

Determinants for Effective Use of E-government Application: Context of an African Smart City

A

Research Report

By

Bende Mark

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Supervisor:

Prof. Ray Kekwaletswe

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ABSTRACT

In spite of the challenges arising from poverty, illiteracy, corruption and inefficient government processes, cities around the world are resolute in their quest to deliver key information and services to citizens by adopting and developing online government applications. For these applications to be successful, it is imperative that they offer services that adequately address the needs of citizens. The present study aimed at exploring the extent an e-government application is being effectively used, in a context of an African Smart city. Initially, the study reviewed a handful of relevant literature to support the aims of this study and to underpin the results on evidence-based theoretical foundations. The study moved beyond the commonly studied behavioural concepts of adoption and use, towards value-driven Information Systems diffusion.

While adoption and use of Information Systems are two widely recognised concepts throughout academia and extensively supported by literature, the effective use of Information Systems is generally neglected in theory and fails in practice. This gap presented in literature, an opportunity for this study to understand the value derived by citizens in using an e-government application and by governments in implementing it. The study has applied the Self-Determination Theory (SDT) and Unified Theory of Acceptance and Use Theory (UTAUT) frameworks to explain the determinants of use and subsequently, effective use. From the conceptual definition of the use of e-governance, this study has identified the motivating or self-regulating factors of effective use. The study then empirically measured a handful of them in order to infer and argue a case for effective use of such applications.

The initial findings suggest that an inferential discipline was applied and that Actual Usage infers Effective Use as intended by this study. The results also suggest that diffusion and effective use of an e-government application still requires some improvements. The user experience, lack or out-dated information and general lack of awareness of the application are among the more pertinent findings on effective use of an e-government application. The findings highlighted that effective use is

inferable when use of IS has been established. The empirical findings of this study demonstrate a need for a 'one-stop shop' model and citizen-focused service delivery agenda for e-government applications. More specifically, the results of this study highlighted an inferential relationship between actual usage and effective use. This means that factors that affect *Actual Usage*, based on UTAUT are positively related to SDT factors of *Effective Use*. For instance, *Performance Expectancy* has been found to have a positive effect on *Actual Usage*, implying that citizens with high *Performance Expectancy* are more likely to use an e-government. *Social Influences* were also found to significantly affect the citizens' motivation and intentions to engage with an e-government application. A large number of users have indicated that their inclination to use the application was influenced by social connections. The *Facilitating Conditions* construct has been found to significantly influence the citizens' behavioural intention to use an e-government application. Predictably, the study also found *Self-efficacy* to be a weak predictor and moderator of a relationship between a dependent and an independent variable.

The immediate relevance and application of this study lies in the expected return on investment derived from an effective use of an e-government application, which is particularly beneficial for a budding African Smart City. The need to effectively and affordably deliver needed government information and services to citizen across the spectrum is even more pronounced in Africa. This study makes specific contributions to the formulation of a model and suggestions for future research. The theoretical contribution is in bridging the literature gap by providing a model for effective use of e-government application in the context of an African Smart City. The current study is one of the first to demonstrate the influence SDT has on actual usage and effective use. This is useful to studies in the IS Domain, particularly for the new concepts of e-government and Smart City.

Keywords: e-government, Information Systems, self-determination theory, and UTAUT, Smart City, governance

DECLARATION

I, Bende Mark, hereby declare that this research report is my own production and solely for the purposes of attaining a Masters qualification. This work has not been submitted to any other institution of higher learning for assessment. I submit the report to the School of Economic and Business Sciences, at the University of Witwatersrand, in partial fulfilment of the requirements for the Masters in Information Systems degree.

Student: **Bende Mark**

Supervisory: **Prof. Ray Kekwaletswe**

Date: _____

Date: _____

ACKNOWLEDGEMENTS AND DEDICATIONS

For the most part of my life, there has always been an in-bred philosophy that I have carried with me, that of being unique. It is this philosophy that has allowed to me to unlearn in order to learn. As I have journeyed through life, I have learned from many individuals at all levels and in different stages of my life. Despite all my good intentions of being *the* teacher, Motheo, my son, my latest teacher, has re-ignited the curiosity of a child in me. He is not only at the age where he tests the limits, but knows who, between his mother and I, to manipulate. He is methodical, obedient and stubborn at the same time. The last trait I suspect he inherited from his mother. But the most important lesson I have learned to date, is his undying spirit of not giving up. I have persisted with this study and have successfully completed it, because of him. So, thank you son for teaching me to persevere, I love you!

A myriad of people were involved in the production of this work, I might not be able to thank them all individually and personally, but I am deeply indebted to them and I will forever be grateful to them for their help and support in the accomplishment of this study. It was not, by any stretch of imagination, a smooth and challenge-free journey, but one filled with a lot of frustrations, stresses and challenges. To this end, let me firstly express my deepest gratitude to Professor Ray Kekwaletswe, my Supervisor at the University of Witwatersrand or Wits in short, for his guidance, patience and faith in me, and for his immense support throughout. His feedback, questions, and suggestions have helped me enormously to structure my ideas, solve problems, and improve my work. He has mentored and motivated me in ways that have driven me to exceed my own expectations and realise my strengths and abilities to execute this study with eagerness. Other people who have helped me greatly with their invaluable comments, questions, and suggestions for improvements in this study are Akeem Adenuga and Honest Muchabaiwa, both of whom played a significant role in helping me think beyond the challenges faced but to structure my arguments with clarity and simplicity — Thank YOU!

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Most of all, this work is a heartfelt dedication to my grandmother - Moipone Annie Mark, who has taught me everything and would have been proud to see me graduate - may she rest peacefully!

Best!

Bende Mark, Johannesburg, bende.mark@gmail.com, August 2017.

*“Two roads diverged in a wood,
and I— I took the one less travelled
by, and that has made all the
difference.” – Robert Frost*

TABLE OF CONTENTS

CHAPTER ONE	16
Introduction and Background	16
1. Introduction to the Field of Study.....	16
1.1 Overview of e-government	17
1.2 Background to the Research Problem.....	21
1.2.1 Study location and context	22
1.2.2 Challenges observed at study location	22
1.2.3 City of Johannesburg Demography	24
1.2.4 Challenges in service delivery and role of e-government.....	25
1.3 Problem statement	26
1.4 Goal and objectives of this study.....	27
1.4.1 Study objectives.....	28
1.5 Research questions	28
1.6 Delimitations of the study	29
1.6.1 In scope.....	29
1.6.2 Out of scope	29
1.7 Research Contributions.....	29
1.8 Chapter Summary.....	30
1.9 Outline of the Research Report	31
CHAPTER TWO.....	32
Survey of Scholarship and Theoretical Framework	32
2. Introduction to Survey of Scholarship.....	32
2.1 Background to Survey of Scholarship.....	32
2.1 Services on e-government	33

2.2	Benefits of e-government	34
2.2.1	<i>Value for Residents/Citizens</i>	36
2.2.2	<i>Value for the Government</i>	36
2.2.3	<i>Value for Business</i>	37
2.3	Drawbacks of e-government	41
2.3.1	<i>Cost of implementation, enhancement and maintenance</i>	41
2.3.2	<i>Accessibility of e-government</i>	41
2.3.3	<i>Information quality on e-government</i>	42
2.3.4	<i>Trust in e-government and government</i>	42
2.4	Related works	43
2.4.1	<i>In defining e-Government</i>	45
2.4.2	<i>In defining a Smart City</i>	46
2.4.3	<i>In search of e-government factors</i>	49
2.5	Theoretical Frameworks	57
2.5.1	<i>Self-determination Theory - SDT</i>	57
2.5.2	<i>Unified Theory of Acceptance and Use of Technology - UTAUT</i>	58
2.6	The Research Model, Hypothesis and Measurements.....	60
2.6.1	<i>Research Model</i>	61
2.6.2	<i>Moderator and hypothesis</i>	62
2.6.3	<i>Measurements</i>	66
CHAPTER THREE		71
Research Methodology		71
3	Introduction to Research Methodology	71
3.1	Research paradigm and approach	71
3.1.1	<i>Positivist</i>	72
3.1.2	<i>Interpretivist</i>	73

3.2	Research Design.....	74
3.3	Sampling frame.....	76
3.4	Population	76
3.5	Data Collection.....	77
3.6	Data Analysis	78
3.7	Limitations and threats	79
 CHAPTER FOUR		80
Data Analysis and Discussion.....		80
4	Introduction to Data Analysis and Discussion	80
4.1	Results	80
4.2	Sample	81
4.3	Demographic Information.....	82
4.4	Measurement scale	87
4.5	Scale Reliability	92
4.6	Hypothesis testing	95
4.7	Hypothesis Testing Results	105
4.8	Discussion of results	106
 CHAPTER FIVE		108
Interpretation of Findings and Conceptual Model		108
5	Introduction to Interpretation and Model Findings	108
5.1	Findings	108
5.2	Recommendations	111
5.3	Implications	111
5.4	Future Research	112
5.5	Conclusion	114

<i>Reference</i>	116
<i>Appendix A - Ethical Considerations.....</i>	121
<i>Appendix B – Approvals</i>	123
<i>Appendix C – Research Questionnaire</i>	126
<i>Appendix D – Demographics</i>	140

List of Tables

Table 1: City of Johannesburg Demographic Overview.....	24
Table 2: Comparative E-government Features.....	34
Table 3: Africa Population and Internet Users 2016	38
Table 4: Definitions of E-governments and Variants.....	46
Table 5: Literature Review, Factors for E-government Use	53
Table 6: Definitions and Measures	67
Table 9: Gender and educational level	82
Table 7: Frequency of use of the e-government application	81
Table 8: Reasons for not using the www.joburg.org.za application	83
Table 10: Age and Work experience	84
Table 11: KMO and Bartlett's Test.....	85
Table 12: Construct Validity.....	88
Table 13: Cronbach's Alpha Classification	92
Table 14: Scale Reliability	93
Table 15: Descriptive Statistics and Pearson's Correlation	94
Table 16: Self-efficacy moderation - Performance Expectancy and Actual Usage .	95
Table 17: Self-efficacy moderating the relationship between Effort Expectancy and Actual Usage	96
Table 18: Self-efficacy moderating the relationship between Social Influence and Actual Usage	97
Table 19: Self-efficacy moderating relationship between Facilitating Conditions – Support and Actual Usage.....	98

Table 20: Self-efficacy moderating relationship between Facilitating Conditions-Accessibility and Actual Usage.....	99
Table 21: Self-efficacy moderating relationship between Perceived Competence and Actual Usage	100
Table 22: Self-efficacy moderating relationship between Perceived Relatedness and Actual Usage	101
Table 23: Self-efficacy moderating relationship between Perceived Autonomy and Actual Usage	102
Table 24: Regression between Actual Usage and Effective Use of an e-government application	103
Table 25: Hypothesis Testing Results	104

List of Figures

Figure 1: E-government application interaction (Alghamdi and Beloff 2014)	19
Figure 2: E-government Maturity Model (Gartner 2000)	20
Figure 3: The City of Johannesburg Region Map Integrated Annual Report, 2014/15	24
Figure 4: E-government Integration model (Lee and Lavy 2001).....	44
Figure 5: Smart Solutions Diamond (Prakash et al. 2016).....	48
Figure 6: A Typical Topology for online application usage (Nam 2014).....	51
Figure 7: SDT Conceptual Model (Gagne´ 2008)	58
Figure 8: Types of UTAUT Extensions (Venkatesh et al. 2012)	59
Figure 9: Research Model	61
Figure 10: Hypothesis testing graphical representation.....	106

CHAPTER ONE

INTRODUCTION AND BACKGROUND

The present research report is about conceptualisation of a model of effective use that is based on the use of an e-governance application. This research report is structured to introduce the field of study and key concepts. The rest of the introductory chapter is outlined as follows: the overview of the e-government, the background to research problems, the problem statement, goals and objectives, research questions, delimitations and study contributions.

1. Introduction to the Field of Study

E-government can be described broadly as an online application that is used to “promote policy integration, enhance public accountability, participation and inclusive societies” for the delivery of information and services to all citizens (United Nations E-government Survey: UN-EGS 2016). An e-government application enables the delivery of important information and a wide variety of services by way of Information and Communication Technology (ICT) (Abu-Shanab 2016; Kyem 2016; UN-EGS 2016; Estevez and Janowski 2013; Cloete 2012; Twinomurizi, Zwane and Debusho 2012; Bertot, Jaeger and Grimes 2010; Caraglui, Bo and Nijkamp 2009; Ochara 2009). E-government enables the delivery of key services to the poorest and most vulnerable groups in society, an essential tenet of good governance (UN-EGS 2016). In turn, good governance entails the effective, efficient, and democratic mobilization and application of key resources, coordinated strategies that support the development of the society (Cloete 2012).

The American Psychological Association Task Force on Urban Psychology (APATFUP 2005) estimated that the population growth in cities around the world will increase by 2.5 billion by 2050. The two continents of Asia and Africa are expected to contribute the largest percentage of this growth. The demand for more sophisticated government

infrastructure that supports effective information and service delivery to citizens is therefore more critical than ever (APATFUP 2005).

Cities around the world are becoming 'smarter' in the way they deliver government information and services to citizens (APATFUP 2005). In South Africa, major cities have incorporated the concept of Smart Cities in their service delivery and global competitiveness agendas (UN-EGS 2016; Cloete 2012; Naidoo 2012; Ochara 2009). It was the intention of this study to examine the evolution of a Smart City concept, in an African context, with e-government as a focal point. The study also empirically assessed the key factors of its use, more so, of effective use.

1.1 Overview of e-government

The role of ICTs in enabling the proliferation of e-government developments has immense potential in helping governments to deliver the information and services required by its citizens (Kyem 2016; Dingley and Hart 2015; Chen, Capistrano and Yen 2015; Alghamdi and Beloff 2014). Governments in many developing countries around the world, recognise that the role of e-government is indicative of the highest level of efficiency of their administration, hence the willingness to invest in it (UN-EGS 2016). Whereas, in the developed economies such as Estonia, The Netherlands, US and the UK, an adoption of some sort of an online application is in far more advanced stages (UN-EGS 2016).

According to Chen et al. (2006), over 500 online government programs have been launched worldwide to render key services to citizens. At the same time, the government services such as online company registration and approvals, maternity benefits registration and online child naming services have surpassed traditional government service applications (e-estonia.com 2014 and Chen et al. 2006). The concept of e-government lends crucial support to the concept of good governance.

Good governance is at the core of a responsible state that involves all citizens, private sector and civil society, to create an environment of inclusivity and participation (UK Department of International Development: DIFD 2016; Ochara 2009, Abrahams and Newton-Reid 2008; Safari, Moslehi, Mohammadian, Farazmand, Haki and Koshshima 2004). It addresses the responsibilities of the state, private sector, and civil society in creating an environment within which human endeavours can benefit society. It focuses on political, economic, and administrative components of governance. Figure 1 defines the interactions between government and society (Government to Citizen: G2C) for information and services rendered through the government application.

Among others, an online Tax filing functionality, municipal rates and bills processing and online voting are revolutionary concepts in e-governance (Fang 2002; Sun, Ju and Chen 2006). A two-way interaction between Government and Business (Government to Business: G2B) can include provisioning and selling of products and services such as online auctions, infrastructure services and tendering processes (Fang 2002; Sun, Ju and Chen 2006). Additionally, the national government may interact directly with provincial or government agencies to deliver key services, drive policy, administer provincial performance, and track delivery of provincial initiatives. The Government-to-Government interaction is known as G2G interaction (Fang 2002; Sun, Ju and Chen 2006).

To further advance the ideals of a transparent, inclusive and accountable and reformed national government, an effective and efficient medium to deliver key government services should exist. The e-government Adoption and Utilisation Model (EGAUM: Alghamdi and Beloff 2014) in Figure 1 is adapted for the City of Johannesburg for this study to demonstrate the value of using an e-government application.

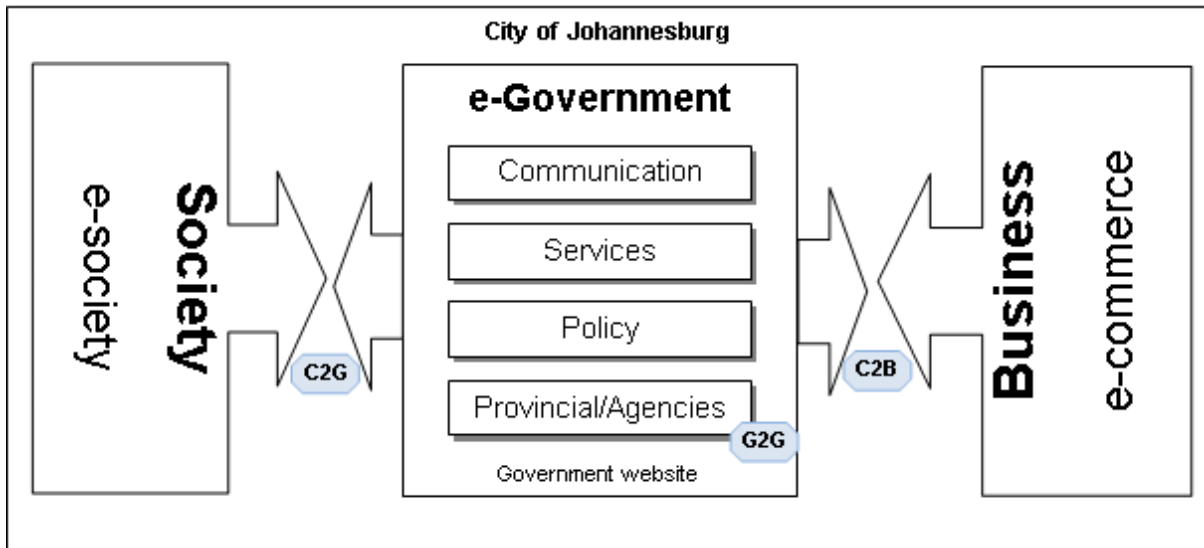


Figure 1: E-government application interaction (Alghamdi and Beloff 2014)

To this end, the United Nations developed a four-stage maturity model for the development of e-government. This model measures progress made by countries around the world in e-government adoption and diffusion (UN 2001 - 2008). Since then, various other revisions of this model were carried out (Anderson and Henriksen 2006; Siau and Long 2005; West 2004, Accenture 2003; World Bank 2002; Netchaeva 2002; Levy and Lee 2001; Hillar and Belanger 2001, Scott 2001, Gartner 2000; Deloitte 2000). The more widely used (Figure 2) is the Gartner model (Gartner 2000) on e-government maturity, which consists of four main phases of maturity, which include:

- I. **Stage 1** – The Information stage involves the use of physical or semi-automated channels for communication. The back office can be automated and integrated.
- II. **Stage 2** – The Interaction stage involves applications that mature from static to dynamic. The security of documents is more relaxed and can be transmitted through computer networks and in other cases, physical channels.

