMM). The respondents indicated 90% “strongly agree” and “agree”

Table 6.15: Without broadband and high capacity wireless connectivity, service delivery systems would not be possible or take hold.

	Frequency	Percent	Percent	Cumulative Percent
Agree	3	30.0	30.0	30.0
Neither agree nor disagree	1	10.0	10.0	40.0
Strongly agree	6	60.0	60.0	100.0
Total	10	100.0	100.0	



6.6 Detailed Data Analysis

The application of the MINITAB v17 statistical software and calculation of the Chi square is presented. One scenario question is considered and used for the explanation. This is to investigate the effect of five predictors on the response variable Y (e.g. Are you using one of the ICTs for accessing any municipal service?). The predictors are:

X_1 : Gender

X_2 : Are you familiar with e-government services,

X_3 : Level of experience on knowledge and previous usage of e-government services

X_4 : Help is available when faced with difficulties

X_5 : Do you often use the Internet

The fitted equation is:

$$Y = -4.45 + 1.73X_1 + 5.59X_2(1) + 3.57X_2(2) + 4.82X_2(3) + 2.10X_2(4) - 1.56X_3(\leq 1 \text{ yr}) \\ + 4.67X_3(2 - 4\text{yrs}) - 1.73X_3(4 - 6\text{yrs}) - 0.24X_3(\geq 6\text{yrs}) - 3.56X_4(\text{Disagree}) \\ - 2.17X_4(\text{Neither}) + 4.22X_5(\text{Yes})$$

Table 6.16: Deviance Table

Deviance Table					
Source	DF	Adj Dev	Adj Mean	Chi-Square	P-Value
Regression	12	41.264	3.4387	41.26	0.000
X1	1	2.189	2.1888	2.19	0.139
X2	4	11.506	2.8764	11.51	0.021
X3	4	8.525	2.1311	8.52	0.074
X4	2	7.442	3.7212	7.44	0.024
X5	1	8.146	8.1461	8.15	0.004
Error	43	27.488	0.6393		
Total	55	68.752			

Estimated coefficients for X_2 , X_4 and X_5 have p-values that are less than 0.05. These results indicate that there is sufficient evidence that the coefficients are not zero using 5% level of significance. (Chi-square = 11.51, $p = 0.021$), (Chi-square = 7.44, $p = 0.024$) and (Chi-square = 8.15, $p = 0.004$) respectively.

The p-value corresponding to the entire logistic model is very small ($p = 0.000$) indicating that there is sufficient evidence that at least one of the coefficients is different from zero, which allows us to continue with our logistic model. The Pearson, deviance, and Hosmer-Lemeshow goodness-of-fit tests with p-values ranging from 0.616 to 0.968, indicate that there is insufficient evidence to claim that the model does not fit the data adequately.

Table 6.17: Goodness –of- Fit Tests

Goodness-of-Fit Tests			
Test	DF	Chi-Square	P-Value
Deviance	43	27.49	0.968
Pearson	43	30.05	0.932
Hosmer-Lemeshow	8	6.28	0.616

The effect of gender (Chi-square = 2.19, p = 0.139) and X_3 (Chi-square = 8.52, p = 0.072) are not significant in the model at 5% level of significance. Removing these variables affects the significance of other variables which suggests the presence of collinearity in our predictors. However, since the Variance Inflation Factor (VIF) is less than 5, this indicates that there is little or no multi collinearity problem among the predictor variables.

Table 6.18: Coefficients

Term	Coef	SE Coef	VIF
Constant	-4.45	2.97	
X1 (Gender)			
Male	1.73	1.26	1.73
X2 (Are you familiar with e-gov services)			
1	5.59	2.41	4.10
2	3.57	2.19	3.61
3	4.82	2.36	3.60
4	2.10	1.95	2.45
X3 (Level of experience on knowledge and previous usage of e-gov services)			
1 year or less	-1.56	1.76	3.15
2-4 years	4.67	2.57	2.90
4-6 years	-1.73	2.52	1.68
6yrs +	-0.24	1.71	2.59
X4 (Help is available when faced with difficulties)			
Disagree	-3.56	1.63	2.91
Neither agree nor disagree	-2.17	1.94	2.49
X5 (Do you often use the Internet)			
Yes	4.23	2.01	3.53

The coefficient for X_5 is 4.23, which suggests that often use of the internet is associated with higher probabilities that the citizen will use ICTs when compared to those who do not use the internet often. However, those citizens who did not agree (b=-3.56) and neither agreed nor disagreed (b =-2.17) that help is available when faced with difficulties are associated with lower probabilities that they will use ICTs when compared to those who agreed that help is available.

Moreover, citizens with a level of experience on knowledge of 4 years and above are associated with lower probabilities that they will use ICTs when compared to those with 1-2 years. The odds that a citizen uses the ICTs is 106 times higher for 2-4 years experienced citizens compared to 1-2 years

experienced citizens. Also the odds are 508 times higher for this group of experienced citizens when compared to those having experience of a year or less.

Table 6.19: Odds Ratios

Level A	Level B	Odds Ratio	95% CI
X1 (Gender)			
Male	Female	5.6564	(0.4787, 66.8381)
X2 (Are you familiar with e-government services)			
1	0	268.1214	(2.3737, 30285.2933)
2	0	35.3549	(0.4880, 2561.4499)
3	0	124.3551	(1.2207, 12668.6498)
4	0	8.1265	(0.1776, 371.9286)
2	1	0.1319	(0.0042, 4.1186)
3	1	0.4638	(0.0128, 16.8424)
4	1	0.0303	(0.0006, 1.4514)
3	2	3.5173	(0.1273, 97.2024)
4	2	0.2299	(0.0068, 7.8141)
4	3	0.0653	(0.0021, 2.0593)
X3 (Level of experience on knowledge and previous usage of e-government services)			
1 year or less	1-2 years	0.2098	(0.0066, 6.6646)
2-4 years	1-2 years	106.5817	(0.6963, 16313.5154)
4-6 years	1-2 years	0.1769	(0.0013, 24.8637)
6yrs +	1-2 years	0.7890	(0.0278, 22.3929)
2-4 years	1 year or less	508.1195	(2.6435, 97669.0023)
4-6 years	1 year or less	0.8434	(0.0109, 65.5050)
6yrs +	1 year or less	3.7613	(0.2530, 55.9160)
4-6 years	2-4 years	0.0017	(0.0000, 1.5880)
6yrs +	2-4 years	0.0074	(0.0000, 1.3175)
6yrs +	4-6 years	4.4596	(0.0577, 344.8576)
X4 (Help is available when faced with difficulties)			
Disagree	Agree	0.0285	(0.0012, 0.7028)
Neither agree nor disagree	Agree	0.1147	(0.0026, 5.0921)
Neither agree nor disagree	Disagree	4.0222	(0.0879, 184.0641)
X5 (Do you often use the Internet)			
Yes	No	68.8739	(1.3490, 3516.5130)
Odds ratio for level A relative to level B			

The odds ratio is 5.7, which indicates that the odds that a citizen uses ICTs for accessing municipal services is almost 6 times higher for male citizens compared to female citizens. To those who are familiar with at least one e-government service, the odds that a citizen uses ICTs are more than 8 or above compared to those who are not familiar with any e-government service. Interestingly, the odds

that a citizen uses ICTs are consistently less for citizen's familiar with three services than those familiar with 2 or 1 service.