- III. **Stage 3** – Transaction stage focuses on application security, which is the most important factor considered in this phase. At this stage, information and services are transmitted with the highest levels of security.
- IV. **Stage 4** – Transformation stage is involved with informing and enabling access to government information and services that are automated and integrated through a government portal.

Looking at the e-government maturity model comparative study by Fath-allah, Cheikhi, Al-qutaiash and Idri (2014), the majority of the models that have been defined are for and used in developed countries such as US, Canada, China and Finland. Only the Accenture model includes developing countries of South Africa and Brazil. This suggests that many developing countries, particularly in Africa, have not yet fully embraced and further developed e-government applications to advance governance. Nevertheless, the latest UN e-government survey report suggests that South Africa is among the more improved nations in the world and in the top ten in Africa on e-government performance (UN EGDI 2016). Also, the socio-political challenges that are stifling the pace of development of e-government applications to all sectors of society have been noted.

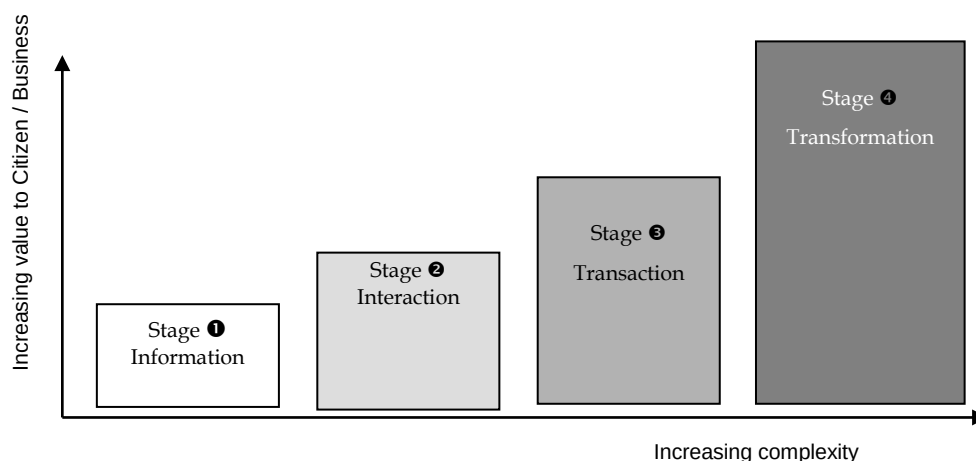


Figure 2: E-government Maturity Model (Gartner 2000)

According to Abrahams and Newton-Reid (2008), the applications of Gauteng municipalities provided a mixed bag of effective and ineffective services across a

number of sectors. They assert that services available on the application were mostly to provide information, but are less interactive or transactional. Additionally, the authors developed and shared with the local and provincial governments, an e-governance framework to improve information and service delivery.

However, no evidence is available suggesting that this framework or model has been adopted and used. In fact, and despite the growing wave of technological advancement, Africa still lags behind in the investment and delivery of public services to citizens through online applications (United Nations 2014). This demonstrates that the e-government maturity levels are still mostly in the early stages.

1.2 Background to the Research Problem

This section provides background to the overview and background to the research problem. It outlines the overall strategic Smart City agenda, the study location, key demographic information and key challenges as well as the potential role an e-government application can play in addressing them.

The City of Johannesburg's Growth and Development Strategy (GDS) has outlined plans to create a world class and liveable city ("Growth and Development Strategy", 2011). In these plans, the key resource improvements, sustainability, health and governance goals, as well as transport and community safety goals are outlined. The Growth and Development Strategy further highlights the City of Johannesburg's goals to become a smart city. This study has explored the use and effective use of an e-government application by the citizens of a Smart City of Johannesburg, within the context of an African Smart City.

1.2.1 Study location and context

The study location for this research was the City of Johannesburg, in Gauteng province, South Africa. The population included participants from one of the top four financial services providers in South Africa. With its sophisticated financial systems and infrastructure, the City of Johannesburg is known as Africa's financial hub. The social and political challenges and its Smart City ambitions, for example it has implemented an e-government application, which makes the city an ideal study location. Further, as estimated by the World Bank (2013), about 40% of South Africans use the Internet, which is the highest penetration of any country in Africa. This provides a favourable platform for an extensive roll out of broadband Internet-based services, particularly in delivering key government services to citizens.

1.2.2 Challenges observed at study location

Despite the advances in e-governance and other similar e-applications, there are several challenges associated with the government's capability to identify, plan and implement e-government that threaten their pervasive and aggressive rollout to citizens (Oyomno 2004). Where such applications have been successfully implemented for instance in the US, Finland, and The Netherlands, studies that assessed the effective use of these applications are poor and few (Teo et. al 2009; Burton-Jones and Grange 2008), effective use of e-governance in an Africa context is even more limited (Subban, Nzimakwe and Pillay 2007). It follows then that in general, the use of these e-government application indicates a growing trend (UN-EGDI 2016), albeit some improvements in poorer economies. The effectiveness of the use of e-government is still to be established. This is the key interest of this study. Burton-Jones and Grange (2008) have defined effective use from a Representation theory perspective, by replacing *use*: goal-directed activity, with *effective use*: goal achievement.

This study took a slightly different approach to firstly establish *Actual Usage* and then proceeded to make inferences about *effective use* of e-government applications. This

distinction is prompted by the fact that causal inference in Social Sciences has been criticized as suffering from “ideological fallacy” both at macro and micro levels. The critics and proponents at both ends have been in locker heads for decades, arguing that inferential discipline must be maintained in order not to define concepts and collect data “at levels of analysis inappropriate for the theoretical propositions being examined” (Klees 2016; Markus, Robey 1988). To avoid this problem, this study has limited the unit of analysis and ruled out possible ambiguity by firstly separating variables from each other as suggested by Freeman (1978) and secondly, by carefully selecting a set of variables grounded in the theoretic basis of Self-Determination (SDT: Deci and Ryan 2011) and Unified Theory of Acceptance and Use of Technology (UTAUT: Venkatesh et al. 2003).

Thirdly, this study also applied the regression testing and analysis techniques to strengthen the validity of the selected variables. Although Klees (2016) argues that certain conditions must also exist such as: inclusion of all variables in the model, proper variable measurement and specification of variable relationships, the reverse argument is theoretically and empirically presented for this study. The initial results suggest that an inferential discipline was applied and that Actual Usage infers Effective Use as intended by this study. The results also suggest that diffusion and effective use of an e-government application still requires some improvements. The user experience, lack or out-dated information and general lack of awareness of the application are among the more pertinent findings on effective use of an e-government application.

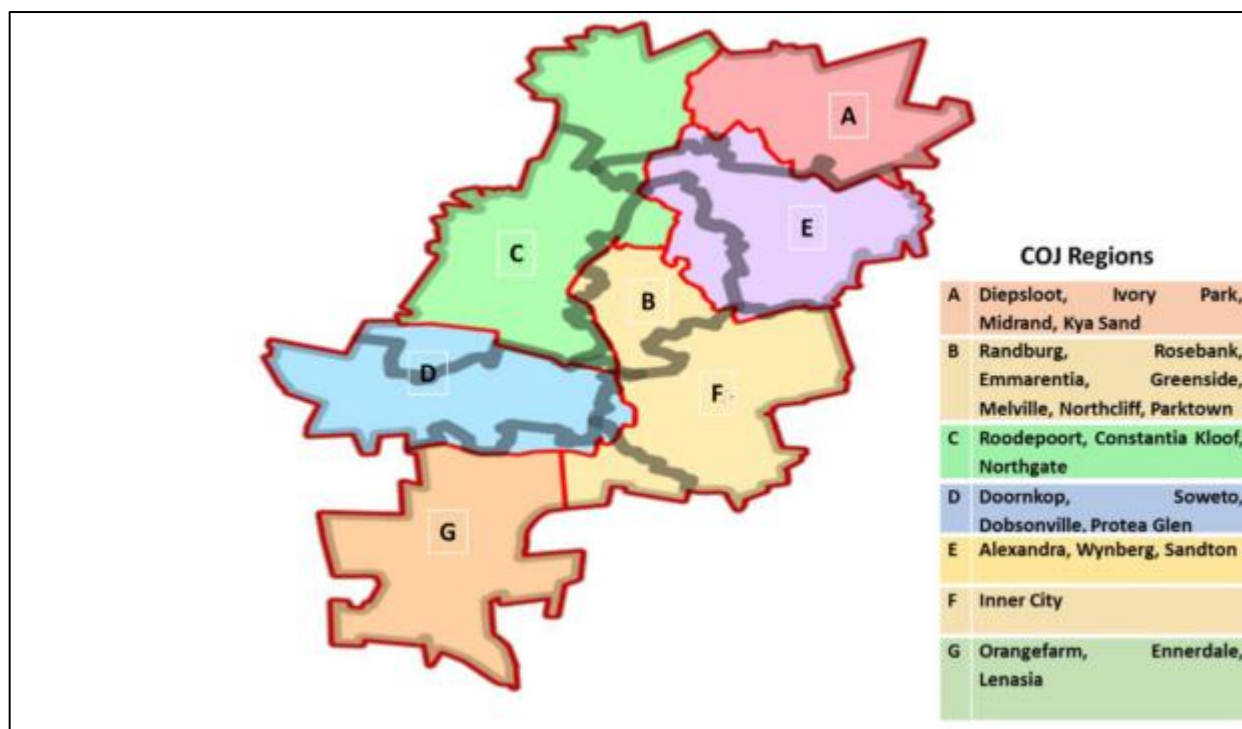


Figure 3: The City of Johannesburg Region Map Integrated Annual Report, 2014/15

1.2.3 City of Johannesburg Demography

The City of Johannesburg constitutes seven main regions and is home to more than 4.7 million people (City of Johannesburg Integrated Annual, 2014/15). This accounts for approximately 36 percent of the Gauteng province's population and eight percent of the national population of South Africa. It is projected that the population of the city of Johannesburg could increase from approximately 4.39 million in 2011 to about 5.43 million in 2021 (City of Johannesburg Integrated Annual, 2014/15). The corresponding growth rates in the projection period range from about 2 percent per annum to about 2.3 percent per annum. The projected annual growth rates are lower than the average annual growth during the period 2001 and 2011 (approximately 7.3 percent per annum).

Table 1: City of Johannesburg Demographic Overview

Size of area (km ²) *	1,645	GDP Per Capita (Current Prices) [‡]	R121,937
Population – total (2015) ≈	4,764 381	Unemployment rate, official definition (%) [‡]	24.5%
Population growth 2015 (%) ≈	2%	Economically Active Population [‡]	50.5%
Households (2015) ≈	1,738 073	Labour force participation rate [‡]	75%
Households' growth 2015 (%) ≈	3.9	Average GDP Growth Rate 1996-2013 [‡]	4.1%
Households' size (2015) ≈	2.7	Households living in informal housing [‡]	297,828
Population density (People per sq. km) (2015) ≈	2,896	Share of households with piped water at or above RDP-level (%) [‡]	95.8%
Households density (Households per sq. km) (2015) ≈	1,056	Share of households with electrical connections (%) [‡]	89.1%
Percentage of Citizens satisfied with quality of Life in Johannesburg Ω	71%	Share of households with formal refuse removal (%) [‡]	96.8%

Source: City of Johannesburg Integrated Annual, 2014/15.

1.2.4 Challenges in service delivery and role of e-government

Presently, the Internet access and penetration in South Africa is still limited, with less than 45 percent of households having access to it (Abrahams and Newton-Reid 2008). Thus, an average household in South Africa may not have access to online government services provided through an e-government application. For the City of Johannesburg (COJ), Information communication technologies (ICT) challenges, poor or lack of infrastructure (Caraglui et al. 2009; Basu 2004), poverty and corruption (Estevez and Janowski 2013; Abrahams and Newton-Reid 2008), illiteracy and skills shortage (Estevez and Janowski 2013) and economic inequality (Ericsson 2016; Cloete 2012) continue to hamper the delivery of services to citizens, primarily to those located in remote parts of the major metropolis (Abu-Shanab and Emad 2016; Kyem 2016; Dingley and Hart 2015; Chen, Capistrano and Yen 2015; Alghamdi and Beloff 2014; Faith-All et al. 2014; Bertot, Jaeger and Grimes 2010; Lee 2010).

Although some studies found that the pace of e-government adoption in South Africa has generally been lacklustre, the UN's E-government Survey (2016) has ranked South Africa as one of the top five highest performing in e-government in Africa and 76th worldwide. An estimated 45 percent of South African population is living in rural areas, with underdeveloped ICT infrastructure and extended travel distances for citizens to access government facilities, it is essential that the delivery of information

and services is carried via mobile and internet facilities (Naidoo 2012). Other challenges affecting the use and in fact, the effective use of e-government services are issues of trust in the government (Carter and Belanger 2008; Evans and Yen 2006). Because of lack of trust, citizens are less likely to abandon the traditional methods of attaining services they require from governments. The traditional service delivery methods, including government office visitations or calling into the call centre (Carter and Belanger 2008), are more desirable in the absence of trust in government systems and processes. Twinomurinzi, Zwane and Debusho (2012) reflect on the need for assurance, which is an antecedent to trust, when accessing services provided via an online application.

Additionally, Abrahams and Newton-Reid (2008) concluded that other key challenges in the Gauteng province are institutional. The lack of a coordinated and a shared vision towards a provincial e-government strategy stifles its development. Competition for the minimum resources by municipalities is hampering and in some cases, regressing progress made. According to the same study, over 80 percent of individuals in South Africa have access to a cellphone. Although this creates an opportunity for a mobile-enabled e-government service provision, this opportunity is still far from being explored. This study recommends an exploratory analysis of a mobile-based e-government service delivery. A case is specifically made here as the results suggest that a usage gap exists among new job entrants and citizens living in rural and remote areas exist. For the local government, potential targeted marketing campaigns addressed to the above groups may be of value.

1.3 Problem statement

Problems previously associated with urbanisation and agglomerations of city living spaces have necessitated human creativity and coordinated approaches. Underscoring these sources of creative solutions, technology has played a major role in solving them through smart solutions, for smart city living. These gave birth to the Smart City concept, which was explored further in this study.

From the review of literature and research paradigm, it appears that the adoption and use of Information Systems is an area sufficiently studied and theoretically grounded. However, research on the effective use of e-government is limited (Burton-Jones and Grange 2011), particularly for an African city (Subban, Nzimakwe and Pillay 2007). With the heavy reliance and investments in Information Systems across many organisations, the adoption and is use no longer sufficient to establish the expected value and return on investment (Burton-Jones and Grange 2011). While over fifty percent of organisational capital expenditure is being allocated to IT system implementation and maintenance, only ten percent of the value is derived (Burton-Jones and Grange 2008). This phenomenon is pervasive in government organisations.

Despite a growing trend in the delivery of government services through online applications, the value derived does not justify the investment cost. An ideal opportunity for this research was presented by the challenges mentioned above. Effective use of the City of Johannesburg Smart City e-government application is unknown, in fact little is known of its actual usage. As such, this study bridged this gap by investigating actual usage, and thereafter proceeding to infer its effective use.

1.4 Goal and objectives of this study

Firstly, the study drew upon the conceptual definitions of effective use among other theoretical definitions of use. The goal of the study was to conceptualise a model for effective use.

1.4.1 Study objectives

The objectives of the present study were:

- I. To explore the determinants for effective use of an e-government application, in the context of a Smart city.*
- II. To understand the extent to which the Self-determination Theory and Unified Theory of Acceptance and Use of Technology may explain effective use of an e-government application; and*
- III. To explain the factors that influenced the use of an e-government application in an African Smart City.*

1.5 Research questions

The primary research question that was addressed by this study is:

What are the determinants for the effective use of an e-government application by the residents of a Smart City?

The secondary questions (SQ) addressed by the study are:

(SQ1) - What are the determinants for use of an e-government application?

(SQ2) - What factors of UTAUT and SDT that could explain the effective use of an e-government application?

(SQ3) – Which factors could best influence the effective use of an e-government application?

1.6 Delimitations of the study

The study focused primarily on the social influences, attitudinal effects and technical infrastructural characteristics as the key determinants that affect the use of an e-government application, joburg.org.za. These determinants are generally perceptive and influenced by external, social and interpersonal pressures on an individual's keenness to use a new technology (Ajzen 1991; Fishbein and Ajzen 1980: 1975). The study delimited the context to the Johannesburg metropolitan city as a case to understand the challenges faced in the use of its online application.

1.6.1 *In scope*

The study focused on users of the joburg.org.za application, currently being used for tariffs payments, licences and city accounts management. However, the effective use of e-Government application at city or metropolitan level has not been studied. The demographics chosen in this study included males and females between the ages: 20s, early 30s and mid to late 40s.

1.6.2 *Out of scope*

Disparate online applications have been implemented across South Africa, mostly at a national government level, including the online tax application, *e-filing* application. The use of tax e-filing application in South Africa has been widely researched (Munyoka and Manzira 2013; van der Vyve and Rajapakse 2012). Therefore, it is excluded from the scope of this study, in addition to e-siyakhokha.

1.7 Research Contributions

The opportunities for academic research to inform practice and theoretical evolution can be achieved in several ways. One would be to identify key determinants for the effective use of online government applications. Governments may utilise the content

of this research as a basis to consider factors that are key when implementing an e-government application. Notwithstanding the expansive research on similar applications in other countries, a particular case is made herein of a contextual assessment that considers specific and unique realities of a country or city in Africa.