For gender, the positive coefficient of 1.73 and the odds ratio of 5.7 indicate that male citizens tend to use ICTs for accessing municipal services than female citizens. The odds of males in the sample who are using ICTs for accessing municipal service 30% of the odds of non-smokers having a low pulse.

Table 6.20: Predicted probabilities

X2	X3	X4	X5	Males probabilities	Females probabilities
0	1-2 years	Agree	No	0.061904	0.011532
0	1-2 years	Agree	Yes	0.819656	0.445525
0	1-2 years	Disagree	No	0.001878	0.000333
0	1-2 years	Disagree	Yes	0.114741	0.022401
0	1-2 years	Neither Agree nor Disagree	No	0.007513	0.001336
0	1-2 years	Neither Agree nor Disagree	Yes	0.342682	0.084389
0	≤1 year	Agree	No	0.013653	0.002441
0	≤1 year	Agree	Yes	0.488056	0.144232

There is 82% chance that a male citizen not familiar with any ICT will use ICTs when he has an experience of between 1 year and 2 years, holds the opinion that help is available when faced with difficulties and when he often uses the internet. This probability is 44.6% for the female counterparts. When the citizen is familiar with ICTs, the probability is increase to 100% for males and to 99.5% for females.

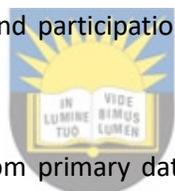
Table 6.21: Male and Female Probabilities

X2	X3	X4	X5	Males probabilities	Females probabilities
1	1-2 years	Agree	No	0.946505	0.757752
1	1-2 years	Agree	Yes	0.999180	0.995380
2	1-2 years	Disagree	No	0.062384	0.011626
2	1-2 years	Disagree	Yes	0.820868	0.447556

1	1-2 years	Neither Agree nor Disagree	No	0.669914	0.264057
1	1-2 years	Neither Agree nor Disagree	Yes	0.992897	0.961108
2	<=1 year	Agree	No	0.328577	0.079628
2	<=1 year	Agree	Yes	0.971186	0.856296

6.7 Conclusion

The findings from the survey are consistent with the literature survey findings deliberated in Chapter Two, Chapter Three and Chapter Four. E-government systems are hampered due to the barriers found from the survey findings. An important observation made from the survey results is that citizens are not aware that they are using e-government services and lack of education and knowledge, poor infrastructures, lack of advertisement on municipality notices and the use of databases and lack of internet connectivity. These few mentioned barriers hinder the best service delivery in municipality level and lack of citizen's engagement and participation due to the lack of trust on e-government services.

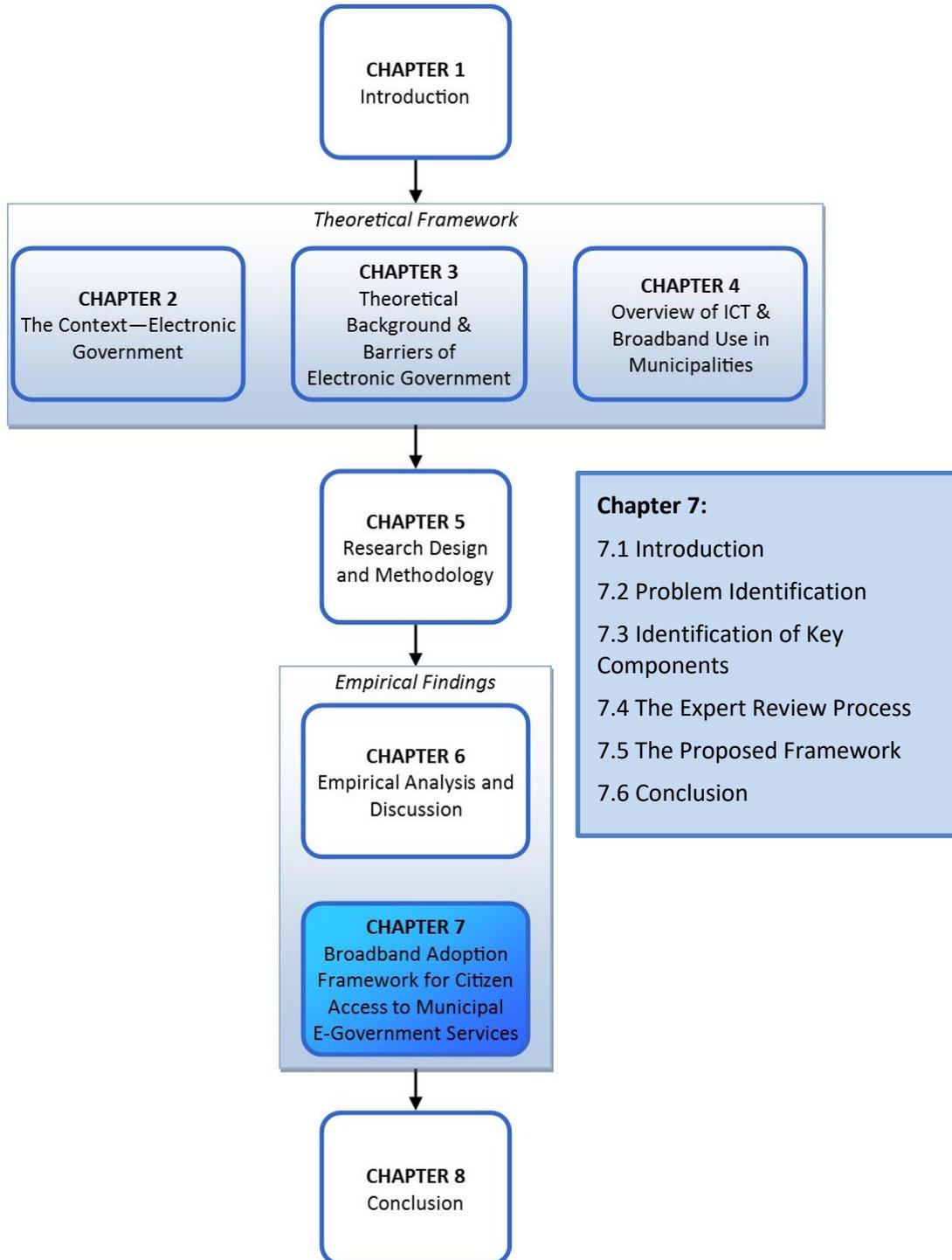


In Chapter 6 the results and findings from primary data collected, and the literature review were summarized, analysed and discussed. Conclusion drawn from these discussions established that a problem certainly exists in the area of e-government and broadband adoption because of the most barriers mentioned above. Data was analysed and gathered into four categories for discussion.

This chapter has distributed with the research findings and results by analyzing the findings according to the for research sub-questions identified in this study. Firstly, the findings provided on barriers impact on the adoption of e-government. Secondly, on the techniques available to ensure access to e-government within BCMM. Thirdly, on the availability of technologies currently in the Buffalo City Metropolitan Municipality. Finally, on the elements of a Buffalo City Metropolitan Municipality broadband adoption strategy. The research sub-question were derived in an attempt to answer the main reserch question.

The following chapter illustrates the framework for broadband adoption model to enable citizen access to BCMM e-government services, which is the primary objective of this research project. The foundation of this framework is the literature survey findings and the primary data discussed in this chapter.

Chapter 7 : Broadband Adoption Framework for Citizen Access to Municipal Electronic Government Services



7.1 Introduction

This chapter discusses the framework for broadband adoption model to enable citizen access to BCMM e-government services.

This chapter firstly recaps the research problem, before describing the key components of the framework and the theoretical and empirical relevance of these. Delphi technique was used to gathered opinions from carefully selected experts.

7.2 Problem Identification

According to Mawela et al, (2017) e-government projects in South Africa, especially municipalities frequently fail to deliver the expected results in terms of outputs and outcomes. This failure appears to be related to numerous technical, organizational, institutional and contextual factors. This is attributed to ineffective and inefficient e-government services in most South African Municipalities. Furthermore, Sibanda and Solms, (2019) challenges on the access to e-government services due to poor internet connections, poor infrastructures, lack of awareness and the lack of public participation also restricts the level of communication between governments, municipalities and citizen. Mimbi and Kyobe (2017) identified the lack of IT infrastructure, resistance to change or cultural barrier and exposure of misconduct were main themes related to IT usage or facilitating IT access for the wider public.

The formulation of Provincial Broadband Master Plan was seen as critical to raising awareness amongst communities and other concerns such as lack of effective engagement with stakeholders, inadequate resources and skills to successfully deliver the overall broadband Project (Van der Waldt, 2018). Citizens demand a more flexible and more transparent administration as well as an increasing range of services that are provided online via the Internet (Ramli, 2017). From a business perspective, a consistent, sustainable implementation of e-government is highly relevant for the economy since an unrestricted online availability of public services is regarded as an essential factor in international competitiveness. In this regard, e-government reflects an important starting point for satisfying these requests. And apart from that, governments aim at optimizing efficiency and effectiveness through increased administrative productivity as well as substantial cost reductions (Wirtz, *et al*, 2014).

7.3 Identification of Key Components

This section explains how the key framework components were derived. The research framework draws on appropriate literature and theory (as discussed in Chapter Two to Four) and the empirical findings which were discussed in Chapter Six. This framework is proposed to address the problem identified in Chapter One. Therefore, the presented framework is guided by the following:

- Current literature review as presented in Chapter 2, 3 and 4.
- The research findings based on the BCM context presented in Chapter 6.
- Interpretation of the current literature and aligning to findings. This is to support the qualitative approach considered.

It is clear that there are many factors and considerations that could have been made in formulating the framework. In this research, to address the problem at hand, the focus was on a framework that addresses current e-government adoption challenges.

The primary e-government barriers found from literature as pointed in section 3.6.1 are: Security, Trust and Privacy, Infrastructure Development, Legal Issues, Law and Public Policy, Connectivity, Internet bandwidth, Cost and Public Participation. With regards to the technology itself, the lack of proper broadband standards and the issue of connectivity, infrastructure remain key technology challenges to be addressed, security, trust, privacy and organizational concern. Availability of the service is outside of the organisation control and is managed by third party network or internet service providers. The legislative controls around broadband are relatively undeveloped and there is no control of the organisation. Finally, Internet bandwidth, participation and cost remain major concerns which organisation are unable to directly influence.

In summary to the process followed for the framework development, the following sections were considered most:

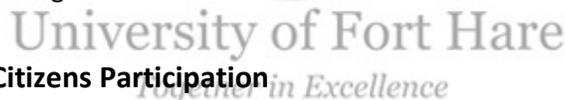
- Section 2.2.2 – Privacy and security as barriers;
- Section 3.4 - the barriers of e-government (Political, Economic, Social and Technological);

- Section 3.5 – overcoming implementing e-Government barriers;
- Table 3.3 - presents 12 key strategies that could be considered in avoiding some implementation barriers. These include: infrastructure development, policies, digital divide, eliteracy, accessible government, trust, privacy, transparency, interoperability, education and availability of services.

The main sections from the findings in Chapter 6 that were influential in deriving the components are:

- Section 6.5.1 – on barriers on adoption of e-government within BCMM (Figure 6.1)
- Tables 6.2, 6.3, 6.4 and 6.5 – all presenting key challenges within the BCMM.

A framework focused on meaningful broadband adoption is not necessarily brand new. The idea of this technology adoption to address the identified problems from respondents in the analysis phase. Observation revealed various views or concerns from employees and citizens when using e-government services. The researcher focuses on the major component. Guided by the existing adoption frameworks, the framework components were derived. The next section is about introducing the proposed framework and enlightens each element of the framework.



7.3.1 COMPONENT 1: Citizens Participation

Findings showed that the majority of the citizen respondents had certain expectations of services and information from e-government channels. This becomes clear that, although most government departments and agencies seem to be meeting the service expectations of citizens, citizens expect more advanced services, including payment of their rates and fines electronically, making online applications for licensing, online certification and the ability to contact government officials. With regards to meet citizen’s expectation community leaders or suburb leaders need to be involved, citizens of Buffalo City Metropolitan Municipality (BCMM) should attend regular workshops that is knowing more about technology and to be engaged to all stakeholders, so as to gain support to achieving a better quality of life.

7.3.2 COMPONENT 2: Information and Communication Technology (ICT) Infrastructure

Mimbi and Kyobe (2017) identified the lack of IT infrastructure, resistance to change or cultural barrier and exposure of misconduct were main themes related to IT usage or facilitating IT access for the wider public. Furthermore, highlighted on the lack of meaningful participation and freedom of association emerged as themes related to governance effectiveness. Their findings clearly showed that there is no meaningful participation between the government and citizens that can ensure effective governance.

Zhao, *et al*, (2012) argue that development requires building an interagency network of systems, networks, software i.e. free or open source, hardware and organisation, which is important in early stages of implementing an e-government. The success of e-government requires a well-defined and well formulated, forward looking and system thinking and the implementation of that strategy. Various technologies mainly for e-government services mentioned in the literature chapters.

It was identified in the findings that, not all citizens had used e-government services before and also noted that some do not even have ICTs for them to access e-government services. This will mean that, the citizens with high level of experience with Internet are more likely to find it easy to use e-government services unlike citizens with no idea at all. With this regard, the introduction on basics of hardware and software should assist the citizens, training awareness should fit in so as to avoid the lack of participation due to the lack of knowledge. Regarding to networks facilities, the citizens of BCM should be aware of high speed transmission technologies such as: Digital Subscriber Line (DSL), Cable Modem, Fiber, Wireless, Satellite and Broadband over Power Lines (BPL) as this would bring communities closer to real-time updates from municipalities.

7.3.3 COMPONENT 3: Training Awareness

Referring to the finding of this study, lack of awareness about e-government systems had a very high response rate from citizen's point of view. When these training are taking place, it is very important to consider the motivation first. Proper training to users and citizens through the Common Service Centres (CSCs) established across the country so that they can be positively influenced to use a relatively new e-government system (Rana, *et al*, 2016). Motivation measures the point to which citizens are motivated to use the services. Motivation is usually accompanied by an expectation to gain, to procure some advantage from the e-government system performance. There is a need to ensure proper

advertisement and legitimate announcements through e-government systems and for the BCMM citizens to gain trust over these online benefits.

The issues that have contributed to this low usage of Internet are inadequate ICT knowledge, poor infrastructure and low availability of Internet services within this municipality. Therefore, there should be a programme designed to reduce the illiteracy rate in BCMM and a strong strategy to make the Internet accessible through the use of broadband and train citizens in basic technological skills. This would allow for greater ease of use of e-government services so that all BCMM citizens (users) and employees would benefit from such services, even those with limited Internet experience.

7.3.4 COMPONENT 4: Supporting Policies

Security and trust is another aspect in which respondents presented as another concern. ICT Policies should be documented and implemented so as to build citizens trust and for them to believe that indeed the e-government systems are secured. With regards to that, the policy reviews and policy updates would help them to perform their e-government services faster and secured without any doubts.