The second contribution could pertain to the definition of a smart city and theory development. Potentially, the study sets the basis for future researchers to expand on the key characteristics and a unified definition of a smart city within the context of a developing economy. The research project particularly examined factors for the effective use of e-government applications based on strong behavioural frameworks for use. The application of the Self-determination and UTAUT theories strengthens the findings of this research and expands these theories further.

Thirdly, the research contributes to the body of knowledge through a paradigm shift from technology acceptance and use, to an effective use of technology. Research on the effective use of technology is currently limited due to the attention in past studies on acceptance and use. Special attention in future research should be dedicated to studying 'how well' technology is being used in order to extract value, considering that many organisations spend over 50 percent of capital expenditure of IT systems (Burton-Jones and Grange 2008).

1.8 Chapter Summary

In this first chapter, a brief background to the study was outlined, the study problem was introduced and the objectives of this study were explored. In addition to determining the location of the research, the key concepts used throughout this study were introduced. The chapter concluded with the scope of the research and research contributions to the present body of knowledge and practice. The next chapter surveys related works and scholarships.

1.9 Outline of the Research Report

This research report is arranged in a manner that *Chapter Two* surveys the related works and literature to support and contextualise the objectives of this study. The study outlines the theoretical foundations for the study and formulates a case in relation to the application and selection of the theories in this study. Additionally, an outline of the study methodology, strategy and the proposed measurements and definitions of constructs are presented in *Chapter Three*. Data analysis of the results of this study and key discussions points are presented in *Chapter Four*. The study also highlights measurement instruments and statistical techniques used for validity and reliability of the results. *Chapter Five* provides an interpretation of the findings and recommendations for future research and highlighting key research limitations.

CHAPTER TWO

SURVEY OF SCHOLARSHIP AND THEORETICAL FRAMEWORK

2. Introduction to Survey of Scholarship

This chapter reviews similar works and studies forming the foundations for this study. The literature selection for this study is based on a handful of journals, articles and selection of conference proceedings published between 2005 and 2016. A total of 594 academic publications were directly sourced from ScienceDirect, JSTOR, EBSCO Business Complete and PROQUEST Computing and the e-Wits Catalogue and Sabinet Online. Keywords used in the search were: Factors, e-Government, e-governance, online government and electronic government.

2.1 Background to Survey of Scholarship

Prior studies that employed similar search strategies included those by Tongia and Subrahmanian (2006). Candidate publications were surveyed using the search terms mentioned, resulting in an extensive search hits (over 500 publications). The results were further filtered based on the title relevance, the abstract context and conclusion summary. Publications that were published before 2005, that were not tangential and not underpinned by an IT artifact or not empirically tested were excluded. Studies that have been cited more than once were considered. This chapter surveys a host of published works that have explored the implementation, adoption and use, as well as effective use, of an e-government application. In order to clearly delineate the key concepts that relate to such online applications, the study maintains a broad scope in order to understand how these have been implemented adopted and used globally.

The review and survey of literature pays particular attention to related works that have examined e-government initiatives in the developing economies, more so within an African Smart City. This chapter also discusses the theories that underpin the study, presents related works and conceptualises the model, including hypothesis, for the present research. The chapter is outlined as follows: a generic overview of services rendered through an e-government application, its key benefits, and its value to citizens, government and business, as well as some drawbacks, the definitions of key concepts, and identification of key common factors for actual usage.

2.1 Services on e-government

Currently the COJ e-government application is only being used to ‘access’ information and services. There is a scope for the application to integrate with other services such as the e-democracy and e-participation services (Cloete 2012). However, in order to move to the next stage of the E-government Maturity Model, the e-government use and effective use must be in place (World Bank 2012). Although very limited research makes specific mention of the typical e-government services, except in abstract terms, typical services including direct conversions of traditional e-government services (Table 2) is the current practice.

According to Brooke-Norris and Pretorius (2007) the COJ e-government application has had over 160 000 users since it was implemented in 2004. The top four highly used services were: Accounts by e-Mail / View Accounts Online (22500 hits per month), Online Johannesburg Metro Police Traffic Fines (Average of 18000 hits per month), View City Maps Online – GIS (Average of 17000 hits per month), and, Submit Meter Reading Online (10000 page hits). Despite the successes noted, the challenges of location, travel time, long queues, and waiting hours and the lack of information services affect the effective use of e-government application (Mutula and Mostert 2010; Twum-Darko 2014; “COJ Integrated Development Plan”, 2016).

Table 2: Comparative E-government Features

Services	Reference
E-payment, e-assessment, e-complaint, e-licensing, e-compound, e-submission, e-rental, e-forum, e-Learning, e-tax.	Oseni and Dingley (2015)
Online disbursements, Online procurement, Electronic document interchange.	Wang (2002)
Basic services: water, sanitation, electricity, and refuse removal.	Estevez and Janowski (2013)

2.2 Benefits of e-government

Although in developing economies, the use of online government applications is in its infancy, the success of such applications is already being witnessed in South Africa in the use of online applications (Mutula and Mostert 2010). The e-government applications are used to (i) simplify government service delivery, (ii) improve access to information and foster relationships with the business sector, and (iii) strengthen accountability and transparency (National Integrated ICT Policy Green Paper 2014). There are several benefits to it from which citizens and business may derive value in using e-government applications, the following are among the most important:

- **Easy access to information and services:** easily accessible relevant information and services through e-government help citizens, businesses and government department managers to make timely and informed decisions. Additionally, it is highly likely to be encouraged to use these applications if the information and services are up to date and in the format desired by each sector type (Kyem 2016; Bertot et al. 2010).

- **Convenience:** the government information and services that are accessible electronically enable citizens to access them comfortably and conveniently at their homes. This benefits both the citizens and government by saving money and time (Nam 2014; Abrahams and Newton-Reid 2008).
- **Improved customer service:** because e-government information and services are electronically available to citizens, the waiting time for the government officials to assist them is minimised. Therefore public servants can be better deployed to more pressing issues affecting citizens. (Nam 2014; Bertot et al. 2010; Lee 2010).
- **Reduced cost of doing business:** digitally or electronically available business transactional information and services on the e-government applications reduces the cost of conducting business with government. Saving time and money for both the business people and government (Helbig, Gil-Garcia and Ferro 2009).
- **Reduced paperwork:** e-government means that transactions are processed online, meaning no paperwork necessary. Saving the government and businesses money and storage space and retrieval timelines drastically reduced as a result (UN-EGS 2016; Yildiz 2007).

These are just some of the benefits that come with electronic government. In South Africa the e-governance has been adopted, but there is still more that can be done to make sure that it is utilised to the fullest so that public service applications are utilized to their maximum capacity. In addition, e-government helps businesses intending to do business with the government to access rules and regulations at their fingertips; this will help increase compliance with the regulations.

There is no denying the overwhelming benefits of the e-government programs if they are carefully implemented. Examples below are some of the more successfully implemented in South Africa:

- **Independent Electoral Commission (IEC):** e-procurement for the transparent bidding for government tenders, aiming to prevent corruption;
- **South African Revenue Services (SARS):** e-filing system for filing tax returns online by individuals and businesses seamlessly and fast; and
- **Nation Traffic Information System (NaTiS):** e-Natis system that allows for fast application and registration for driving and motor vehicle licenses and notification of change of ownership/sale of motor vehicles.

2.2.1 *Value for Residents/Citizens*

The value of an online government application to residents has been identified. It includes convenience, time saving and accessibility. Rendering government services online significantly decreases the processing cost of various activities compared with the manual way of handling operations (Ndou 2004). Therefore, secure and easily accessible government services may improve communication, enhance greater transparency and accountability

2.2.2 *Value for the Government*

For governments, streamlining processes for online products and service provisioning reduces errors, increases service delivery speed and increases greater transparency and trust among residents (Fang 2002). Governments can reduce cost of delivering services and increase government revenue growth, profitability and improve efficiencies, which may increase trust in government capabilities to deliver products and services effectively.

2.2.3 *Value for Business*

Accessibility to government information, products and services provides greater opportunities for business to participate in democratic institutions and processes (Tolbert and Mossberger 2006). Thus, conducting business online with the government provides added value of convenience and the reduced cost of doing business. Additionally, the perceived value of completing an online company registration or tax filing decreases time and enhances business opportunities. These benefits can be categorised as functional (convenience of performing the intended action anywhere and anytime) and non-functional benefits including time saving (Alghamdi and Beloff 2014).

Table 3: Africa Population and Internet Users 2016

Country	Population (2016 Est.)	Internet Users 31-Dec-00	Internet Users 30-Jun-16	Penetration (% Population)	Internet Africa	% Facebook 30-Jun-16
Algeria	40,263,711	50,000	15,000,000	37.30%	4.40%	15,000,000
Angola	20,172,332	30,000	5,951,453	29.50%	1.70%	3,500,000
Benin	10,741,458	15,000	1,232,940	11.50%	0.40%	800,000
Botswana	2,209,208	15,000	690,000	31.20%	0.20%	690,000
Burkina Faso	19,512,533	10,000	1,894,498	9.70%	0.60%	600,000
Burundi	11,099,298	3,000	526,372	4.70%	0.20%	450,000
Cabo Verde	553,432	8,000	224,183	40.50%	0.10%	210,000
Cameroon	24,360,803	20,000	4,311,178	17.70%	1.30%	2,100,000
Cent. African Rep.	5,507,257	1,500	224,432	4.10%	0.10%	66,000
Chad	11,852,462	1,000	387,063	3.30%	0.10%	170,000
Comoros	794,678	1,500	60,000	7.60%	0.00%	60,000
Congo	4,852,412	500	400,000	8.20%	0.10%	400,000
Congo, Dem. Rep.	81,331,050	500	3,101,210	3.80%	0.90%	2,100,000
Cote d'Ivoire	23,740,424	40,000	5,230,000	22.00%	1.50%	2,400,000
Djibouti	846,687	1,400	150,000	17.70%	0.00%	150,000
Egypt	90,067,793	450,000	34,800,000	38.60%	10.20%	32,000,000
Eq. Guinea	759,451	500	181,657	23.90%	0.10%	67,000
Eritrea	6,674,489	5,000	67,000	1.00%	0.00%	63,000
Ethiopia	102,374,044	10,000	4,500,000	4.40%	1.30%	4,500,000

Gabon	1,738,541	15,000	670,197	38.50%	0.20%	470,000
Gambia	2,009,648	4,000	373,865	18.60%	0.10%	220,000
Ghana	26,908,262	30,000	7,958,675	29.60%	2.30%	3,500,000
Guinea	12,093,349	8,000	950,000	7.90%	0.30%	950,000
Guinea-Bissau	1,759,159	1,500	84,000	4.80%	0.00%	84,000
Kenya	46,790,758	200,000	31,985,048	68.40%	9.40%	5,500,000
Lesotho	1,953,070	4,000	444,376	22.80%	0.10%	290,000
Liberia	4,299,944	500	395,063	9.20%	0.10%	330,000
Libya	6,541,948	10,000	2,800,000	42.80%	0.80%	2,800,000
Madagascar	24,430,325	30,000	1,300,000	5.30%	0.40%	1,300,000
Malawi	18,570,321	15,000	1,160,839	6.30%	0.30%	720,000
Mali	17,467,108	18,800	2,212,450	12.70%	0.60%	1,000,000
Mauritania	3,677,293	5,000	714,132	19.40%	0.20%	370,000
Mauritius	1,348,242	87,000	803,896	59.60%	0.20%	630,000
Mayotte (FR)	243,430	n/a	107,940	44.30%	0.00%	56,000
Morocco	33,655,786	100,000	20,207,154	60.00%	5.90%	12,000,000
Mozambique	25,930,150	30,000	1,834,337	7.10%	0.50%	1,400,000
Namibia	2,224,786	30,000	520,000	23.40%	0.20%	520,000
Niger	18,638,600	5,000	439,164	2.40%	0.10%	280,000
Nigeria	186,879,760	200,000	97,210,000	52.00%	28.50%	16,000,000
Reunion (FR)	867,291	130,000	390,000	45.00%	0.10%	390,000
Rwanda	12,988,423	5,000	3,216,080	24.80%	0.90%	490,000
St. Helena (UK)	3,996	n/a	2,000	50.10%	0.00%	2,000

S. Tome and Principe	197,541	6,500	49,686	25.20%	0.00%	38,000
Senegal	14,320,055	40,000	7,260,000	50.70%	2.10%	2,300,000
Seychelles	93,186	6,000	56,168	60.30%	0.00%	48,000
Sierra Leone	6,018,888	5,000	310,000	5.20%	0.10%	310,000
Somalia	10,817,354	200	660,000	6.10%	0.20%	660,000
South Africa	54,300,704	2,400,000	28,580,290	52.60%	8.40%	14,000,000
South Sudan	12,530,717	n/a	2,179,963	17.40%	0.60%	180,000
Sudan	36,729,501	30,000	10,886,813	29.60%	3.20%	n/a
Swaziland	1,451,428	10,000	389,051	26.80%	0.10%	160,000
Tanzania	52,482,726	115,000	7,590,794	14.50%	2.20%	3,700,000
Togo	7,756,937	100,000	430,482	5.50%	0.10%	340,000
Tunisia	11,134,588	100,000	5,800,000	52.10%	1.70%	5,800,000
Uganda	38,319,241	40,000	11,924,927	31.10%	3.50%	2,200,000
W. Sahara	585,328	n/a	27,000	4.60%	0.00%	23,000
Zambia	15,510,711	20,000	3,167,934	20.40%	0.90%	1,400,000
Zimbabwe	14,546,961	50,000	6,759,032	46.50%	2.00%	850,000
Total	1,185,529,578	4,514,400	340,783,342	28.70%	100.00%	146,637,00

Source: <http://www.internetworldstats.com/stats1.htm>, accessed December 2016.

2.3 Drawbacks of e-government

2.3.1 *Cost of implementation, enhancement and maintenance*

The technological readiness and awareness of the citizens to adopt and effectively use e-government services is critical (Srivastava and Teo 2009; Teo et al. 2008; Venkatesh et al. 2013). However, the technology implementation readiness and digital exclusion are adversely impacted by the socio-political challenges faced by governments, in turn impacting e-governance success (United Nations E-Government Survey: UN-EGS 2016; Cegarra-Navarro et al. 2012; Cloete 2012; Rowley 2011). According to (Abrahams and Newton-Reid) a flourishing e-governance requires an institutional context within which to successfully operate, based on the dimensions of both service delivery and infrastructural requirements. The authors also point to the need for public office reforms that refocuses on good governance and management excellence. These reforms are expected to create fertile grounds for more effective information and service delivery.

2.3.2 *Accessibility of e-government*

The primary role of an e-government is enabling to government information and services to be available, for online access and use (Rose, Persson, Heeaga and Irani 2015). This must consider the needs of all citizens and addressing them in the most convenient and suitable medium designed to be disabled-friendly (Srivastava and Teo 2009). Accessibility also leads to reduction in travel times, the suitability and quality of e-government, convenient online payment facilities and general ease of use of the applications (Cloete 2012).

2.3.3 *Information quality on e-government*

One of the key determinants of user satisfaction and continued use of the online application is the quality of the system and the information it provides (Teo et al. 2009). The UN-EGS (2016) has determined that there is a need for governments around the world, particularly developing countries to improve quality. Other scholars argue that there is a close relationship between quality perceptions and intention to use (Teo et al. 2009).

2.3.4 *Trust in e-government and government*

Given the inherent risks associated with transacting and interacting online, trust as a factor, becomes an essential one (Mostafa and El-Masry 2013; Weerakkody et al. 2013). However, the extent with which trust is established depends on the context and source (Gefen, Benbasat, and Pavlou 2008; Gefen, Karahanna, and Straub 2003; McKnight and Chervany 2002). Typically, the two components that define trust are: trust in the entity providing the information and service, such as government, and trust in the tools used to deliver that particular information and service, for example technology (Weerakkody et al. 2013; Beldad et al. 2011). In the case of government and online government information and service delivery, Reddick and Roy (2013) emphasise that “trust in government arises if citizens have confidence in the government”. Particularly critical to this are the perceptions of integrity and reliability that fosters or destroy trust in the government (Lee et al. 2011; Srivastava and Teo 2009; Belanger and Carter 2008; Benbasat, Gefen and Pavlou 2008). Thus, building trust in government is an arduous and continuous task (Srivastava and Teo 2009).

As a key factor affecting the degree of interaction with the government, trust is rarely explored in the context of e-government developments (Beldad et al. 2012; Lee et al. 2011; Schaupp et al. 2010). Additionally, some of the concerns that affect trust include: design inadequacies (Aladwani 2013), insufficient system capabilities, low network security, shortage of information technology literacy (Venkatesh et al. 2012), the lack of security policies and regulations, as well as the absence of implementation

guidelines. The associated social, management, and financial issues (Aladwani 2013; Lee et al. 2011), and citizen adoption (Schaupp et al. 2010) also impact the e-government use.

2.4 Related works

The studies relating to the implementation, adoption and use are extensive specifically focusing on developing models for e-government implementation (Chen et al. 2006; Al-Busaidy 2011; Reddick 2009), measure adoption and use (Kumar et al. 2007; Belanger and Carter 2006, 2008; Carter and Weerakkody 2008; Shareef et al. 2011). Other unique studies on the impact of digital divide and technology inequalities for the adoption and the intention to use ICT by Zafiropoulos (2012) and Hsieh et al. (2008) found no particular correlation between digital divide and use. Other studies focused on business and organisational development through the use of e-government (Almahamid 2013; Mitrovic and Bytheway 2011). Other researchers have studied the predecessors of service quality in the delivery of e-government as an alternative to service delivery (Tan et al. 2013; Subban, Nzimakwe and Pillay 2007).