As discussed in the literature of this study, the adoption and the use of sophisticated ICT in government will result in little social value if the citizens are unable to use the services or interact in political processes in a meaningful way, therefore, parallels between e-government and the digital divide understanding are important to establish how policies, society, organisations and information technologies can be used together (Doong and Ho, 2012). The use of cyber security for citizen's computers, laptops or any smart phones to be provided a desired level of protection including the confidentiality, Integrity and availability when they use e-government services. The above mentioned key components are illustrated in the following graph:

7.4 The Expert Review Process

After deriving the framework components, experts in the field with experience were engaged. This was to validate the components. This section describes the process whereby the research project's main contribution (namely the framework) was critically analysed by a number of experts. A total number of six experts in the field of e-government were approached and requested to conduct a critical analysis of the study's contribution.

According to Skulmoski, Hartman and Krahn (2007), the experts used for an expert review should meet four criteria: (i) knowledge and experience relevant to the research; (ii) capacity and willingness to participate; (iii) sufficient time to participate; and (iv) effective communication skills. These four criteria have been met by the experts engaged in for the evaluation of the research model. This evaluation of the research artifact is a necessary step in the Design Science Methodology (as described in Chapter Five). The use of expert review also enhances credibility of this research project.

Respondents were asked to comment on: the suitability of the framework for addressing the stated research objectives; applicability of key components identified and any components which should have been considered. General comments on the research framework were also requested. The feedback from the expert review was used to refine the research framework

The main recommendation and results obtained from the expert review were:

1. Reviewers viewed the research objectives and outcomes as original, relevant and significant.
2. A reviewer stated that use of UTAUT and TOE in this study was highly significant but required more detail. As a result, the explanation of these theories (in terms of the model components) was included.
3. A reviewer required more detail to be provided for each of the steps to show how these would be achieved. This has been included in the final framework.

This feedback is in line with the recommendations of this study. The naming of the components was pointed out, but all experts agreed to the proposed framework components. Having considered all feedback obtained on the framework, it was refined and is explained in the section that follows.

7.5 The Proposed Framework

Federal Communications Commission (2014) states that the term *broadband* commonly refers to high speed internet access always on and faster than the traditional dial-up access. Broadband includes several high speed transmission technologies such as: Digital Subscriber Line (DSL), Cable Modem, Fiber, Wireless, Satellite and Broadband over Power Lines (BPL). An integrated local government application made available by affordable Wi-Fi or broadband brings communities closer to real-time updates from municipalities.

The following framework (Figure 7.1) has been developed to accomplish the research objectives of this research project. The four key components of the framework are: ICT Infrastructure (which include hardware, software and networks such as fibre, Wi-Fi etc.); Training awareness (which include planned workshops, training advertisement and ICT usage); Citizens participation (which include community /suburb leaders, inclusive workshops and engagement of key stakeholders (i.e. service providers) and Supporting policies (which include ICT broadband policies, review policies, update policies, cyber security).

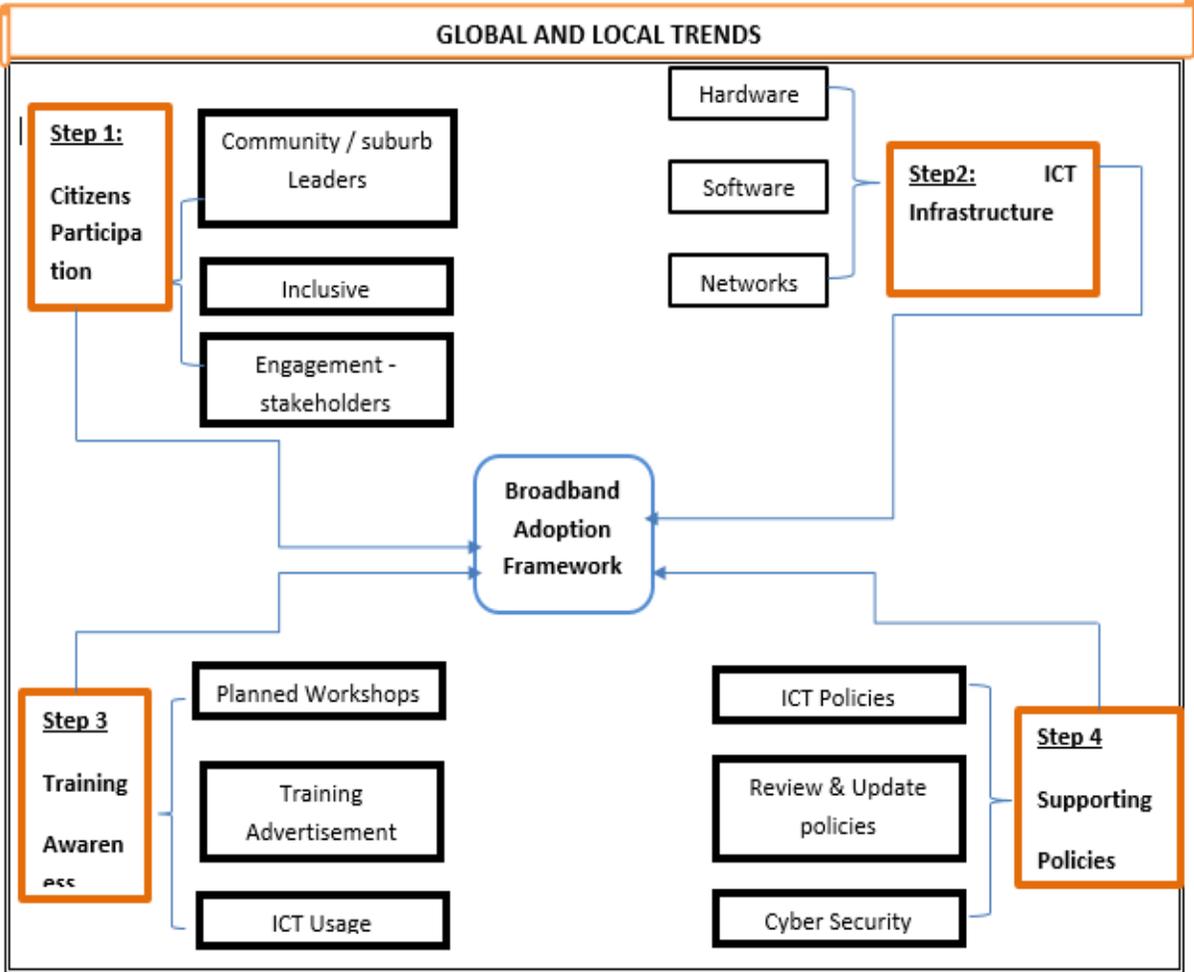


Figure 7.1: Broadband Adoption Framework to enable citizen access to e-government service

7.6 Conclusion

This chapter gave an account of the research findings and how they were explored and incorporated to produce an initial framework for broadband adoption model to afford citizen access to BCMM e-government services. This framework was designed based on results obtained from the questionnaire and reviewed literature.