Studies that made particular reference to an African country's e-government initiatives were also considered (Asongwe 2012; Subban, Nzimakwe and Pillay 2007). The study by Subban, Nzimakwe and Pillay (2007) outline the use of e-governance as alternative to service delivery in an African context. Asongwe (2012) and Schaupp et al. (2010) reviews the impact of cyber-security and legislative laws in the implementation of e-government in Cameroon. According to Asongwe (2012) poor legislation and political will may negatively impact e-government use. While many studies of e-government describe in detail the various implementation initiatives and how widely used, little research has investigated whether people actually need, want, or effectively use them. Like other online applications, e-government is an IS application where citizens interact with a complex IT system. Therefore, this study is grounded in the e-governance technology adoption literature.

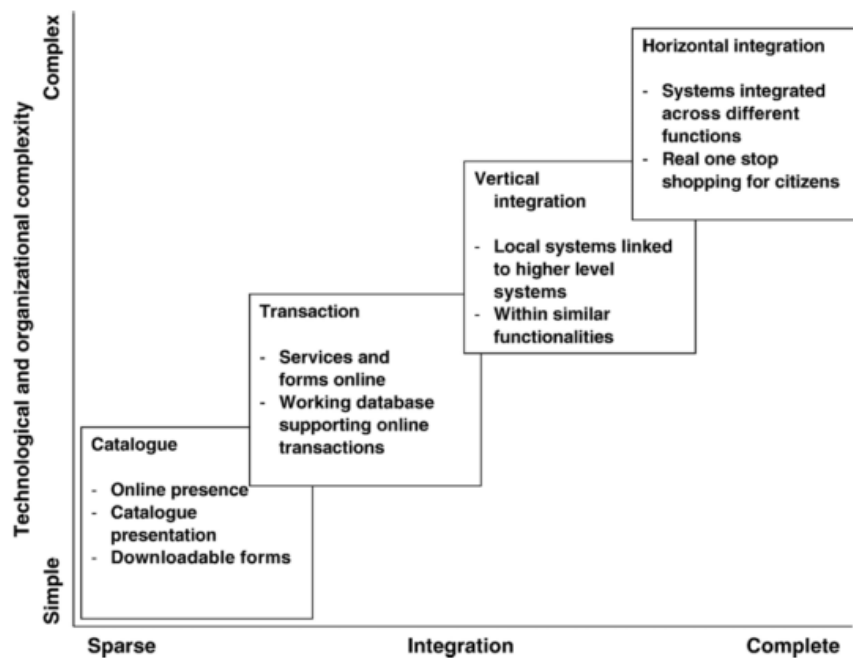


Figure 4: E-government Integration model (Lee & Lavy 2001)

A widely used e-government transition model of Lee & Lavy (2001), which is a maturity model applied in assessing or ranking the evolution of e-government implementations globally (Figure 3). It explains how electronic technologies can be coherently and progressively integrated into public sector management processes to such an extent that public services can become more easily accessible to the public, and can potentially be provided more effectively, efficiently and affordably. It also predicts that the optimal use of these technologies has the potential to lead to a fundamental transformation in the nature of public management itself (Cloete 2003). Evidence presented here indicates that e-government in South Africa has made little progress beyond the information provision stage. A few pockets of excellence do exist, where electronic interaction between government and citizen, and transaction completion, is possible, but these cases are exceptions to the more dismal prevailing practice of static information provision. Additionally, limited evidence exists that suggest that the maturity model has been successfully implemented. This study may set the basis for the COJ managers to potentially use to assess the city's readiness.

2.4.1 *In defining e-Government*

E-government: defined as the use of information and communications technologies (ICT) to improve the efficiency, effectiveness, transparency and accountability of government (World Bank 2011). The e-government definition is grounded on characteristics of improving efficiencies, delivering quality products and services, communicating and outlining policy, economic outcomes and contributing to reform (United Nations 2011). These characteristics may influence the effective use of an online government service delivery applications and trust between (i) residents and government (C2G), (ii) business and government (B2G), and (iii) government and government (G2G), (Ndou 2004).

The concept of e-government has not been clearly conceptualised to create a common understanding of its definition (Helbig et al., 2005). In fact, while other researchers have attempted to define the concept, they have also attempted to define a related concept of e-governance to refer to an activity of electronic governance (Palvia and Shalma 2007). This activity and the content, is independent of an organisation type, therefore cannot be used to refer only to public sector administration activities. For simplicity, and to align to the objectives of this study, the two concepts of e-government and e-governance have been used interchangeably to refer to activities, services and technologies that support the online, digital and electronic information and service delivery by the public sector administrations or governments.

Other colloquial definitions used in literature that include m-government, mobile phone, open governance, digital governance, electronic government (Kyem 2016; Abu-Shanab and Emad 2016; Estevez and Janowski 2013; Alghamdi and Beloff 2014; Lee 2010; Teo and Srivastava and Jiang 2009; Gallant, Culnan and Mcloughlin 2007; Grönlund and Horan 2004), are assumed to also refer to the public sector services and have been uniformly applied throughout this study. Some earlier conceptualisations of the e-government concept are delineated in Table 1.

Table 4: Definitions of E-governments and Variants

Author(s)	Definition
Hernon (2000)	Simply using information technology to deliver government services directly to the customer 24/7. The customer can be a citizen, a business or even another government entity.
Brown and Brudney (2001)	The use of technology, especially Web-based application...efficiently delivers government information and services. They categorize...three broad categories of Government- to-Government (G2G), Government-to-Citizen (G2C), and Government-to-Business (G2B). One may include...Government-to-Civil Societal.
Fountain (2001)	Digital government ... is a government that is organized increasingly in terms of virtual agencies...whose structure and capacity depend on the Internet and Web.... Client organises the virtual agency, following the Web portal model used in the economy.
UN and ASPA (2002)	Utilizing the Internet and the World-Wide-Web for delivering government information and services to citizens.
Jaeger (2003)	It may also include using other ICTs in addition to the Internet and the Web, such as database, networking, discussion support, multimedia, automation, tracking and tracing, and personal identification technologies.

2.4.2 *In defining a Smart City*

The concept of a Smart City, although pervasive in political and academic discourses, it remains fuzzy and narrowly defined (Manville, Cochrane, Cave, Millard, Pederson, Thaarup and Kotterink 2014). Currently, a Smart City is defined as a city seeking to address the needs of residents through ICT-enabled solutions, determined by multi-stakeholder, municipality-based partnership (Manville et al. 2014). Prior definitions of

a Smart City considered its key characteristics, including (i) Smart Economy, (ii) Smart People, (iii) Smart Governance, (iv) Smart Mobility, (v) Smart Environment, and (vi) Smart Living (Giffinger, Fertner, Kramar, Kalasek, Pichler-Milanovic, Meijers 2007). Based on the definitions and characteristics presented, it could be argued whether the City of Johannesburg fits the defined criteria of a Smart City. Manville et al (2004) argue that a city exhibiting any of the six dimensions of a smart city such as:

“Smart People, Smart Economy....defines the ‘smartness’ of that city”. According to Lombardi (2011), the city’s socio-economic and political narrative in narrowing down the information gap defines its smartness. Misuraca (2006) emphasise that the co-existence and seamless IT-driven service delivery makes a city ‘smart’.

A critical aspect of a smart city is the individual and institutional adoption and use of its online services including e-commerce, e-tax and now e-government applications (Roberts, Galluch, Dinger, Grover and Varun 2012; Wang 2003). E-governance enables the delivery of government products and information services to its residents. However, the benefits of adoption and effective use of a smart city e-government are eroded by the lack of trust in the government (Welch, Hinnant and Moon 2005). Figure 5 below encapsulates the relationships between citizens and smart city solutions, the fundamental pillars of a smart city.

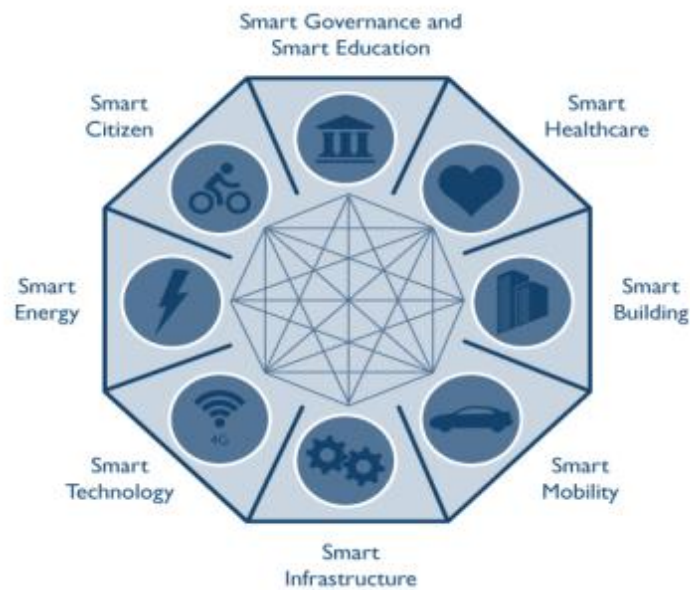


Figure 5: Smart Solutions Diamond (Prakash et al. 2016)

Academic research supporting the definition of Johannesburg as a Smart City is currently limited. Perhaps, for the City of Johannesburg, the ICT initiatives and projects in the city put it in par with other cities around the world that have been defined as smart. Numerous transformational initiatives including the Growth Development Strategy (Accessed: August 2016, GDS2040, www.joburg.org.za/gds2040/intro.php), the Central Johannesburg Partnership project (CJP) and the Urban Review Programme (URP, 2001) were initiated with the aim of enhancing the Smart City ambition (Accessed: June 2015, www.bwired.co.za/smartcities and www.joburg.org.za/gds2040/intro.php).

With infrastructural demands comes the need for an effective government service provision and smarter, more liveable cities (Ramaswami, Russell, Culligan, Sharma and Kumar 2016). Nijkamp et al. (2009) define Smart cities broadly as *“investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance”*.

The smart city concept, according to Ramaswami et al. (2016), hinges integrally on five main components of Urban Form or morphology, which is the human activity and physical spaces. Urban complexity focuses on population density, connectivity, and proximity to key services. Human health and well-being systems, which aims to curb or minimise the negative effects of greenhouse gas emissions as cities congest, as well safety and security features for city dwellers. An effective ICT underpins these for an efficient delivery of government and business information and services.

For the purpose of this study, the definitions presented were applied interchangeably. These definitions were applied to refer to aspects of a Smart City that highlight an ambition and some aspects that focus on operationalisation of the concept of Smart City across all sectors of society.

2.4.3 *In search of e-government factors*

In the search for additional factors that become relevant to the issue of adoption in the specific context of e-government services, literature on barriers to public services on a more general level has been reviewed as well. Gilbert et al. (2004) identify eight factors that are correlated to an individual's willingness to use public services online. Gilbert et al. (2004) did not measure individual's perceptions but identified those factors individuals consider as important when deciding whether to use a public service online. These factors are cost, time, visual appeal, experience, financial security, information quality, low stress, and trust. The study by Nam (2014) highlights other high-level considerations. These factors are Civic Mindedness, Demographic Conditions, and Information Channels, Trust in Government and Psychological Predisposition. Because technology acceptance models are developed in the context of employees rather than online consumer behaviour, a gap may exist in predicting online consumer intention to use e-government.

Majority of the studies have identified barriers affecting use (Rodrigues et al. 2016; UN-EGS 2016; Oseni, Dingley and Hart 2015; Nam 2014; Lee and Levy 2014; Barua

2013; Esteven and Janowski 2013; Pillay 2012). This suggests a need to firstly address the impending challenges that affect usage in general. In this study, another valuable finding is the significance of the difference in age and its correlation to the propensity to use an e-government application. This study is not concerned with these two major findings. However they present fertile grounds for future studies. Table 8 below summarises literature examined and synthesised.

Moreover, Nam (2014) posits that psychological predisposition defines TAM's perceived ease of use (PEOU) and perceived usefulness (PU), including trust, which were among the highest predictors for behavioural intention to use or of actual usage (Teo et al. 2009). The authors found that the credibility, the quality and reliability of the application were key determinants for PEOU and PU. The authors determined that citizens are less likely to continue using online government applications while the credibility and quality of the application and its information is questionable (Rodrigues, Sarabdeen, Balasubramanian 2016; Nam 2014; Azmi 2010; Teo et al. 2009; Agarwal and Karhanna 2000; Teo et al. 2009).

Trust on the other hand, was found to be a determining factor in the citizen's propensity to interact with an online government application for the first time (Chen, Jibilado, Capistrano and Yen 2015; Oseni, Dingley and Hart 2015; Lee and Levy 2014; Pillay 2012; Abrahams and Newton-Reid 2008). Citizens measured trust, as an antecedent to the risk of an online interaction and transaction. This willingness to "act despite the possibility of being disappointed by the actions of another" is what determines trust in online applications (Gallant, Culnan and McLoughlin 2007). Figure 6 depicts typical the factors mentioned above and more that influence affinity to use an online application, in particular and fitting for this study, an e-government application.

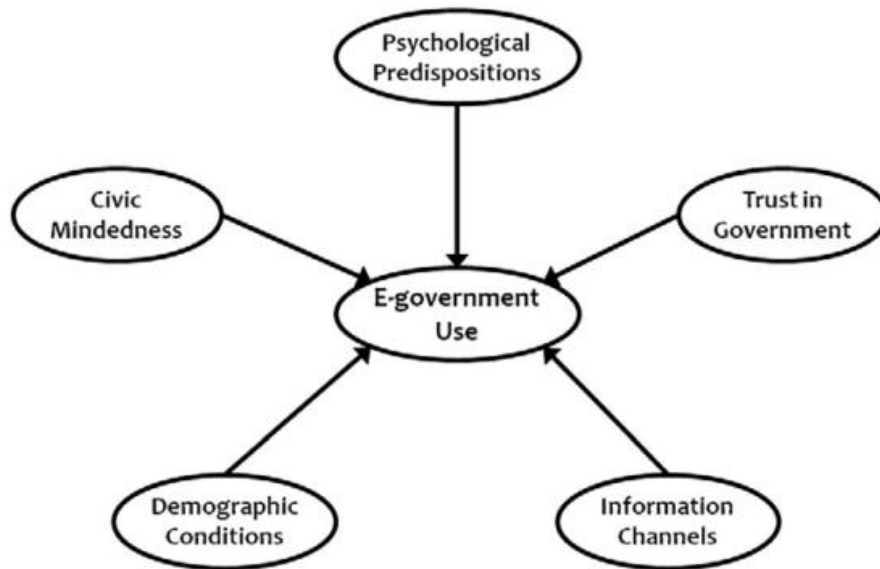


Figure 6: A Typical Topology for online application usage (Nam 2014).

The authors also point to the voluntariness of online interaction, transaction and information transfer. Therefore, the perceived lack of safety or the perceived risk related to online applications affect the likelihood to adopt and use online applications. For example, in their study relating to identity theft, Kahn and Liñares-Zegarra (2016) found that the personal experiences of consumers affected their online transaction patterns. In some instances, the authors found that consumers stopped using online payments facilities altogether. Trust is therefore particularly important, as users are not empowered, by their use of online applications, to influence how their personal information is being used by the subject organisation. Some authors have argued on the existence of a strong relationship between PEOU and trust (Gefen et. al 2015). They posited that an easy to use web-interface conveys a perception of care and commitment by the vendor, which leads to the consumer's responsiveness to trust and use it.

The following table (Table 5) gives a summary of the reviewed works in the areas of use of IS and e-government applications. The table shows variables that affect use,

including the social and behavioural effects of use (Hsieh et al. 2008; Zafiroopoulos 2012; Belanger and Carter 2008; Reddick 2009; Schaupp et al. 2010). Various studies highlight the digital divide as it affects use, as well as the organisational effects such as agility to support use of IS (Almahamid 2013; Tongia 2012; Mitrovic and Bytheway 2011). In other studies, proposals are made for models that can be used to measure e-government adoption and use, while others evaluated the strategies for e-government implementation and use by citizens, including small-medium business (Chen et al. 2006; Kumar et al. 2007; Al-Busaidy 2011; Tan et al. 2013; Mitrovic and Bytheway 2011).

Some other studies attempted to determine whether the same factors are present in e-government adoption in different countries (Carter and Weerakkody 2008). While other studies combine theoretical models to create a unified model for factors that influence adoption and use (Carter and Belanger 2005). One study empirically tested the taxpayers' intentions to e-file while security emerged as key factor encouraging adoption and use (Schaupp et al. 2010). The present study evaluated these studies to help conclude on the objectives of this study. The initial results show correlational effects of user behaviour on e-government use. The results are presented in Chapter Four and further discussed in Chapter Five.

Table 5: Literature Review, Factors for E-government Use

Source	Summary	Context	Purpose of Study	Variables Examined
Hsieh et al. (2008)	The study reviews the technology inequalities on continued use of e-government applications.	Socio-economic factors that influence e-government adoption and use	Causal implications on continued use	Digital inequalities, Continued use
Tongia (2012)	The study reviews the impact of country collaboration to influence continued use.	E-government impact on country democracy	Theoretical Framework application	Usage
Kumar et al. (2007)	The research proposes a model for measuring e-government adoption and use.	Theoretical design for linking e-government system acceptance	Theory development	Media use habits, social locators, communication needs, media use habits, and relationships with technology
Al-Busaidy (2011)	The study evaluates the strategies for e-government implementation.	Internal and external pressures that influence E-government adoption and use and use.	Literature review, conceptual design and model testing	Usability, Security, Online and Communications
Almahamid (2013)	The study reviews the links between	Organisational agility	Theoretical	Perceived Ease Use,

	agility of the organisation and e-government factors that influence this.	and e-government adoption and use	framework development	Intention to Use, Attitude Towards, Perceived Usefulness, Actual Usage.
Chen et al. (2006)	The study reviews the strategies that developed countries use to implement e-government.	E-government development strategies	Conceptual framework design	National e-government factors, Culture factors, Society factors,
Zafiropoulos (2012)	The study reviews the digital divide gaps of teachers and user willingness to use e-government application.	Assessing the Adoption and use of e-Government Services by teachers, from Greece perspective	Theoretical model proposition	Trust, Perceived Risk, Image, Subjective norm and Output quality, TAM and DoI constructs
Mitrovic and Bytheway (2011)	E-government services to support small-medium business.	Citizens perceptions of E-government, small business support	Grounded theory methods	Factors for effective inter-based support system for small business.
Belanger and Carter (2008)	This model attempts to identify the characteristics of trust in e-government and its impact on citizen adoption and use and intention to use e-government.	E-government trust	Conceptual model	Perceived Trust

Shareef et al. (2011)	The research attempts discovery of the critical factors that enable citizens to adopt e-government at different stages of service maturity.	E-Government adoption and use factors	Conceptual Model	Perceived Awareness, Perceived Ability to Use, Perceived Trust, Perceived Information Quality
Belanger and Carter. (2009)	This study develops a model to understand factors that influence the digital divide and how this impacts adoption and use of e-government.	Digital Divide impact on E-Government		Intention to Use, Ethnicity, Income
Carter and Weerakkody (2008).	This study attempts to determine if the same factors are present in e-government adoption and use in the U.S. and U.K.	E-Government cultural comparison	Conceptual Model	Intention to Use, Trust, Culture
Carter and Belanger (2005)	This study combines elements from the technology acceptance model (TAM), the diffusions of innovation theory (DOI) and Web trust model to create a model for factors that influence citizen adoption and use of electronic government.	E-Government adoption and use	Conceptual Model	Intention to Use, Perceived, Usefulness, Perceived Ease of Use,
Reddick (2009)	The study examines the perceptions of	E-Government	Conceptual Model	Security and Privacy

	government officials on the effectiveness of e-government.	effectiveness		Perceived Relative Advantage, Perceived Compatibility
Schaupp et al. (2010)	Empirical study of U.S. taxpayers' intentions in e-file adoption and use. The results indicated that ensuring that citizen information is secure encourages adoption and use.	E-government adoption and use	Conceptual Model	Intention to Use, Trust, Perceived Risk, Performance Expectancy
Tan et al. (2013)	Empirical study the predecessors of service quality in the service delivery via e-government.	Service Quality in E-Government delivery	Conceptual Model	Service Quality, E-Government Quality
Subban, Nzimakwe and Pillay (2007)	E-governance as alternative to service delivery in an African context.	e-government implementation	Conceptual model	Service delivery, e-government
Reddick (2005)	The study examines citizen interaction with the government.	Citizen interaction with E-government		E-Democracy, Citizen interaction

2.5 Theoretical Frameworks

The study bases its theoretical lenses on two prominent theories of SDT (Deci and Ryan 2000; 1985) and UTAUT (Venkatesh et al. 2016; 2003; 2012), to explain the motivation to use and the effective use of Information Systems. Deci and Ryan (2000) posit that the reasons or goals that give rise to use an information system are both intrinsically and extrinsically linked. On the other hand and according to Burton-Jones and Grange (2011), the benefits of a proposed information system can be maximized when the system is used effectively. Burton-Jones and Grange (2011) posit from a Representation theory, that the effective use of IS relates to the nature and purpose of that system. The effective use of Information Systems, although predicted as an emerging future study in IS research, has rarely been studied. This section presents theoretical lenses for this study.

2.5.1 Self-determination Theory - SDT

The Self-Determination Theory (SDT) distinguishes between the two main motivation types viz. intrinsic motivation and extrinsic motivation. This theory, first published in 1971 (Deci 1971), was empirically derived through numerous experiments to test extrinsic motivations on intrinsic rewards (Deci and Ryan 2011). The theory evolved and led to further research around the motivation concepts of being controlled and autonomous. Deci and Ryan (2011) defines control as comprising of “externally controlled and introjection motivations, whereas autonomous motivations encompass intrinsic motivations and identified/integrated external motivations. Whilst the theory’s evolution has been widely used spanning a period of over 30 years since the 1970’s, it is still relevant and widely applied in IS studies to study human behaviour within the social context (Deci and Ryan 2000; 2011; 1985, Deci 1971). The theory looks particularly at the effects of social environments on people’s attitude, values, motivations and behaviours. According to this, three psychological needs of competence; autonomy and relatedness must be present to lead to optimal development and functioning.

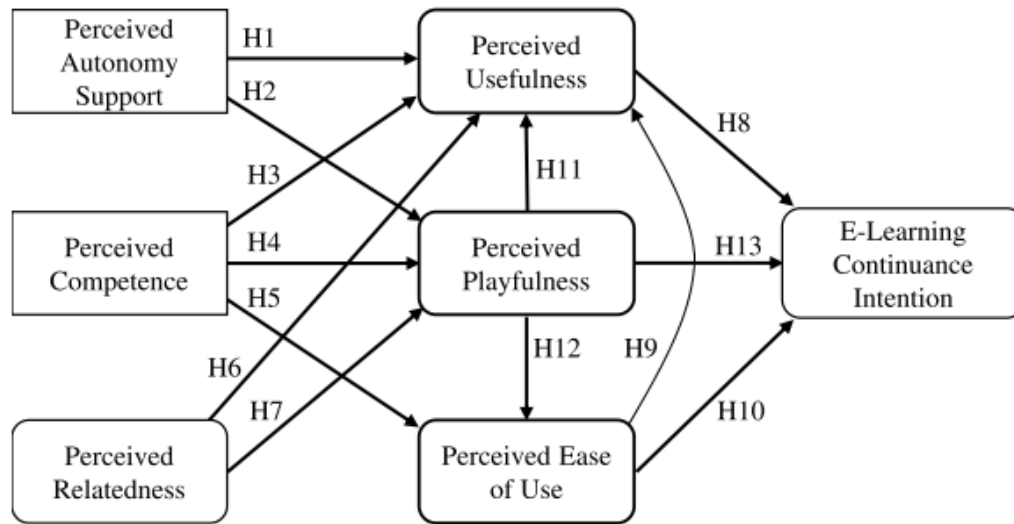


Figure 7: SDT Conceptual Model (Gagné 2008)

The theory focuses on the effect of reward or recognition in the achievement of actions or goals. In IS, the theory has been applied to study: e-Learning continuance intention in the workplace (Roca and Gagné 2008), User acceptance of computer technology (Davis, Bagozzi, and Warshaw 1989) and teachers motivations to continue to use e-learning technology (Sørenbø, Halvari, Gulli, and Kristiansen 2009), information security policy compliance (Bulgurcu, Cavusoglu, and Benbasat 2010) and definition of gamification, knowledge sharing in virtual communities (Lee, Cheung and Chen 2005) and Critical success factors in e-learning (Davis, Bagozzi and Warshaw 1992).

2.5.2 Unified Theory of Acceptance and Use of Technology - UTAUT

The UTAUT has previously explored the adoption and use of Information Systems (Venkatesh et al. 2003). UTAUT has direct determinants of behavioural intention and usage: (i) Performance Expectancy, which is “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (Venkatesh et al. 2003); (ii) Effort Expectancy, which is “the degree of ease associated with the use of the system” (Venkatesh et al. 2003); (iii) Social Influence, which is “the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al. 2003); and (iv) Facilitating Conditions, which is “the degree to which an individual believes that an organisational and technical

infrastructure exists to support the use of the system” (Venkatesh et al. 2003). These determinants are mediated by age, gender, experience and voluntariness.

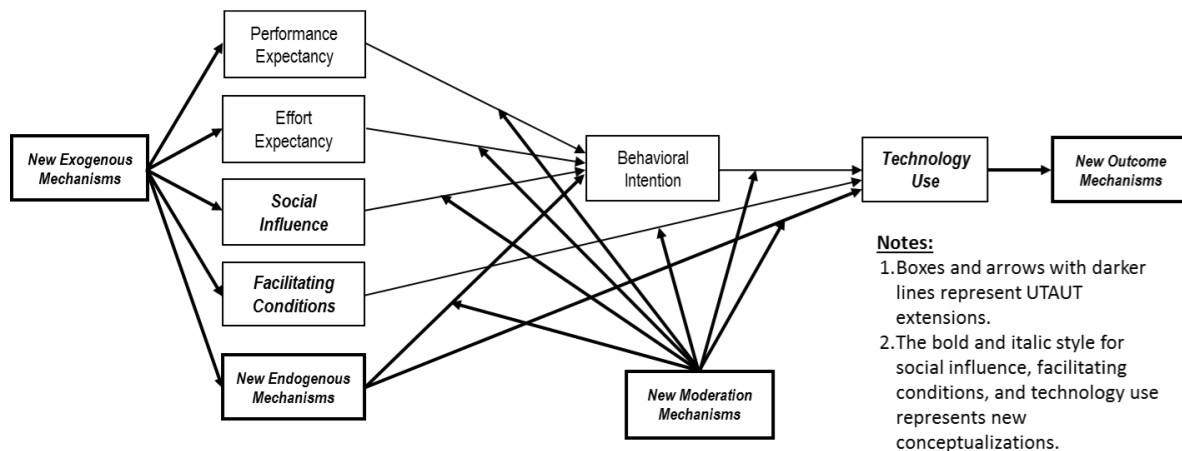


Figure 8: Types of UTAUT Extensions (Venkatesh et al. 2012)

Venkatesh, Xu and Thong (2012) identified gaps in the application of the original UTAUT in differing settings through an extensive review of literature. For instance, in organisation settings, *Effort Expectancy* is assessed in terms of time and effort for Effort Expectancy in general. Based on this, Venkatesh et al. (2012) have integrated three additional determinants of hedonic motivation, price value, and habit/experience into UTAUT. This view considers technology use contextually by varying user types and across varying industries. Hedonic motivation is defined as the fun or pleasure derived from using a technology, and it has been shown to play an important role in determining technology acceptance and use (Brown and Venkatesh 2005). Price value in non-organisational setting refers to an instance where a technology use bears the monetary cost of such use. This differs to the organisational setting, UTAUT’s origins, where employees do not bear any monetary cost in the use. Experience is defined as the experience of technology based on passage of time (Venkatesh et al. 2012); while Habit is defined as the extent to which people tend to perform behaviours automatically because of learning (Limayem, Hart and Cheung 2007) or automaticity according to Kim and Narasimhan (2005).

Recently, UTAUT (2016) has been proposed and conceptualised to consider 37 additional extensions of behavioural intention (Venkatesh, Xu and Thong 2016). Venkatesh et al. (2016) categorise these extensions into four main extension types: New exogenous mechanisms, which refers to the impact external predictors such as, leadership on performance, on the four UTAUT determinants. New endogenous mechanisms, refers to the impact of new predictors on behavioural intention and use behaviour, or the enrichment of the four UTAUT determinants on behavioural intention and use behaviour, which for instance looks at the influence a department such as Marketing has on use (Venkatesh et al. 2016). New moderating mechanism looks at additional moderating effects of use on new relationships, where for instance experience moderates the relationships between behavioural intention and use Venkatesh et al. (2016). The New outcome mechanisms refer specifically to the consequences of intention and use from the original UTAUT Venkatesh et al. (2016), where for instance, performance is a consequence of behavioural intention and use (Venkatesh et al. 2016).

This study drew on the four main determinants of use in UTAUT and used self-efficacy to determine the moderating effect on these main determinants. Because the determinants that lead to the effective use of an e-governance application are generally perceptive and undetermined for a COJ e-government application, the study has explored use based on UTAUT first before concluding on the effective use. Key constructs are conceptualised in Figure 9.

2.6 The Research Model, Hypothesis and Measurements

The questionnaire used for this study comprised of five parts. Part One had 3 items Likert intending to understand two things: the respondent's knowledge of a Smart City agenda and their knowledge of the services available on the joburg.org.za application. Part Two was intended to obtain the respondent's use and experience of the joburg.org.za application. A frequency scale was applied to understand the frequency at which the respondents interacted with the jobur.org.za application to attain the desired services. Part Three of the questionnaire was intended to understanding of

how well the respondents used the joburg.org.za application. A five-point Likert was applied to assess the chosen variables. Part Four of the questionnaire is intended to obtain the profile of the respondents, including demographic, work experience and level of education.

2.6.1 Research Model

The research model supporting the study is shown below (Figure 9) and was adapted from UTAUT and SDT frameworks. As used in previous studies, UTAUT variables (Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions) have been applied to measure use and combined with other constructs of SDT (Perceived Competency, Relatedness and Autonomy) to assess the effects on the Actual Usage and Effective Use. The research model included one individual difference of self-efficacy to moderate the relationship between UTAUT and SDT. The selection of variables are supported by prior studies in IS literature.

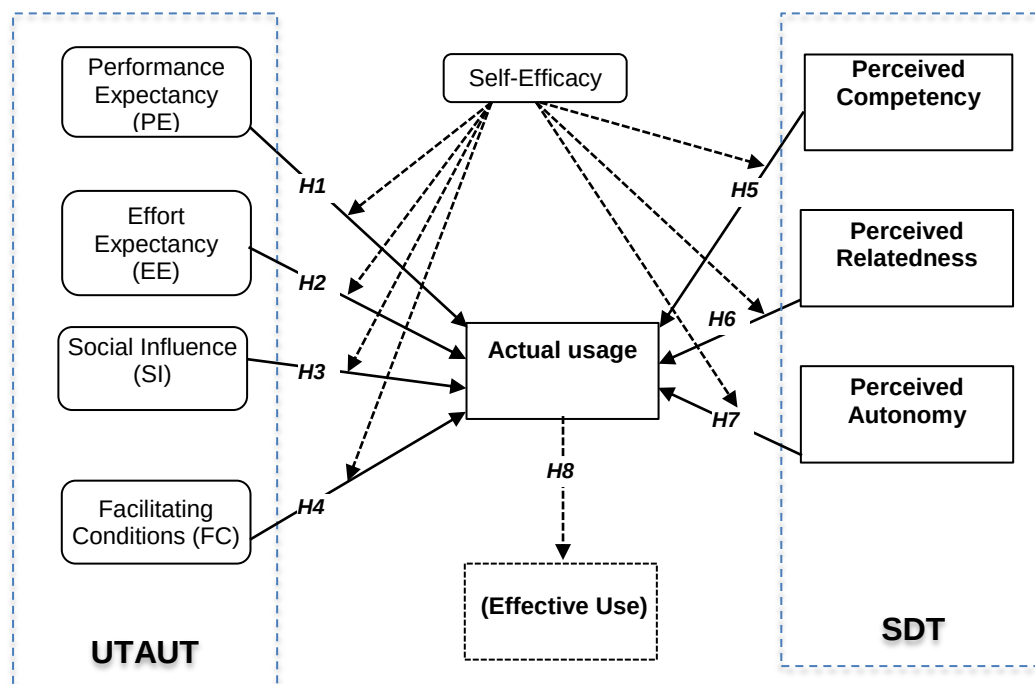


Figure 9: Research Model

The research model shows the envisaged or hypothesised relationship between the constructs and variables. The results presented in Chapter Five.

2.6.2 Moderator and hypothesis

In this section, hypotheses that examine the relationships between the key determinant of use and the motivation to use an e-government of an African smart city application are proposed. These determinants were moderated by self-efficacy measures to determine the strength of the relationships.

Performance Expectancy

Performance Expectancy is defined as the degree to which using a technology will provide benefits to consumers in performing certain activities (Venkatesh et al. 2012). Performance Expectancy has been found to be a strongest predictor of intention (Venkatesh et al. 2012; Bandura 1997; Gist and Mitchell 1992; Marakas et al. 1998). Previous studies, both in IS and non-IS, have attempted to make a clear distinction between self-efficacy and Performance Expectancy. Similarly, in this study, measures of performance were examined against the moderating factor of self-efficacy and not as a direct determinant of Actual Usage. Therefore, the study proposed that:

H1: Performance Expectancy has a positive effect on the Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy.

Effort Expectancy

Defined as the degree of ease associated with consumers' use of technology, Effort Expectancy has been likened to self-efficacy (Vroom 1964) and more recently Vroom's (2011) Expectancy theory posits the strong relationship between user's effort and their outcomes of usage, performance. Venkatesh et al. (2003) posits that there is a positive relationship between Effort Expectancy and usage of e-government

application. The effects of Performance Expectancy, Effort Expectancy, and Social Influence on behavioural intention are moderated by individual characteristics of self-efficacy. To assess this relationship, the study proposed that:

H2. Effort Expectancy has a positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy.

Social Influence

Although Social Influence has been found to vary across studies (Venkatesh et al. 2011), the significance of “one perceiving that his or her significant others believed that they make use of an information system” is significant enough for this study. According to Vries, Backbier, Kok and Dijkstra (1995) Social Influence determinant correlated significantly with intention and behaviour. This is in line with this study to measure the moderating effects of self-efficacy on the user’s Social Influence to use an e-government application as well as measure actual usage of that application. For this purpose, the study proposed that:

H3. Social Influence has positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy.

Facilitating Conditions

The study focused on the individual’s usage of an e-government application to assess that individual’s perceived beliefs of being supported. For purposes of this study, the technical infrastructure and organisational proposed by Venkatesh et al. (2011) will be at an individual level or from a point of view of COJ resident using an e-government application. Therefore, the study proposed that:

H4. Facilitating Conditions have positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy.

Perceived Competence

Perceived Competence is the individual's perception of themselves to be competent in their interactions with an online application and when they perform an activity (Roca and Gagne´ 2008; Elliot and Thrash 2002; Ryan and Deci 2000; Deci and Ryan 1985a, 1980). This means that a user is perceived to be more motivated to use a system when they feel competent. Perceived Competence gives an individual the feeling of being more competent to use a system because they are unobstructed by the anxiety to use that technology, resulting in actual and effective use of that technology (Burton-Jones and Grange 2011).

Prior research, including Cognitive Evaluation Theory (CET: Ryan and Deci 1985; 2000) and Self-Determination Theory (Deci and Ryan, 1985a) has looked at Perceived Competence as a determinant of Actual Usage. Self-efficacy studies have also demonstrated the distinct difference between self-efficacy and Perceived Performance to Perceived Competence. These studies emphasised on the strength of the relationship between the determinants of Perceived Performance, Self-Efficacy and Perceived Competence (Omoniyi and Quadri 2013). Therefore, this study proposed that:

H5: Perceived Competence has a positive influence on Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy.