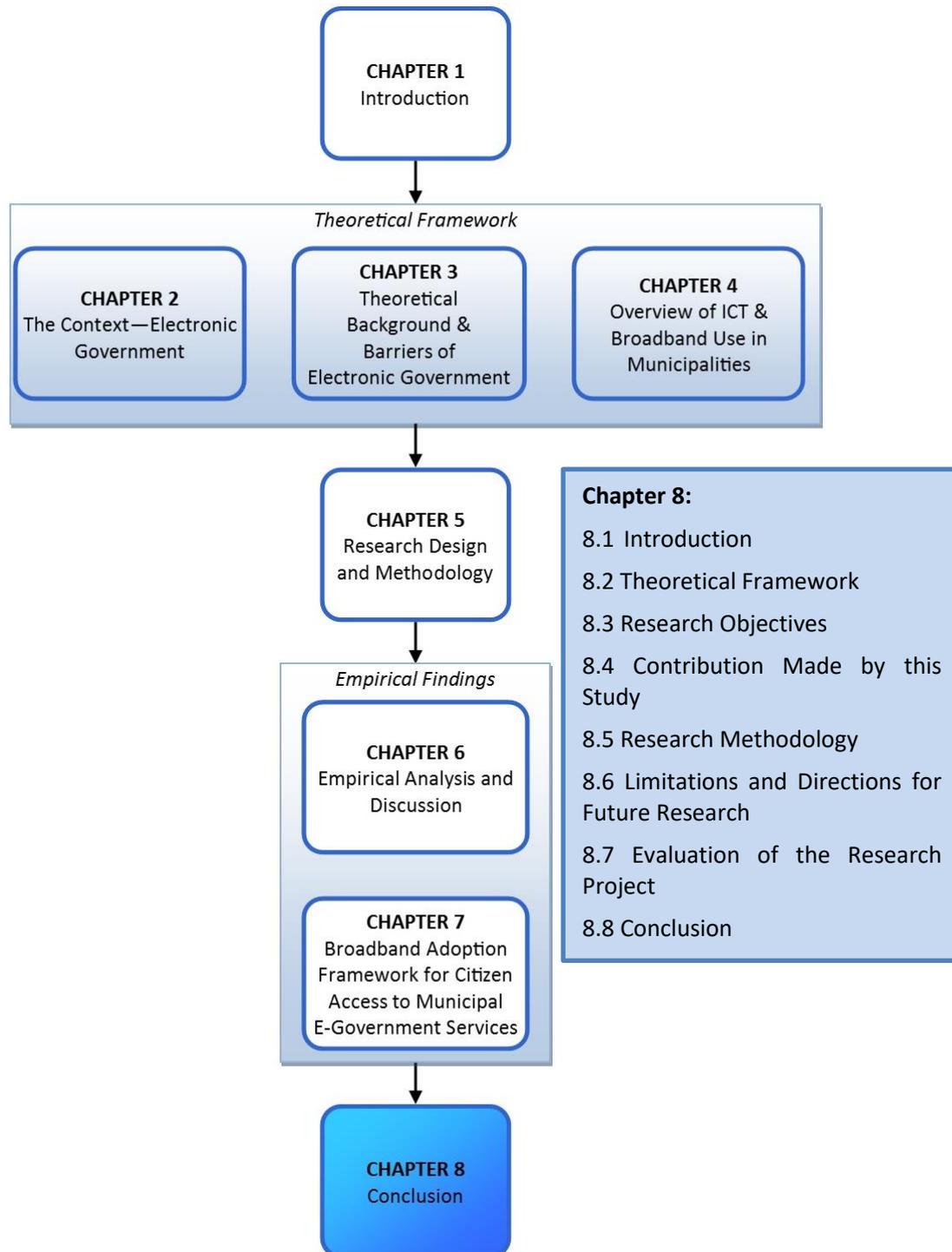
The key finding of this study is that the adoption of broadband can improve citizens' access of e-government services in Buffalo City Metropolitan Municipality (BCMM). With the aid of Information and Communication Technologies (ICTs) and Improved Infrastructures, all ICT stakeholders involved, ICT policies and citizens' training and participation can reduce barriers faced by Buffalo City Metropolitan Municipality (BCMM) community at large. Effective use of e-government services through broadband connection is where the key success mostly lies to help citizens in achieving better service delivery. The appropriate utilization of information and communication technologies, policies, faster and reliable internet connection through broadband when accessing e-government services can allow citizen access to BCMM e-government services, as illustrated by the proposed framework.

The study sought to formulate a framework for broadband adoption model to enable citizen access to BCMM e-government services. In order to fulfill this objective, secondary objectives were investigated, namely:

1. To evaluate barriers of e-government adoption within Buffalo City Metropolitan Municipality.
2. To assess techniques for accessing e-government services within Buffalo City Metropolitan Municipality.
3. To examine current technologies to support e-government services with Buffalo City Metropolitan Municipality.
4. To analyze elements of Buffalo City Metropolitan Municipality broadband adoption strategy.

Finally, the proposed broadband adoption framework was presented. A comprehensive conclusion of this study is presented in Chapter Eight. This completes the study by applying knowledge or information gained from the research to objectives of the study.

Chapter 8 : Conclusion

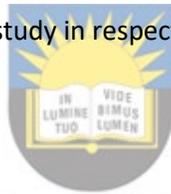


8.1 Introduction

The preceding chapters provided findings and recommendations of this study. Chapter one provided the introduction and background and discussion of the research problem and objectives. Chapter two outlined the background of e-government context in globally, in Africa, South Africa and Eastern Cape. Chapter three outlined theoretical background and barriers for e-government research. Chapter four described the overview of Information and Communication Technologies (ICTs) in South African municipalities and broadband initiatives. Chapter five provided the methodology and design of the research. The findings and empirical analysis were discussed in Chapter six, and Chapter seven provided recommendations in the form of the framework.

Chapter eight provides a brief discussion of the theoretical background of the study and the contribution made by this study, followed by a summary of the research project and discusses each research question. The restrictions and directions for future research are the outlined. This chapter then concludes with an evaluation of the study in respect of the overall findings.

8.2 Theoretical Framework



The primary underlying theory of this study is the TOE Framework. The TOE was chosen due to the emphasis it places on adoption at an organisational level, as opposed to an individual level. It was revealed that performance and effort expectancy, social influence and facilitating conditions have a positive impact on the use of the Information and Communication technology (ICT). Its main focus is on how technology characteristics can influence the adoption process (Tornatzky and Fleischer, 1990). This includes existing technologies inside the firm, as well as the pool of available technologies in the market (Tornatzky and Fleischer, 1990). The three contexts aim to represent not only the limitations but the opportunities encountered when considering technological innovation.

Thus, when assessing technology innovation of e-government services, specifically the adoption of broadband, it should feature all possible strengths and weaknesses. Additional to this, Tornatzky and Fleischer (1990) state that three contexts influence the way in which organisations evaluate the need, explore and adopt new technology, that is, the core element to this study. In order to determine means of overcoming identified barriers, three contextual components of the TOE model (technology,

organisation and environment) were aligned to these barriers. TOE includes the ease of use and usefulness of the individual in accepting technology services (Gangwar *et al*, 2015; Awa *et al*, 2015).

The TOE model is incorporated into the framework as a measure of development towards the adoption of broadband for e-government services and provides organized and logical steps to measure progress of such adoption.

8.3 Research Objectives

The primary objective of this study was to produce a framework to assist in overcoming barriers to broadband adoption for Buffalo City Metropolitan Municipality in implementing e-government.

At the beginning of this study, the primary research question was proposed and four sub-questions presented in Section 1.3.1 and 1.3.2, respectively. The purpose of these research questions mentioned above was to lead the focus of the study. An assessment of the research questions was conducted in order to conclude and evaluate the success of this study. The primary research question is as follows:

How can broadband adoption barriers be overcome in order to enable citizen access to e-government in Buffalo City Metropolitan Municipality?