Perceived Relatedness

Baart et al. (2004) further posit that relatedness, which is the feeling of support an individual's performance, which is a consequence of their actions to satisfy a specific need, is most strongly related to performance. Performance is considered strongly linked as an outcome of effective use (Burton-Jones and Grange 2011). Therefore:

H6: Perceived relatedness has a positive effect on Actual Usage of an e-government application effectively and this relationship will be moderated by self-efficacy.

Perceived autonomy

The concept of extrinsic motivation bases its conceptual founds on the perceived autonomy construct of an individual. It posits that a user is autonomous when they have the “desire to self-organise their actions and when the individual can freely pursue an activity and feel volitional in doing so” (Roca and Gagne´ 2008, Ryan and Connell 1989; Deci and Ryan 1987, 1985a).

In perceived autonomy, the user’s desire propels them to act and self-organise in order to complete a specific task or use a system (Baard, Ryan and Deci 2004). These studies have noted a close correlation between autonomy-driven actions and usage (Xu et al. 2013; Roca and Gagne 2008; Baard et al. 2004; Ryan and Deci 2000). Therefore the study proposed that:

H7: Perceived autonomy has a positive effect on Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy.

Actual Usage

Actual Usage and perceived usage have been found to be incongruent and contentious at times, but not similar (Devaraj and Kohli 2003). Little evidence exists showing a non-subjective view of usage (Devaraj and Kohli 2003). For purposes of this study, Actual Usage was assessed from user’s perspective. The laboratory-like objective examinations and assessments undertaken by Devaraj and Kohli (2003) are not intended for this study. Therefore the study proposed that:

H8. Actual Usage has a positive relationship and is inferable to effective use of an e-government application.

Self-efficacy

Although previously verified to have little to no impact on the actual behavioural intention to Actual Usage, self-efficacy in this study will be assessed to determine its correlation with other determinants of use. According to Yu (2012), self-efficacy has in fact an effect on the intention to use. Self-efficacy is also considered in this study as a moderating factor for determinants of Actual Usage (Yu 2012; Venkatesh et al. 2012; Brown and Venkatesh 2005; Venkatesh et al. 2003).

2.6.3 Measurements

In order to identify the actions and behaviours that lead to use and subsequent effective use, the research draws from SDT and UTAT. The SDT asserts that the users are intrinsically and extrinsically motivated to use technology. Motivation in this case means: *“to be moved to do something”* (Ryan and Deci 2000).

The study adopts UTAUT focusing on direct determinants of behavioural intention and usage. The last determinant, behavioural intention was replaced with Actual Usage, as a proxy in determining effective use. This was to satisfy the objective for this study. Most constructs have used a 5-point Likert scale adopted from prior studies (Deci et al., 2001; Gagne´ 2003) that have employed similar approach. The scales were anchor items from 1 to 5, where 1 corresponds with “Strongly Disagree” and 5 corresponding with “Strongly Agree”. Participants were also asked the frequency of their use. A response option “I have not used it before” was to establish Actual Usage. Table 6 presents definitions and measurements for this study.

Table 6: Definitions and Measures

Variable	Definition	Sample measurement Items
Performance Expectancy Venkatesh et al. (2012)	Degree to which using an e-government application will provide benefits to COJ residents in performing certain activities.	• Using the e-gov. application would improve my performance • Using e-gov. application enables me achieve tasks more quickly • I would use e-gov. application anyplace • I would find e-gov. application useful
Effort Expectancy Venkatesh et al. (2003; 2012)	Degree of ease associated with COJ resident's use of an e-government application.	• Learning to use e-gov application is easy for me • Becoming skilful at using e-gov application is easy for me • My interaction with e-gov application is clear and understandable • Interaction with e-gov application is easy for me • I would find e-gov application is easy to use
Social Influence Venkatesh et al. (2012)	Extent to which COJ residents perceive that important others (e.g., family and friends) believe they should use an e-government application.	• People who are important to me think that I should use e-gov. application • People who are familiar with me think that I should use e-gov. application • People who influence my behaviour think that I should use e-

		gov. application • Most people surrounding with me use e-gov. application
Facilitating Conditions (Venkatesh et al. 2012; Brown and Venkatesh 2005); Venkatesh et al. 2003)	The COJ residents' perceptions of the resources and support available to perform a behaviour.	• My living environment supports me to use e-gov application • My working environment supports me to use e-gov application • Using e-gov application is compatible with my life • Help is available when I get problem in using e-gov application
Self-efficacy (Yu 2012; Bandura 1977)	A basic belief in COJ resident's ability to exercise control over challenging demands and over the resident's functions.	I could use e-gov application: • If I had the built-in help guidance for assistance • If someone showed me how to do it • If I had seen someone else using it • If I could call someone for help Source: Yu (2012)
Perceived Competence (Ryan and Deci 2000; Burton-Jones and Grange 2011; Baard et al. 2004)	COJ resident feeling that they are able to take specific actions with intent to yield specific outcomes and succeeding optimally at completing challenging tasks. Including the ability to navigate the application unaided.	• I could complete my online activities using the e-gov application if I had never used an application like it before • I feel confident in navigating the e-gov application by following hyperlinks Source: Roca and Gagne' (2008).

Perceived autonomy (Ryan and Deci 2000; Burton-Jones and Grange 2011; Baard et al. 2004)	COJ residents' desire to self-organise their actions and when the resident can freely pursue an activity and feel volitional in doing so. This could include successfully processing online payment.	• I feel a certain freedom of action when using e-gov application • I feel a certain freedom of action in this e-gov application • I feel that e-gov application provides me choices and options • The e-gov application customer support agent understands my needs fully before making suggestions <i>Source: Chen and Jang (2010)</i>
Perceived relatedness Roca and Gagne' (2008)	The need by COJ resident to feel connected and supported by important people. Including the COJ support function.	• I feel more comfortable in using an e-gov application when support is provided timely by a consultant • I feel comfortable logging my query on the e-gov application when I have the confidence that it will be resolved. <i>Source: Deci et al. (2001); Gagne' (2003)</i>
Actual Usage (Devaraj and Kohli 2003)	The extent to which the COJ resident feels that the e-government application helps them achieve their goals."	• When I use the e-gov application to pay my rates and taxes, • I am confident that my payments are successful" • I feel confident that I can access the e-gov application with ease <i>Source: Burton-Jones and Straub (2006)</i>

Summary of the Chapter

This chapter analysed literature to support the task of conceptualising the terms: e-government, and Smart City, as well as that of theory development and factor identification. The UTAUT and SDT, as philosophical approaches underpinning the study principle of e-governance, focused on literature that related to a developing city. Also in this chapter, further research strategies are described.

CHAPTER THREE

RESEARCH METHODOLOGY

3 Introduction to Research Methodology

The chapter presented the study's methodological development and research model evolution. Initial sections of this study present the main research philosophical paradigms commonly used in similar studies, with an intention to select a suitable one for this study. The later sections of this study present the study design, the intended study populations, samples and proposed data collection and analysis methods. The study finally makes some concessions inherent in this study methodology that may threaten the study objectives.

3.1 Research paradigm and approach

The differences and similarities between Interpretivist and Positivist research paradigms continue to discourse scientific research. Although both are herein delineated, this study undertook a positivist route. As the proposed research project aimed to establish a correlational effect of variables of motivation and effective use, a deductive and quantitative approach was deemed best suited to achieve the study objectives. This research approach was consistent with other similar studies of use, including The Technology Acceptance Model (TAM: Davis 1989), the Theory of Reasoned Action (TRA: Fishbein and Ajzen 1975), the Theory of Planned Behaviour (TPB: Venkatesh and Davis 2000) and the Self-efficacy theory (Bandura 1986).

The theories and models of use mostly followed a positivist approach and assessed the determinants of use in so far as they related to behavioural intention to use an

Information System. Venkatesh et al. (2003) identified the similarities in the competing theories of use and proposed a subsequent model of UTAUT to synthesise the key determinants of use across the theories. This study has also adopted the determinants and measurement items consistent to the positivist philosophy, defined in the theories and models of use and behavioural intention.

3.1.1 Positivist

The positivist paradigm asserts that social constructs, knowledge and social realities of a study are independent from a researcher who is an external and non-participative objective actor (Bhattacharjee 2012; Orlikowski and Baroudi 1991). This paradigm employs large-scale sample surveys and laboratory experiments. These data collection techniques allow for controlling out of antecedents and for methodological manipulation (Bhattacharjee 2012; Orlikowski and Baroudi 1991). Positivist paradigm is based on the “Verification Principle” in which the factual outcome is conveyed through testable quantitative data from a perspective of an observer or researcher (Gregor 2006). Positivist paradigm does not attempt to give a causal reason or explanations, but rather provide quantitative empirical evidence for the development or enhancement of a theory (Bhattacharjee 2012; Gregor 2006).

In contrast to Interpretivist paradigm, the positivist research paradigm does not provide qualitative conclusions on the social or behavioural reasons for a phenomenon. It therefore does not lend itself to substantive or in-depth qualitative analysis of ‘why things happen or happen in a certain way’ (Bhattacharjee 2012; Puhakainen and Siponen 2010; Gregor 2006). Positivist paradigm aims to test theories and propositions from collected data rather than moving from a non-presumed position to uncover the ‘black box’ (Leitch et al. 2013; Gregor 2006). Although positivism has been criticised for its lack in ontological and epistemological quality characteristics, its neutrality on observed phenomena to identify “law-like generalisations to account for what was observed” strengthens its applicability (Leitch et al. 2013).

3.1.2 Interpretivist

An Interpretivist paradigm on the other hand considers that the study's social constructs and the subjects are intertwined and collectively studied within the socio-political context of the participants, and the researcher is a participant (Leitch et al. 2013; Bhattacharjee 2012; Orlikowski and Baroudi 1991). As previously argued by Orlikowski and Baroudi (1990), that the *“more we realise that information processing is more about the social perspective, the more it is clear that a new paradigm needs to be adopted, an Interpretivist paradigm”*.

The primary aim of Interpretivist research is to understand the individuals' reaction and behaviours and their impact on the social processes (Bhattacharjee 2012; Orlikowski and Baroudi 1991). Therefore the interpretive research paradigm is premised upon a progressive and emergent social process, presumed from the unknown. It is a process of theoretical construction through which the social-political realities of the subject to gain understanding of 'the why' of a phenomenon is understood (Yin 2013; Bhattacharjee 2012). As posited by Gregor (2006), the end product of Interpretivist research is therefore to build towards a theoretical viewpoint rather than towards a predictive and deterministic perspective, relating to quantitative patterns.

The research methodologies that fit well with this paradigm include case studies, surveys, and ethnography and field studies (Bhattacharjee 2012; Gregor 2006). These methodologies lend themselves to a predictive rather than an empirical perspective. For example, an action research methodology employed in a behavioural research by Puhakainen and Siponen (2010) to understand employee compliance to security requirements was conducted from an Interpretivist perspective. The authors undertook an action research to determine compliance to information security where training, as an intervention, was introduced.

As argued by Puhakainen and Siponen (2010), this method of action research is suitable as it allows direct involvement by the researcher to determine a substantive analysis, as proposed by Walsh (2006). The Interpretive research paradigm tends to take longer and relies heavily on the quality of evidence from the study sites with similar characteristics and size. Leitch et al. (2009), demonstrate the intense process of data collection, analysis and interpretation they have undertaken in their research.

3.2 Research Design

This study undertook a relational study approach from a quantitative positivist perspective. The study initially aimed to assess a direct correlational effect of a dependent variable on an independent variable of an e-government application usage. As with similar candidate studies reviewed as part of this study (Venkatesh and Goyal 2011), the relationship between a dependent and an independent variable, insofar as it related to the behavioural motivations that resulted in the usage of information technology, within the context of a Smart City, were examined. The theoretical underpinnings for behavioural studies that examined the attitude of citizens toward new technology are varied and included for instance the Expectant Disconfirmation theory (Venkatesh and Goyal 2001). To this end, the key fundamental principles that have been considered in the choice of this study have been delineated below.

Generalisability

The study has used a cross-sectional survey for data collection, in a form of an online questionnaire that has strong external validity. The study data has been collected from real-life organisational setting of a financial services institution, in South Africa. The constructs can be controlled against extraneous influences (Bhattacharjee 2012). The study drew from established behavioural theories including theories of Self Determination and UTAUT. These theoretical foundations further strengthen the generalisability of empirically tested results. However, it was not the intention of this study to provide multi-disciplinal generalisability, but to apply already established theories to formulate a case beyond the behavioral realm of use to that of value-

derived effective use theories. This refutes the present discourse that the bridge between academic research and its practical applicability is ever-growing.

Hypothesis

The relationships between the predictive propositions were empirically tested to evaluate the motivations of actual usage and inferentially predict the effective use of an e-government application. The level of an on-line government application use to derive value and the variables that affect usage, such as trust, were hypothesised and measured. The results are presented in Chapter 4.

Parsimonious

The results of this study provided explanations of behavioural motivations of actual usage, which explained the effective use of an e-government application for delivering essential government information and services to citizens. The validity and reliability construct correlations (Cronbach alpha – 0.98 and standard deviation of over 1) were tested. The study also demonstrated a correlation between a dependent and independent variables by testing the various factors impacting the same variables.

Falsifiability

At the core of scientific and the most essential demarcation of a scientific research is the testability or temporality of its theories. For example, the theory purporting the roundness of the earth has been consistently proven false and as Popper (1959) said, the events that caused this theory to be abandoned were scientific in nature. This research project is falsifiable and provided the basis for further research into the application of combined behavioural theories of SDT and UTAUT. This further provided this study a basis for a substantive evaluation and assessment of the dependent variables on actual usage and effective use of a government application, within the context of an African Smart City.

Specific

The research specifically and precisely evaluated the correlational effect of user behaviour and the usage of an e-governance application in order to infer its effective use, for the City of Johannesburg (COJ). For purposes of the study, all other online applications including the tax e-filing application were excluded from this study. This approach limited the focus of the study and channelled responses to a specific e-government application, that of the City of Johannesburg.

3.3 Sampling frame

The study was relational and applied a survey method for data collection. An online questionnaire was administrated to a population of over 6000 respondents of a top financial services institution. The respondents' age ranged from 25 to 40. The respondents were treated as elements of this study and their identity anonymised. The sample size selected 350 respondents and a non-probability sampling was used for the study.

The respondents were residents of the COJ. Although this sampling strategy is perceived to suffer sample biases because it systematically excludes other population of online government application users may be systematically excluded (Bhattacharjee 2012), the method is suitable given the time limitations of this study.

3.4 Population

The population for this study includes every resident of the City of Johannesburg. However, for purpose of this study and ease of access of the population was confined to a Financial Services Provider. This is because of accessibility of the study unit and convenience of data collection. The chosen financial services institution had a national footprint of over 36000 employees countrywide. The study sampled participants in the ages of between 24 and 40s across all demographics within a department of a financial services institution that reside in the COJ municipality,

Gauteng province. The chosen technology department had a total of between 4500 to 6000 employees.

Sample

Although the study had aimed to distribute 3000 questionnaires to participants via the internal Research and Development (R&D) department, an alternative method was followed. The experience of the R&D department increased participation and the follow-up. However this approach required extensive bureaucratic conformance, therefore not desirable. A targeted approach was instead undertaken with the technology department from which study sample was selected.

3.5 Data Collection

A structured questionnaire was administered to participants for data collection. The instrument was developed in such a way that was simple and in understandable language. Specific, open-ended and positively written statements were used to increase reliability and validity of data. Where responses were misunderstood, subjective or incorrectly answered, these were excluded in order to remove any potential measurement errors. These errors could result from respondent fatigue or simply lack of interest.

Validity and reliability

The results of this research study provided some explanations of behavioural motivation to use e-governance and to use it effectively. Validity and reliability were tested with construct correlations (Cronbach alpha – 0.98 and standard deviation of over 1). The study has demonstrated a correlational relationship between a dependent and independent variables by testing the various factors impacting the same variables. The techniques and tools used to test reliability and validity, for this particular research methods and strategies, included the regression tests or scale

tests, factor analysis using modelling tools like PLS and SEM. A cross-sectional questionnaire, which are highly generalizable providing scope for controlling out extraneous variables, were used to collect data (Bhattacharjee 2012; Karahanna, Agarwal and Angst 2006; Gefen 2002).

3.6 Data Analysis

Initially, a pre-test was conducted (Nevo and Wade 2011), on a sample of departmental employees, with relevant permission from the head of department and sign-off from the institution's ethics head. The aim of this is to assess the reliability of the survey instrument prior to administering it to a larger population. The collected data was statistically tested from the basis of answering the "what", "who" and "how many" questions as posited by Yin (2003). For instance, lab experiments are high in internal validity and low in external validity because the lab environment does not represent real-life complexities. Therefore this technique was not suitable for this study as it aimed to generalise the results and use it other contexts.

Techniques such as t-tests and confirmatory factor analysis were used to measure discriminant and convergent reliability of variables i.e. correlational effect of constructs with each other (convergent) and with other constructs (discriminant). These tools helped in avoiding or minimising common method bias, construct validity errors and statistical conclusion errors such as type 1 and type 2 errors. Special; care was taken in order not to incorrectly reject null hypothesis or fail to reject a false one. An online survey was used and distributed to a sampled list of residents of the COJ. In a study by Meuter et al. (2000), the researchers focused their study on user's memorable experiences and therefore used the services of an online marketing company to select a unit of analysis and sample. Similarly, for this study, an online survey company, survemokey.com was used to administer the questionnaire to a select sample of online government application users.

3.7 Limitations and threats

As previously indicated, the research is a relational study using a cross-sectional questionnaire as a data collection instrument. As with other research designs, this approach suffers threats of internal and external validity, which may potentially be caused by the unreliability of data collected. Additionally, other confounding factors that may explain causal effects for effective use were excluded in order not to skew the results. The relational design uses strong theory, methodological and statistical controls, and random sampling to limit threats to internal and external validity, and longitudinal designs to help to recover some causality. This design is preferred in this study (Bhattacharjee, 2012). Pre-pilots were conducted in order to minimise false positives and increase the reliability of the measurement instrument.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4 Introduction to Data Analysis and Discussion

In this chapter, the data analysis of the results are presented and discussed. The chapter is divided as follows: review of participant responses and characteristics; evaluation of the reliability and validity of the measurement scale; descriptive statistics; analysis of tested hypothesis; specification of the structural model and summation of the results. The empirical representation of the research model is finally presented and overall results discussed.

4.1 Results

The study responses were collected on a Likert scale of 1 to 5 for all the variables. The content validity was established through instrument piloting. The reliability tests for all variables were evaluated for the instrument to study behavioural intention and effective use. The factors of behavioural intention, actual usage and effective use were evaluated using a Factor Analysis, as well as to identify other underlying factors. A moderation effect on all factors against the self-efficacy factor was evaluated using Moderation Regression, as well as evaluating the cause and effect relationship between independent variables on the dependent one. The mean differences were computed for the demographic variables (Table 8). People who used e-government are significantly older; however there was no correlation between their education levels than the people who do not use an e-government application (Table 7, Table 8, and Tables 9, 10). Principally, the study applied the Kaiser-Meyer-Olkin (KMO), Table 11, to establish the significance and adequacy of the chosen sample (Bhakar, Bhakar and Bhakar 2013). A KMO measure that is greater than .5 is considered adequate for the study.

The overall KMO factors are significant (Values > 0.5, p-values < 0.05). From this, only one of the independent variables was a significant predictor of usage and effective use: Effort Expectancy. All other factors were significant discriminators, this descriptive statistics and correlational analysis is presented in Table 15. Hypothesis testing is presented in Tables 16 – 24 and Table 25 presents strength of supported hypothesis. An Exploratory Factor Analysis (EFA) was used to analyse the study data (Table 12). The EFA scale was appropriately used to measure the latent factors that may influence Actual Usage and potentially infer effective use of an e-government application. This instrument is particularly relevant for this study as it considered potential measurement errors that may have resulted from the use chosen online questionnaire instrument for this study.

4.2 Sample

There were 342 responses received. Of the 342, a total of 85 responses were removed because they were incomplete or completed by participants who did not reside in the City of Johannesburg municipality. Table 7 shows the frequency of use of the e-government application for the remaining 257 responses as summarised below.

Table 7: Frequency of use of the e-government application

	Frequency	Percent
At least once a week	8	3.1
Once a month	50	19.5
Rarely or hardly ever	102	39.7
I have never used it	97	37.7
Total	257	100.0

4.3 Demographic Information

Among the 160 participants that use the www.joburg.org.za application, 58.1% were male, 40% were female and 1.9% preferred not to mention their gender. This is compared to 50.5% male, 48.5% female and 1% preferred not to mentioned their gender among of those who have never used the application. There was no association between the usage of the application and a participant's gender since the chi-square p-value was greater than 0.05 (p-value = 0.658). The demographic results are presented in Table 8 below.

Table 8: Gender and educational level

		I use the www.joburg.org.za application	No, I have never used it	Total	P-value
Gender	n =	160	97	257	0.385
	Male	58.1%	50.5%	55.3%	
	Female	40.0%	48.5%	43.2%	
	Prefer not to say	1.9%	1.0%	1.6%	
Highest qualification	n =	148	85	233	0.658
	Matric	4.7%	7.1%	5.6%	
	Certificate	10.1%	12.9%	11.2%	
	Diploma	23.0%	18.8%	21.5%	
	Degree	29.1%	34.1%	30.9%	
	Postgraduate degree	33.1%	27.1%	30.9%	

The gender and the highest level of education for both the participants who use the www.joburg.org.za application and the ones that do not use the application were assessed. A *chi-square* test for association was conducted to assess if there was an association between the use of the www.joburg.org.za application and a respondent's gender and highest level of education. The results are presented in Table 9. Although there were 257 complete responses, 97 participants (37.7%) had never used

the application for various reasons. Thus, 160 participants were using the www.joburg.org.za application at any one point and were in scope for analysis.

The reasons for not having used the application are summarised in Table 9. Generally, a large percentage (28.4%) of the participants has never heard of the joburg.org.za application. Through varying degrees, other participants that used the application infrequently have cited reasons such as distrust (1.9%) in the application or the unavailability of other key services available on the application (3.5%).

Table 9: Reasons for not using the www.joburg.org.za application

	Frequency	Percent
I have never heard of it before.	73	28.4%
I do not trust the application.	9	1.9%
Not all services I need are available	5	3.5%
Not aware of the website	4	1.6%
Always receive the following error message - Forbidden: You don't have permission to access / on this server.	1	0.4%
Don't know which services I would be able to use via the website	1	0.4%
I prefer going to the offices	1	0.4%
Is not appealing and attractive to the eyes.	1	0.4%
More a need to put a name to a consultant on follow up	1	0.4%
Never really thought of using it	1	0.4%
Total	97	37.7%

Of the 257 participants, 233 indicated their level of education. Of the participants that use the www.joburg.org.za application, 62.2% had either a degree or a post graduate degree. This is comparable to 61.2% with either a degree or a post-graduate degree among those who do not use the www.joburg.org.za application. The p-value of 0.658 is an indication that there is no association between use of the application and one's highest level of education. Independent samples t-tests were used to assess whether the mean age and mean working experience of the participants differed by whether they use the www.joburg.org.za application or not. The results are shown in Table 10 below.

Table 10: Age and Work experience

Variable	Descriptive statistics					Independent Samples Test	
	Use of the www.joburg.org.za application	N	Mean	Std. Deviation		t-test	P-value
Age	I use the www.joburg.org.za application	155	40.26	10.475		4.182	.000
	I have never used it	95	34.77	9.413			
Working Experience	I use the www.joburg.org.za application	159	17.94	11.197		3.789	.000
	I have never used it	92	12.91	9.446			

The participants who were using the www.joburg.org.za application were on average 40.26 ± 10.475 years old compared to 34.77 ± 9.413 years old for those who had never used the application. The difference in age was significant at 5% significance level since the p-value was less than 0.05 (p-value = 0.000). The results on work experience shows that the participants who were using the [joburg.org.za](http://www.joburg.org.za) application (mean = 17.94 ± 11.197 years) had significantly more years of experience compared

to those who had never used the application (mean = 12.91 ± 9.446 years). This is because the mean value is higher and the p-value was less than 0.05 (p-value = 0.000). Table 11 below presents these results.

Table 11: KMO and Bartlett's Test

Performance Expectancy (PE)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.742
Bartlett's Test of Sphericity	Approx. Chi-Square	267.065
	Df	6
	Sig.	.000
Effort Expectancy (EE)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.682
Bartlett's Test of Sphericity	Approx. Chi-Square	220.423
	Df	3
	Sig.	.000
Social Influence (SI)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.758
Bartlett's Test of Sphericity	Approx. Chi-Square	532.005
	Df	6
	Sig.	.000
Facilitating Conditions (FC)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.707
Bartlett's Test of Sphericity	Approx. Chi-Square	292.434
	Df	15
	Sig.	.000
Self-Efficacy (SE)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.830

Bartlett's Test of Sphericity	Approx. Chi-Square	535.496
	Df	10
	Sig.	.000
Perceived Competence (PC)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.847
Bartlett's Test of Sphericity	Approx. Chi-Square	560.069
	Df	15
	Sig.	.000
Perceived Autonomy (PA)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.591
Bartlett's Test of Sphericity	Approx. Chi-Square	78.919
	Df	3
	Sig.	.000
Perceived Relatedness (PR)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.787
Bartlett's Test of Sphericity	Approx. Chi-Square	461.516
	Df	10
	Sig.	.000
Actual Usage (AU)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.605
Bartlett's Test of Sphericity	Approx. Chi-Square	44.703
	Df	3
	Sig.	.000
Effective Use (EU)		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.790
Bartlett's Test of Sphericity	Approx. Chi-Square	442.752
	Df	10
	Sig.	.000

4.4 Measurement scale

Scale validity

Exploratory Factor Analysis was conducted to assess the validity of the hypothesised constructs. Initially, the KMO measured the significance of the constructs in order to address any possible concerns about the adequacy of the instrument. In this study, the content and sample adequacy were significant, more than 0.5, to predict the sampling adequacy and the adequacy of the content of this study. The results are shown in Table 12 and 13. The results show that all the KMO values were greater than the minimum required value of 0.5, implying that the sample was adequate to conduct factor analysis for the different constructs. The Bartlett's Test of Sphericity had significant p-values (p-values < 0.05) as required. These results (Table 11) suggest that factor analysis could be fitted. Table 15 shows the final construct composition, factor loadings for the items within each factor and the total variance explained by the retained factors.

Table 12: Construct Validity

Construct	Sub-construct	Items	Factor 1	Factor 2	Total Variance Explained
PE	-	Using the www.joburg.org.za application saves my time.	.892		66%
		Using www.joburg.org.za application enables access all services I need quickly.	.857		
		The www.joburg.org.za application allows me to use it from anywhere.	.755		
		I would use www.joburg.org.za application for accessing services and doing other activities.	.729		
EE	-	Interaction with www.joburg.org.za application is easy for me to use.	.912		76%
		The content on www.joburg.org.za application is clear and understandable.	.901		
		Becoming skilful at using www.joburg.org.za application is easy for me.	.800		
SI		People who are familiar with me think that I should use www.joburg.org.za application.	.934		78%
		People who are important to me think that I should use www.joburg.org.za application.	.917		
		Most people surrounding me use www.joburg.org.za application.	.868		
		The public marketing campaigns have influenced me to use the www.joburg.org.za application.	.804		
FC	S*	My query gets resolved quickly and satisfactorily when I log it on the www.joburg.org.za	.877	-.011	

		application.			39%
		The FAQ site available on the www.joburg.org.za application helps me to easily use the application.	.874	.086	
		The online support enables me to use www.joburg.org.za application to help resolve my query.	.861	.201	
		My internet access at home enables me to use a www.joburg.org.za application.	-.054	.825	
	A**	My internet access at work enables me to use a www.joburg.org.za application.	.075	.774	30%
		My internet access at in public places enables me to use a www.joburg.org.za application.	.230	.680	
		I could use www.joburg.org.za application if I had seen someone else using it.	.900		
		I could use www.joburg.org.za application if I could call someone for help.	.890		
		I could use www.joburg.org.za application if someone showed me how to do it.	.880		
SE	-	I could use www.joburg.org.za application if I had just the built-in help facility for assistance.	.853		71%
		I could use www.joburg.org.za application if I had the built-in help guidance for assistance.	.661		
		I am able to navigate the www.joburg.org.za application by following the relevant links.	.884		
PC	-	I am able to find the information I need to use the services on the www.joburg.org.za application.	.867		65%

		My ability to access services I need at the right time has improved since using the www.joburg.org.za application.	.832	
		My ability to budget more precisely has improved with the COJ www.joburg.org.za application service;	.799	
		I could complete my online activities using the www.joburg.org.za application even if I had never used an application like it before	.715	
		I have the necessary knowledge to understand how use all services on the www.joburg.org.za application.	.715	
PA	-	I feel that the www.joburg.org.za application provides me choices and options.	.855	60%
		The customer support agents spend time understanding my needs before addressing them.	.798	
		I feel unrestricted to browse the www.joburg.org.za application for the information and services I need.	.645	
PR		The support I have received from the COJ consultant and the www.joburg.org.za application increase my motivation to use the application.	.892	65%
		I found the COJ consultant helpful in helping me complete my tasks on the www.joburg.org.za application.	.881	
		I feel comfortable logging my query on the www.joburg.org.za application because I am confident that it will be resolved.	.845	
		The online support on the www.joburg.org.za application gives me sufficient guidance on how to navigate the application.	.840	

AU	-	I feel more comfortable in using a www.joburg.org.za application when support is provided timely by the COJ consultant.	.512	54%
		I have been using the www.joburg.org.za application for: less than 1 year, between 1 and 5 years or more than 5 years.	.781	
		I use the www.joburg.org.za application: between zero and two times a month, between three and five times a month or more than five times a month.	.777	
		I visit the www.joburg.org.za application whenever I need specific information or access municipal services.	.640	
EU	-	The www.joburg.org.za application is set up to provide me enough information and support I need.	.893	65%
		The www.joburg.org.za application is easy to use and to navigate other online services.	.869	
		Using the www.joburg.org.za application helps me access all the services I need.	.850	
		I can access the www.joburg.org.za application conveniently and easily.	.797	
		I believe that I am using the www.joburg.org.za application correctly.	.595	

S* = support, A** = Access to Internet

The Exploratory Factor analysis results shows that all the constructs except Facilitating Conditions retained the originally hypothesised items and each had one factor retained. The Facilitating Conditions construct was split into 2 sub-constructs namely Facilitating Conditions - Support and Facilitating Conditions – Access to internet (Accessibility). The Facilitating Conditions - Support construct explained 39% of variation in the items within the sub-construct while the Facilitating Conditions – Access to internet explained 30% of variation in the items within the sub-construct. All the items within the various constructs / factors loaded highly onto their respective factors. Thus, there was scale validity.

4.5 Scale Reliability

The Cronbach's Alpha was computed to assess the reliability of the scale for internal consistency of each construct. The following table (Table 13) shows how the reliability can be classified based on the Cronbach's Alpha value. The reliability for the constructs is summarised in the table below.

Table 13: Cronbach's Alpha Classification

Cronbach's Alpha Value	Reliability
≥ 0.9	Excellent
≥ 0.8	Good
≥ 0.7	Acceptable
≥ 0.6	Questionable
≥ 0.5	Poor
< 0.5	Unacceptable

The results (Table 14) indicate that there was excellent reliability for the Social Influence construct (4 items, $\alpha = 0.900$) since the alpha value was ≥ 0.9 . There was good reliability for each of Performance Expectancy (4 items, $\alpha = 0.825$), Effort Expectancy (3 items, $\alpha = 0.843$), Facilitating Conditions – support (3 items, $\alpha = 0.850$),

Self-Efficacy (5 items, $\alpha = 0.897$), Perceived Competence (6 items, $\alpha = 0.888$), Perceived Relatedness (5 items, $\alpha = 0.855$) and Effective Use (5 items, $\alpha = 0.866$) constructs since the Cronbach's Alpha values were greater than 0.8.

Table 14: Scale Reliability

Construct		Sub-construct	Number of Items	Cronbach's Alpha	Level of Reliability
Performance Expectancy (PE)	-		4	.825	Good
Effort Expectancy (EE)	-		3	.843	Good
Social Influence (SI)	-		4	.900	Excellent
Facilitating Conditions (FC)	Support		3	.850	Good
Facilitating Conditions (FC)	Access to internet		3	.633	Questionable
Self-Efficacy (SE)	-		5	.897	Good
Perceived Competence (PC)	-		6	.888	Good
Perceived Autonomy (PA)	-		3	.653	Questionable
Perceived Relatedness (PR)	-		5	.855	Good
Actual Usage (AU)	-		3	.570	Poor
Effective Use (EU)	-		5	.866	Good

The reliability for Facilitating Conditions – Access to internet (3 items, $\alpha = 0.633$) and that of Perceived Autonomy (3 items, $\alpha = 0.653$) were questionable while Actual Usage (3 items, $\alpha = 0.570$) had poor reliability. Since all the constructs had a Cronbach's Alpha greater than 0.5, below which the reliability becomes unacceptable, the items within each of the constructs could be combined together to form a summated scale. The summated scale was computed by calculating the average of the items within the scale. Table 15 shows the descriptive statistics and the Pearson's correlation coefficients among the constructs.

Table 15: Descriptive Statistics and Pearson's Correlation

Descriptive Statistics	Correlation Coefficients												
	Mean	SD	PE	EE	SI	FCS	FCA	SE	PC	PA	PR	AU	EU
PE	2.64	0.8	1										
EE	2.70	0.88	.53***	1									
SI	3.41	0.91	.48***	.52***	1								
FCS	3.20	0.89	.48***	.60***	.58***	1							
FCA	2.08	0.61	0.13	.14*	0.06	.22***	1						
SE	2.68	0.79	.25***	.16**	.32***	.29***	.15*	1					
PC	2.63	0.74	.57***	.75***	.49***	.65***	.24***	.24***	1				
PA	2.86	0.7	.47***	.54***	.41***	.67***	.26***	.24***	.58***	1			
PR	3.02	0.71	.49***	.61***	.53***	.75***	.24***	.33***	.64***	.70***	1		
AU	2.78	0.82	.31***	.33***	.24***	.35***	.26***	.16*	.44***	.36***	.37***	1	
EU	2.65	0.75	.54***	.59***	.45***	.63***	.19**	0.08	.62***	.59***	.63***	.41***	1

Notes: M = Variable mean, SD = standard deviation, *** = $p < .01$, ** = $p < .05$, * = $p < .10$

The results show that there was positive correlation between Actual Usage and each of the independent variables as well as the moderating factor of self-efficacy, which had a p-value greater than 0.05. It can also be seen that Actual Usage was significantly correlated with Effective Use ($r = 0.41$, $p\text{-value} < 0.01$). The results show that the dependent and independent variables can be significantly correlated. This meets the objectives of this study.

4.6 Hypothesis testing

The results pertaining to Hypothesis 1 (H1): Performance Expectancy has a positive effect on the Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy. A regression model with Actual Usage as the dependent variable, Performance Expectancy as the independent variable and self-efficacy as the moderating variable was fitted. The results are shown in Table 16 below:

Table 16: Self-efficacy moderation - Performance Expectancy and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Intercept	2.78***	0	2.78***	0	2.76***	0
Performance Expectancy	0.33***	0.31	0.31***	0.29	0.31***	0.29
Self-efficacy			0.09	0.08	0.08	0.08
Performance Expectancy x Self-efficacy					0.09	0.07
<i>R</i>²	0.1		0.1		0.11	

The results in Model 1 show that Performance Expectancy ($B = 0.33$, $\beta = 0.31$ p-value < 0.001) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-value is less than 0.05. Model 2 shows that there is a no significant relationship between Self-efficacy and Actual Usage ($B = 0.09$, $\beta = 0.08$, p-value > 0.05).

Model 3 shows that the addition of the interaction variable (Performance Expectancy x Self-efficacy) on to the model did not increase the r-square significantly (0.1 to 0.11). The coefficient for the interaction variable ($B = 0.09$, $\beta = 0.07$, $p\text{-value} > 0.05$) is not significantly different from zero. This implies that Self-efficacy does not moderate the relationship between Performance Expectancy and Actual Usage.