By designing the framework, citizens and employees of Buffalo City Metropolitan Municipality should be better informed of major barriers and key requirements or technologies of preparing their e-government services through broadband connection, and the best strategies required to improve the e-government systems. In order to accomplish this primary objective, four sub-research questions were considered:

Sub-question 1: What barriers impact on the adoption of e-government in Buffalo City Metropolitan Municipality?

The theory used to answer this sub-question was stated in Chapter three. From the literature review chapters, several definitions of e-government were provided. Furthermore, literature chapters discovered the importance of using e-government systems, namely:

Citizens having more flexible and more transparent administration as well as an increasing range of services provided online via the Internet. From a business perspective, a consistent, sustainable

implementation of e-government is highly relevant for the economy; an unrestricted online availability of public services is regarded as an essential factor in international competitiveness. Efficiency and effectiveness can increase administrative production as well as substantial cost reductions (Wirtz, *et al*, 2014). It was also highlighted that governments seek to engage their citizens, promote transparency and improve their public service offering, social media technologies have been introduced into government workplaces as effective tools to promote service delivery. These social media comprise a set of e-business technologies for citizens and government to communicate, collaborate and engage in all issues and matters relating to governance (Oliviera and Welch, 2013).

From the empirical findings, barriers affecting BCMM citizens in accessing e-government services were confirmed. These empirical findings were obtained through the web-based questionnaire. In particular, citizens respondents agreed that these major barriers: lack of wellness, limited citizens' participation and restricted ICT infrastructure) were relevant for establishing broadband adoption. This led to the addition of some technologies for e-government, broadband and confidence in the framework.

Sub-question 2: What are the techniques available to ensure access to e-government within Buffalo City Metropolitan Municipality?



Chapter four addressed the theory of this research question. From the literature, it has been noted that there are some technologies of e-government in developing countries, which positively impact on the performance of entire e-government systems.

This section from the findings was designed to discover techniques, strategies and technologies used in municipalities in promoting citizens' access and participation in e-government services. In summary, public information can be shared if there are regular online communication channels. E-government services can be gained through use of broadband connection and other technologies to demonstrate a positively service delivery for citizens. The questionnaire findings contained in this section raise a concern of other citizens not using ICTs when accessing municipal e-government services. It is clearly stated in the findings that few citizens are not even familiar with e-government services due to the lack of awareness. Furthermore, it showed better feedback that citizen and employee respondents accepted broadband connection as a better strategy or solution in meeting critical needs of citizens in accessing e-government services.

Secondly, from the questionnaire, it is evident that broadband connection can be a beneficial strategy to measure critical needs of citizens when accessing e-government services. It was also revealed that some technologies were used for better performance on e-government systems for better service delivery.

Sub-question 3: What are the available technologies currently in the Buffalo City Metropolitan Municipality?

The theory of this research sub-question was addressed in Chapter four. From the literature survey, it was noted that the most important impact Information and Communication Technology (ICT) has in the e-government systems is related to available technologies which support performance of e-government services. From the survey, respondents were asked questions that aimed at establishing the technologies used for e-government services.

The survey results indicate that most respondents disagreed that adequate ICT connection exist for e-government services saying that the current ICT does not satisfy the e-government system communication necessities, as most citizens are not linked electronically to municipality e-government systems to access the information.

Lastly, to reveal improved technological aspects of e-government implementation would be beneficial to the community.

Sub-question 4: What are the elements of a Buffalo City Metropolitan Municipality broadband adoption strategy?

From the survey, respondents indicated positive outcomes when it comes to effective systems for better service delivery through broadband connectivity. This means that usage of broadband is highly considered as the best internet connection for citizens' access to municipal e-government services.

The decision of entering the broadband market as an infrastructure provider could be a good policy strategy for Buffalo City Metropolitan Municipality (BCMM) in engaging service operations and citizens' demands for broadband services. Regarding better or improved technologies for e-government through use of broadband connection, this could provide the best ever results for service delivery in BCMM.

As described above the objectives of the research were accomplished in the development of the output framework. The enhancement of the framework was completed by the Design Science Methodology and an Empirical Component.

Above is also the summary of the main findings based on responses to the questionnaire and literature study. The main objective has been addressed through jointly addressing the research sub-questions.

8.4 Contribution Made by this Study

This study has developed a framework to ensure that Buffalo City Metropolitan Municipality (BCMM) citizens can access the e-government services through use of internet broadband connection. The framework illustrated in Figure 7.1 shows how citizens can access information and e-government services through availability of broadband connectivity and improved the main goals of the e-government services, which are proficiency and usefulness through establishment of a broadband connection.



Use of some of the Information and Communication technologies, strategies and techniques was indicated as the best technical support to meet citizens' needs and for better service delivery. There are several advantages which can be realized from this connectivity, namely: proper advertisement and legitimate announcements through e-government systems, networks facilities, high speed transmission technologies such as: Digital Subscriber Line (DSL), Cable Modem, Fiber, Wireless, Satellite and Broadband over Power Lines (BPL), adequate ICT infrastructures and citizens' participation and improved performance and involving and engaging all service providers and stakeholders to gain support in achieving a better quality of life. Other benefits can be realized from collaboration and include greater productivity, especially from employees of BCMM, improved quality and features in BCMM websites, saving costs of travelling when paying municipality bills or rates, efficiency and improved effectiveness and lastly, economic growth and social well-being.

8.5 Research Methodology

This study was conducted within interpretivism, with a slight lean towards a positivist approach, with an important influence from the design science paradigm. The research methodology applicable was the mixed method approach, as this is consistent with a slight lean towards a positivist paradigm adopted for the study. The Design Science Methodology was used in this study and data collection

methods employed were participant web-based questionnaires and expert reviews. Secondary data in the form of a literature review was also utilized.

The limitations of this study are outlined in the next section.

8.6 Limitations and Directions for Future Research

This study attempted to address barriers affecting citizens in accessing the e-government services. A specific focus of this research project was on the effort to overcome challenges encountered by citizens of Buffalo City Metropolitan Municipality (BCMM) by having broadband connection as an infrastructure provider and enabler for better performance in e-government systems.

This research project was undertaken within the context of the Buffalo City Metropolitan Municipality attempting to explore barriers that affect citizens of this municipality in accessing e-government services. In addition, research also explored other technologies and new strategies to enhance better performance to e-government systems. This study can be repeated with e-government projects at a different municipality.

8.7. Evaluation of the Research Project

Research evaluation is a necessary step to ensure credibility and integrity of the research project. Oates (2006) provides a set of equivalent criteria for positivist and interpretivist research. These are shown in Table 8.1.

Table 8.1: Quality in Positivist and Interpretivist Research (Oates, 2006)

Positivism	Interpretivism
Validity	Trustworthiness
Objectivity	Confirmability
Reliability	Dependability
Internal validity	Credibility
External validity	Transferability

As this is an interpretivist study, with a slight lean towards a positivist approach, interpretivist criteria applied to this research as follows:

1. *Trustworthiness*: With respect to expert review employed to evaluate the artifact produced as part of the Design Science process, trustworthiness of experts used to refine the research model was evaluated. The experts used in this process are respected in their field and selected from e-government research. Thus, recommendations made by these experts can be considered trustworthy.
2. *Confirmability*: This criterion has been met through use of multiple data collection techniques culminating in experts confirming the outcome of the research. The use of questionnaire findings confirmed theoretical findings. This led to development of a research framework, which was then confirmed through expert reviews.
3. *Dependability*: Dependability is established through the use of literature from recognized authors and contribution from experts in the field of study in the form of expert review. Use of established theories and models tested in numerous research projects added to the dependability of this project.
4. *Credibility*: Credibility was achieved through use of multiple data collection techniques and expert review (as described with regards to confirmability).
5. *Transferability*: Transferability was achieved as the research framework can be applied to other municipal government settings with similar characteristics.

Through application of these five criteria, the research project can, therefore, be considered credible. In addition, Hevner *et al.* (2004) provide five options for evaluating Design Science research. These evaluation methods are depicted in Table 8.2 below.

Table 8.2: Design Evaluation Methods (Hevner, *et al.*, 2004)

1. Observational	Case Study: Study artifact in depth in business environment
	Field Study: Monitor use of artifact in multiple projects
2. Analytical	Static Analysis: Examine structure of artifact for static qualities (e.g., complexity)
	Architecture Analysis: Study fit of artifact into technical IS architecture
	Optimization: Demonstrate inherent optimal properties of artifact or provide optimality bounds on artifact behavior
	Dynamic Analysis: Study artifact in use for dynamic qualities (e.g., performance)
3. Experimental	Controlled Experiment: Study artifact in controlled environment for qualities (e.g., usability)
	Simulation. Execute artifact with artificial data
4. Testing	Functional (Black Box) Testing: Execute artifact interfaces to discover failures and identify defects
	Structural (White Box) Testing: Perform coverage testing of some metric (e.g., execution paths) in the artifact implementation
5. Descriptive	Informed Argument: Use information from the knowledge base (e.g., relevant research) to build a convincing argument for the artifact's utility
	Scenarios: Construct detailed scenarios around the artifact to demonstrate its utility



This study made use of the following Design Science evaluation techniques:

1. *Analytical*: This research project made use of expert reviews to analyze the structure, fit and performance of the artifact. The outcomes of these expert reviews were incorporated into the final research artifact.
2. *Descriptive*: This research project made use of relevant literature from the e-government knowledge base in order to inform the development of the research artifact.

Through use of these evaluation methods, the research project is considered to have met the requirements of Design Science and thus is a valid Design Science research project.

8.8 Conclusion

In conclusion, there are a number of benefits which municipalities can realize through adoption of broadband; however, certain barriers often result in hesitation. Through the application of the framework provided as the output of this study, underdeveloped South African municipalities could assess and consider the broadband by following the development path provided in the framework.

The aim of this study was to produce a framework to ensure that citizens of Buffalo City Metropolitan Municipality (BCMM) can effortlessly access e-government services through the use of broadband connection. Data from 66 respondents (10 municipal employees, including ICT experts from BCMM and 56 citizens), as well as literature was collected and analyzed and the framework was produced based on the analysis findings. The strength of the proposed framework for broadband adoption lies in its reliability to allow more participation of citizens in accessing e-government services.



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Appendices

- A Ethical Clearance Certificate
- B Citizen Questionnaire
- C Municipal Questionnaire
- D List of Acronyms
- E Glossary



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Appendix A: Ethical Clearance Certificate



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ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: PID011SDUB01

Project title: **A framework for broadband adoption in Buffalo City Metropolitan Municipality to allow citizens access to e-government.**

Nature of Project: Masters

Principal Researcher: Sithandile Twetwa- Dube

Supervisor: Prof R. Piderit

Co-supervisor: N/A

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby grant ethics approval for PID011SDUB01. Should any other instruments be used, these require separate authorization. The Researcher may therefore

commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research



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Appendix B: Citizen Questionnaire

This section was directed to Citizens of Buffalo City Metropolitan Municipality

Section 1: Demographic information

Q1.1 Please indicate your gender.

Female

Male

Q1.2 Do you often use Internet for accessing e-government services?

Yes

No

Q1.3 Which ICTs are you using? Tick any of the following

Mobile Phones

Computers

Laptops

Tablets

Other _____

Q1.4 Are you using one of the ICTs for accessing any municipal services.

Yes

No

Q1.5 Please indicate your level of experience on knowledge and previous usage of e-government services.



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- Below 1 year
- 1 year and above but less than 2 years
- 2 years and above but less than 4 years
- 4 years and above but less than 6 years
- Above 6 years

Section 2: This section is directed to Citizens of Buffalo City Metropolitan Municipality

Q2.1 Are you familiar with electronic government (e-gov) services? Choose the tasks below that you have used to perform e-government services. Tick all the options apply.

- Information Services (public service directory, guide to administrative procedures, public registers and database).
- Transaction Services (email contact with civil servants, politicians, and others).
- Communication Services (electronic submission of forms, tax fillings, applications for licenses or permits).
- Online payments (Municipal bills, municipal rates, etc.)
- None of the above

Q2.2 With your experience of using e-government systems, which benefits do you believe you have realized using e-government? Tick all the options apply.

- Effective systems will go a long way towards a better service delivery through broadband connectivity.
- Cost savings which can stimulate productivity.

- Innovation.
- Economic growth and social well-being.
- To increase transparency and accountability for the speed which data can be collected and shared.
- High level of trust on government

Q2.3 What are the major challenges in using e-government services for BCMM citizens? Tick all the options apply. Tick all the options apply.

- Level of education or knowledge
- Low level access to technology
- Problems of privacy and safety
- Lack of awareness
- Poor website design or lack of functions available on website
- Lack of public or citizen participation
- Lack of connectivity
- Poor Infrastructure
- Too expensive to access e-government services



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4.

Q2.4 Which privacy and safety concerns are relevant when using e-government services? Tick all the options apply.

- Lack of trust
- Municipality Policies are clearly implemented

- Limited bandwidth and speed
- Technical issues
- Signature authentication is very crucial to e-government operations
- Decreased data integrity for database not accurate enough and not up to date to prevent fraud and unauthorized access.
- Unreliable Certification Authority

Section 3: Likert Scale

Please tick one box for each question below to show how much you **agree** or **disagree** with the statement

Variables (Questions)	Strongly Agree	Agree	Neither agree or disagree	Disagree	Disagree strongly
3.1 Level of education affects use of e-government services in BCMM.					
3.2 Lack of awareness of e-government affects the citizens at this municipality.					
3.3 There is a need to improve in access to technology in order to access e-government services.					
3.4 There are often lack of options when using the BCMM website.					

3.5 We access the municipality information a services through the availability of broadband internet.					
3.6 Required application forms can be downloaded from BCMM website.					
3.7 Access to e-government can assist citizens to access the municipality services in the comfort of their homes and offices.					
3.8 Citizens are able to find and access a range of current and archived government and municipality information.					
3.9 E-government systems can decrease the time needed to complete my responsibilities.					
3.10 The current e-government systems are easy to learn.					
3.11 Resources necessary to use e-government systems effectively are available.					
3.12 Specialized instructions concerning the e-government systems are available.					
3.13 Help or assistance is available when faced with difficulties using e-government services.					



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Appendix C: Municipal Questionnaire

This section is directed to Employees of Buffalo City Metropolitan Municipality

Section 1: Demographic information

Q1.1 What is your position at Buffalo City Metropolitan Municipality? Choose

- Executive Position
- Administration Position
- Information Technology Position
- Technical Position
- Other

Q1.2 How long have been working for Buffalo City Metropolitan Municipality? Choose

- Less than a month
- 1-6 month
- 6 months to a year
- 1-2 years
- More than 2 years

Q1.3 Do you use computer for your job description? Choose

- Yes
- No

Q1.4 Do you often use Internet in your workplace?



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Yes

No

Q1.5 Please indicate your gender.

Female

Male

Q1.6 Please indicate your level of experience on knowledge and previous usage of e-government services.

Below 1 year

1 year and above but less than 2 years

2 years and above but less than 4 years

4 years and above but less than 6 years

Above 6 years



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Q1.7 Which ICTs are you using? Tick any of the following

Mobile Phones

Computers

Laptops

Tablets

Other _____

Section 2: This section is directed to Employees of Buffalo City Metropolitan Municipality

Q2.1 Are you familiar with electronic government (e-gov) services? If yes kindly choose the tasks below that you are doing for e-government services.

Yes

No

If Yes, Choose:

Information Services (public service directory, guide to administrative procedures, public registers and database).

Transaction Services (email contact with civil servants, politicians, and others).

Communication Services (electronic submission of forms, tax fillings, applications for licenses or permits).

Online payments (Municipal bills, municipality rates, etc.)



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Q2.2 With your experience of using e-government systems, do you find this system as more in improving services and beneficiary for the community? Tick any benefits from e-gov services below:

Effective systems will go a long way towards a better service delivery through broadband connectivity.

Cost savings which can stimulate productivity.

Innovation.

Economic growth and social well-being.

To increase transparency and accountability for the speed which data can be collected and shared.

High level of trust on government

Q2.3 What are the major challenges of adopting e-government technologies at BCMM?

Tick any challenges below:

- Level of education or knowledge
- Low level access to technology
- Problems of privacy and safety
- Lack of awareness
- Poor website design or lack of functions available on website
- Lack of public or citizen participation
- Lack of connectivity
- Poor Infrastructure
- Too expensive to access e-government services



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5.

Q2.4 List problems of privacy and safety when using e-government services

- Lack of trust
- Municipality Policies are clearly implemented
- Limited bandwidth and speed
- Technical issues
- Signature authentication is very crucial to e-government operations
- Decreased data integrity for database not accurate enough and not up to date to prevent fraud and unauthorized access.

- Unreliable Certification Authority

Section 3: Likert Scale

Please tick one box for each question below to show how much you **agree** or **disagree** with it.

Variables (Questions)	Strongly Agree	Agree	Neither agree or disagree	Disagree	Disagree strongly
3.1 There is confidentiality to your computer when using e-government systems.					
3.2 Users can securely sign up at BCMM website.					
3.3 There are multiple service delivery problems at BCMM that put strain on existing systems.					
3.4 Using e-government system can be integrated into the broadband capability to provide real-time information or data.					
3.5 Broadband adoption for BCMM can provide a beneficial access to measure the critical needs of citizens.					
3.6. Without broadband and high capacity wireless connectivity, service delivery systems would not be possible or take hold.					

3.7 Citizens can be able to find and access a range of current and archived government and municipality information.					
3.8 The use of e-government systems enable me to accomplish tasks more quickly.					
3.9 Use of e-government systems would make it easier to do my job.					
3.10 Learning to operate e-government systems would be easy for me.					
3.11 The current e-government systems are easy to learn.					
3.12 E-government systems are overall easy to use.					
3.13 Interaction with e-government systems is clear and understandable.					
3.14 People who are important to me thinks that I should use e-government systems.					
3.15 People in the municipality who use e-government systems have more prestige than those who do not.					
3.16 Resources necessary are available to use e-government systems effectively.					
3.17 Specialized instructions concerning the e-government systems were made available.					



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3.18 Help or assistance is available when faced with difficulties.					
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Thank you for making some time available to assist with this study. The purpose of this survey is to collect information relating to the barriers hindering the adoption of broadband for e-government services within the Buffalo City Metropolitan Municipality. Participation was completely anonymous and there was no personally identifiable information collected.



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Appendix D: List of Acronyms

AGSA	Auditor General of South Africa
APS	Application Service Provider
BBI	Broadband Infracore
BCMM	Buffalo City Metropolitan Municipality
BPL	Broadband Power Line
CCMS	Citizen Complaints Management System
CSCs	Common Service Centres
CVC	Central Vigilance Commission
DOC	Department of Communication
DPSA	Department of Public Services and Administration
DSL	Digital Subscriber Line
DST	Department of Science and Technology
DTPS	Department of Telecommunication and Postal Service
ECA	Electronic Communication Act
EGDI	E-Government Development Index
FIZ	Free Internet Zone
FTTH	Fiber to the Home

G2B	Government to Business
G2C	Government to Citizen
G2E	Government to Employees
G2G	Government to Government
GCI	Global Competitive Index
GITO	Government Information Technology Officers
GPS	Global Positioning System
GSM	Global System for Mobile
HANIS	Home Affairs National Information System
IBM	International Business Machines
ICTs	Information and Communication Technologies
IoT	Internet of Things
ISP	Internet Service Provider
LTE	Long Term Evolution
NAAIRS	National Automated Archival Information Retrieval System
NDP	National Development Plan
NEMISA	National Electronic Media Institute of South Africa
NPC	National Planning Commission
NRI	Network Readiness Index

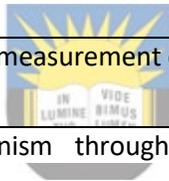
PA	Public Administration
SALGA	South African Local Government Association
SITA	State Information Technology Agency
SOA	Service Oriented Architecture
SOCPEN	Social Pension System
SOEs	State Owned Entities
SSL	Siyakhula Living Lab
SSPS	Statistical Package for the Social Science
TOE	Technology Organization Environment
UN	United Nation
USAASA	Universal Service and Access Agency of South Africa
UTAUT	Unified Theory of Acceptance and Use of Technology
VPN	Virtual Private Network
WAN	Wireless Area Network
WOA	Web Oriented Architecture



Appendix E: Glossary

Adoption	The process of establishing to use something new or different and process of giving approval acceptance to something.
Awareness	Well-informed interest and concern in a particular improvement situation.
Bandwidth	In computing, bandwidth is the maximum rate of data transfer across a given path. Bandwidth is in contrast to the field of signal processing, wireless communications, modem data transmission, digital communications, and electronics
Broadband	The most used form of Internet access because of its high access speeds; it is offered in four different forms, DSL (or Digital Subscriber Line), also fiber-optic, cable, and satellite.
Citizen	Person who is entitled to enjoy all the legal rights and privileges granted by a state to the people comprising its constituency, and is obligated to obey its laws and to fulfil his or duties as called upon.
Design Science	The results based information technology research methodology, which offers guidelines for evaluation and repetition within research projects.
Digital Divide	Any uneven distribution in the access to, use of, or impact of information and communication technologies (ICT) between any number of distinct groups; these groups may be defined based on social, geographical, or geopolitical criteria, or otherwise.
E-governance	The application of information and communication technology (ICT) for delivering government services, exchange of information, communication transactions, integration of various stand-alone systems and services between government-to-citizen (G2C), government-to-business (G2B), government-to-government (G2G), government-to-employees (G2E) as well

	as back-office processes and interactions within the entire government framework.
Framework	A theoretical narrative of a complex entity or process
Infrastructure	The basic physical and organizational structures and facilities (e.g. buildings, roads, and power supplies) needed for the operation of a society or enterprise.
Paradigm	The commonly accepted perception of a particular discipline at a given time.
Public Participation	The process by which an organization consults with interested or affected individuals, organizations, and government entities before making a decision.
Qualitative	Relating to or linking comparisons based on qualities
Quantitative	Connecting to the measurement of quantity
Service Delivery	It is the mechanism through which public services are delivered to the public by local, municipal, or federal governments.
Strategy	A plan of action intended to accomplish a long term goal.



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