The results pertaining to Hypothesis 2 (H2): Effort Expectancy has a positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy. A regression model with Actual Usage as the dependent variable, Performance Expectancy as the independent variable and self-efficacy as the moderating variable was fitted. The results are shown in Table 17 below.

Table 17: Self-efficacy moderating the relationship between Effort Expectancy and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	<i>B</i>	<i>B</i>	β	<i>B</i>	β
Intercept	2.78***	0	2.78***	0	2.78***	0
Effort Expectancy	0.31***	0.33	0.29***	0.31	0.29***	0.31
Self-efficacy			0.11	0.11	0.11	0.1
Effort Expectancy x Self-efficacy					0.02	0.02
<i>R</i>²	0.11		0.12		0.12	

The results in Model 1 shows that Effort Expectancy ($B = 0.31$, $\beta = 0.33$ $p\text{-value} < 0.001$) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the $p\text{-values}$ are less than 0.05. Model 3 shows that the addition of the

interaction variable (Effort Expectancy x Self-efficacy) on to the model did not change the r-square at all. The coefficient for the interaction variable ($B = 0.02$, $\beta = 0.02$, $p\text{-value} > 0.05$) is not significantly different from Zero. This implies that Self-efficacy does not moderate the relationship between Effort Expectancy and Actual Usage. The results pertaining to Hypothesis 3 (H3): Social Influence has positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy. A regression model highlights with Actual Usage as a dependent variable, Performance Expectancy as the independent variable and self-efficacy as a moderating variable was fitted. The results are shown in Table 18 below.

Table 18: Self-efficacy moderating the relationship between Social Influence and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	β	<i>B</i>	<i>B</i>	<i>B</i>	β
Intercept	2.78***	0	2.78***	0	2.78***	0
Social Influence	0.22***	0.24	0.19**	0.21	0.19**	0.21
Self-efficacy			0.09	0.09	0.09	0.09
Social Influence x Self-efficacy					-0.02	-0.01
<i>R</i> ²	0.06		0.06		0.06	

The results in model 1 show that Social Influence ($B = 0.22$, $\beta = 0.24$ $p\text{-value} < 0.001$) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-values are less than 0.05.

Model 3 shows that the addition of the interaction variable (Social Influence x Self-efficacy) on to the model did not change the r-square at all. The coefficient for the interaction variable ($B = -0.02$, $\beta = -0.01$, $p\text{-value} > 0.05$) is not significantly different from Zero. This implies that Self-efficacy does not moderate the relationship between Social Influence and Actual Usage.

The results pertaining to Hypothesis 4 (H4): Facilitating Conditions have positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy. This hypothesis was split into two hypotheses since the Facilitating Conditions construct was split into two sub-constructs namely Facilitating Conditions – Support and Facilitating Conditions - Access to Internet. The results pertaining to Hypothesis H4a (H4a): Facilitating Conditions- Support has a positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy. A regression model for Actual Usage as a dependent variable, Facilitating Conditions – support as the independent variable and self-efficacy as the moderating variable was fitted. The results are shown in Table 19 below.

Table 19: Self-efficacy moderating relationship between Facilitating Conditions – Support and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	<i>B</i>
Intercept	2.78***	0	2.78***	0	2.78***	0
Facilitating Conditions S	0.32***	0.35	0.31***	0.33	0.31***	0.33
Self-efficacy			0.06	0.06	0.06	0.06
Facilitating Conditions S x Self-efficacy					0.00	0.00
<i>R</i>²	0.12		0.12		0.12	

The results in model 1 show that Facilitating Conditions – support ($B = 0.32$, $\beta = 0.35$ p-value < 0.001) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-value is less than 0.05. Model 3 shows that the addition of the interaction variable (Facilitating Conditions – support x self-efficacy) on to the model did not change the r-square at all. The coefficient for the interaction variable ($B = 0.00$, $\beta = 0.00$, p-value > 0.05) is not significantly different from Zero. This implies that Self-efficacy does not moderate the relationship between Facilitating Conditions – support and Actual Usage. The results pertaining to Hypothesis H4b (H4b): Facilitating Conditions - Access to Internet have positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy. A regression model for Actual Usage as the dependent variable, Facilitating Conditions – Access to Internet as the independent variable and self-efficacy as the moderating variable was fitted. The results are shown in Table 20 below.

Table 20: Self-efficacy moderating relationship between Facilitating Conditions- Accessibility and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	<i>B</i>
Intercept	2.78***	0	2.78***	0	2.77***	0
Facilitating Conditions A	0.35***	0.26	0.32***	0.24	0.24**	0.18
Self-efficacy			0.12	0.12	0.12	0.12
Facilitating Conditions A x Self-efficacy					0.15	0.14
<i>R</i>²	0.07		0.08		0.1	

The results in model 1 show that Facilitating Conditions – Accessibility ($B = 0.35$, $\beta = 0.26$ p-value < 0.001) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-value is less than 0.05. Model 3 shows that the addition of the interaction variable (Facilitating Conditions – Accessibility x Self-efficacy) on to the model increased the r-square by 2%. The coefficient for the interaction variable ($B = 0.15$, $\beta = 0.14$, p-value > 0.05) is not significantly different from zero. This implies that Self-efficacy does not moderate the relationship between Facilitating Conditions – Accessibility and Actual Usage.

The results pertaining to Hypothesis 5 (H5): Perceived Competence has a positive influence on Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy. A regression model for Actual Usage as the dependent variable, Perceived Competence as the independent variable and self-efficacy as the moderating variable was fitted. The results are shown in Table 21 below.

Table 21: Self-efficacy moderating relationship between Perceived Competence and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Intercept	2.78***	0	2.78***	0	2.78***	0
Perceived Competence	0.48***	0.44	0.47***	0.42	0.47***	0.42
Self-efficacy			0.06	0.05	0.05	0.05
Perceived Competence x Self-efficacy					0.01	0.01
R^2	0.19		0.19		0.19	

The results in Model 1 shows that Perceived Competence ($B = 0.48$, $\beta = 0.44$ p-value < 0.001) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-value is less than 0.05.

Model 3 shows that the addition of the interaction variable (Perceived Competence x Self-efficacy) on to the model did not change the r-square. The coefficient for the interaction variable ($B = 0.01$, $\beta = 0.01$, p-value > 0.05) is not significantly different from Zero. This implies that Self-efficacy does not moderate the relationship between Perceived Competence and Actual Usage. The results pertaining to Hypothesis 6 (H6): Perceived Relatedness has a positive effect on Actual Usage of an e-government application effectively and this relationship will be moderated by self-efficacy. A regression model with Actual Usage as the dependent variable, Perceived Relatedness as the independent variable and Self-efficacy as the moderating variable was fitted. The results are shown in Table 22 below.

Table 22: Self-efficacy moderating relationship between Perceived Relatedness and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	<i>B</i>	<i>B</i>	β	<i>B</i>	β
Intercept	2.78***	0	2.78***	0	2.77***	0
Perceived Relatedness	0.43***	0.37	0.41***	0.36	0.41***	0.36
Self-efficacy			0.04	0.04	0.03	0.03
Perceived Relatedness x Self-efficacy					0.04	0.04
R^2	0.14		0.14		0.14	

The results in Model 1 shows that Perceived Relatedness ($B = 0.43$, $\beta = 0.37$ p-value < 0.001) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-values are less than 0.05.

Model 3 shows that the addition of the interaction variable (Perceived Relatedness x Self-efficacy) on to the model did not change the r-square at all. The coefficient for the interaction variable ($B = 0.04$, $\beta = 0.04$, p-value > 0.05) is not significantly different from Zero. This implies that Self-efficacy does not moderate the relationship between Perceived Relatedness and Actual Usage. The results pertaining to Hypothesis 7 (H7): Perceived Autonomy has a positive effect on Actual Usage of an e-government application, and this relationship will be moderated by Self-efficacy. A regression model with Actual Usage as the dependent variable, Perceived Autonomy as the independent variable and Self-efficacy as the moderating variable was fitted. The results are shown in Table 23 below.

Table 23: Self-efficacy moderating relationship between Perceived Autonomy and Actual Usage

Moderation Regressions						
	Model 1		Model 2		Model 3	
	<i>B</i>	<i>B</i>	<i>B</i>	β	<i>B</i>	β
Intercept	2.78***	0	2.78***	0	2.78***	0
Perceived Autonomy	0.43***	0.36	0.41***	0.35	0.41***	0.35
Self-efficacy			0.08	0.07	0.08	0.07
Perceived Autonomy x Self-efficacy					-0.01	-0.01
R^2	0.13		0.14		0.14	

The results in Model 1 show that Perceived Autonomy ($B = 0.43$, $\beta = 0.36$ p-value < 0.001) has a positive effect on Actual Usage of the e-government application. The relationship is positive because the coefficient is greater than zero and is significant because the p-values are less than 0.05.

Model 3 shows that the addition of the interaction variable (Perceived Autonomy x Self-efficacy) on to the model did not change the r-square at all. The coefficient for the interaction variable ($B = -0.01$, $\beta = -0.01$, p-value > 0.05) is not significantly different from zero. This implies that Self-efficacy does not moderate the relationship between Perceived Autonomy and Actual Usage. A simple linear regression model with Effective Use as the dependent variable and Actual Usage as the independent variable was fitted. The results are shown in in Table 24 below.

Table 24: Regression between Actual Usage and Effective Use of an e-government application

<i>Variable</i>	Parameters		Statistical Significance		
	<i>B</i>	<i>B</i>	<i>SE</i>	<i>p</i>	<i>95% interval</i>
Intercept	1.62 ^{***}		0.19	0.000	1.24 to 2.00
Actual Usage	0.37 ^{***}	0.41	0.07	0.000	0.24 to 0.50
F	31.37 ^{***}			0.000	
R^2	0.17				

Note: B = unstandardised parameters, β = standardised parameters, ^{***} = $p < .01$, ^{**} = $p < .05$, ^{*} = $p < .10$.

The results in Table 25 show that Actual Usage explained 17% of variation in Effective Use. It can be noted that there is a significant positive relationship between Actual Usage ($B = 0.37$, $\beta = 0.41$ p-value < 0.001) and Effective Use. This is because the coefficient was positive and the p-value was less than 0.05. Thus, Hypothesis 7 (H7)

is supported and it is concluded that Actual Usage has a positive relationship and is inferable to Effective Use of an e-government application.

Table 25: Hypothesis Testing Results

Hypothesis		Outcome
H1i	Performance Expectancy has a positive effect on the Actual Usage of an e-government application.	Supported
H1ii	Performance Expectancy has a positive effect on the Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy.	Not supported
H2i	Effort Expectancy has a positive effect on Actual Usage of e-government applications	Supported
H2ii	Effort Expectancy has a positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy	Not supported
H3i	Social Influence has positive effect on Actual Usage of e-government applications.	Supported
H3ii	Social Influence has positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy.	Not supported
H4ai	Facilitating Conditions - support have positive effect on Actual Usage of e-government applications.	Supported
H4aii	Facilitating Conditions - support have positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy.	Not supported
H4bi	Facilitating Conditions - Access to internet have positive effect on Actual Usage of e-government applications.	Supported
H4bii	Facilitating Conditions - Access to internet have positive effect on Actual Usage of e-government applications, and this relationship will be moderated by self-efficacy.	Not supported
H5i	Perceived Competence has a positive influence on Actual Usage of an e-government application.	Supported

H5ii	Perceived Competence has a positive influence on Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy.	Not supported
H6i	Perceived relatedness has a positive effect on Actual Usage of an e-government application effectively.	Supported
H6ii	Perceived relatedness has a positive effect on Actual Usage of an e-government application effectively and this relationship will be moderated by self-efficacy	Not supported
H7i	Perceived autonomy has a positive effect on Actual Usage of an e-government application.	Supported
H7ii	Perceived autonomy has a positive effect on Actual Usage of an e-government application, and this relationship will be moderated by self-efficacy.	Not supported
H8	Actual Usage has a positive relationship and is inferable to Effective Use of an e-government application	Supported

4.7 Hypothesis Testing Results

The hypothesised model below, Figure 10, explains the causal paths of the standardised coefficients, the t-values and variances. As expected, the hypotheses H1i (0.31), H2i (0.33), H3i (0.24) and H4ai (0.35) and H4aai (0.26) were supported because all UTAUT constructs (PE, EE, SI, FC Support and FC) had significant positive effects on Actual Usage. These constructs accounted for over 66 percent of the variance in Perceived Competence (0.44), which contributed less to Perceived Relatedness (0.37) and even less so to Perceived Autonomy (0.36). The inferential effects of Actual Usage on Effective Use were found to be positive (0.41).

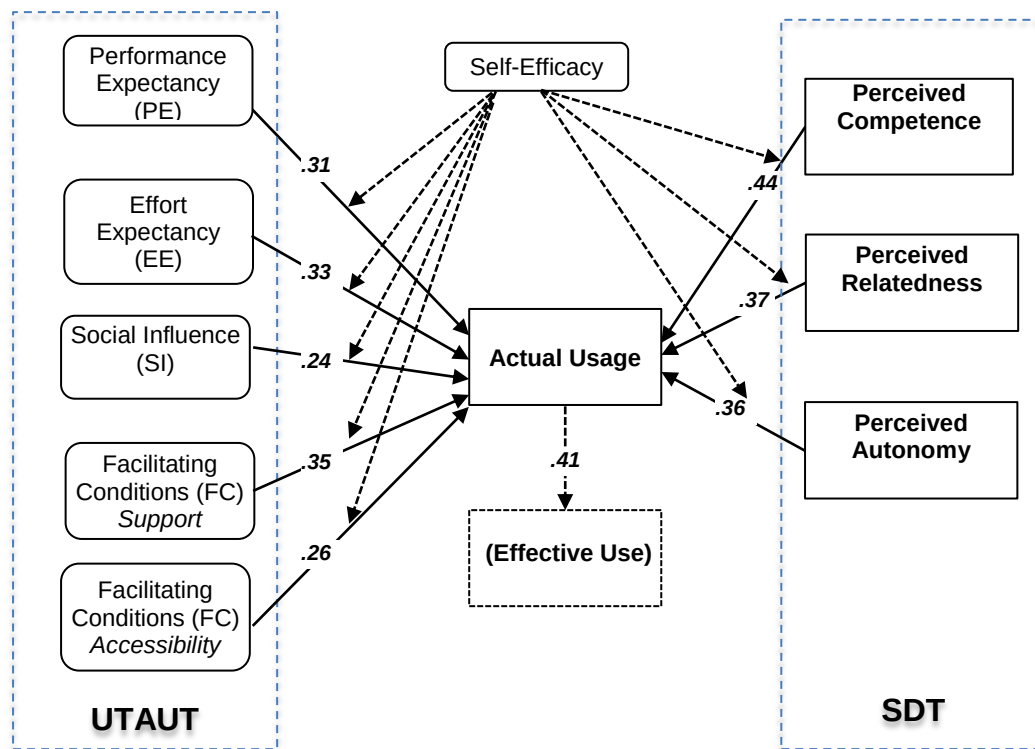


Figure 10: Hypothesis testing graphical representation

4.8 Discussion of results

The objective of this study was to examine the relevance and applicability of the SDT and UTAUT theories to explain the motivational and behavioural factors that explain effective use. By exploring the role played by SDT constructs of Perceived Competence, Perceived Relatedness and Perceived Autonomy, UTAUT could be operationalised to explain Actual Usage and Effective Use of an e-government application. The constructs of UTAUT were used Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions.

The findings in this study suggest that SDT is a practical framework to conceptualise factors that motivate citizens to use government systems and applications. This in turn creates a platform for the government to roll out effective information and service

delivery strategies. It appears that citizens are more willing to continue using e-government applications when they feel autonomous and competent. These basic needs have an influence on their motivation and behavioural attitudes to continue using the e-government applications. Additionally, the feeling of connectedness and support (perceived relatedness) by those around them to use the e-government application motivates them simply because they find it easy and convenient.

CHAPTER FIVE

INTERPRETATION OF FINDINGS AND CONCEPTUAL MODEL

5 Introduction to Interpretation and Model Findings

In this chapter the research findings are interpreted based on the empirical evidence collected during this study. The findings are interpreted based on available literature that support the use of online platforms. The study had multiple aims, which were to explore, understand and explain the determinants for effective use, to what extent the SDT and UTAUT theories may explain effective use and to lastly, empirically measure the identified determinants in order to explain usage. In a more subtle sense, the study also had aimed to expand the behavioural intention theories to be more value-driven. This study also contributes to the definition of Smart City for a developing city or country. The interpretations of finding will be looking at the hypothesis and the results against literature and context.

5.1 Findings

Performance expectancy has been found to have a positive effect on Actual Usage of the e-government application. These results are consistent with the findings in prior studies by Venkatesh, Thong and Xu (2016); Labelle (2016); Wang, Hung and Chou (2006); Agarwal et al. (2007); Rodrigues et al. (2016). The findings show that performance expectancy has a significant positive effect on the citizens' behavioural intention to use an e-government application. Therefore, the present study confirms that citizens with high performance expectancy are more likely to use an e-government application than those with less or low performance expectancy. The results therefore, suggest that specific effort by the application designers is required to

provide useful functional and informational design to increase use and value for citizens.

The results of this study indicate that effort expectancy has a significant influence on the citizen's intention to use an e-government application. This suggests that the majority of users are of the belief that an e-government application should be and is easy to use. This also means that those who do use the application frequently might find it more difficult to use it. The study then suggests a user-friendly design to attract more use and to enable effective and value-driven use of an e-government application. Similar outcomes were suggested in prior studies by Venkatesh, Thong and Xu (2016); Labelle (2016); Wang, Hung and Chou (2006); Agarwal et al. (2007); Rodrigues et al. (2016).

Social Influences were also found to significantly affect the citizens' motivation and intentions to engage with an e-government application. A large number of users have indicated that their inclination to use the application was influenced by social connections. This means that the e-government application designers and marketers should leverage off these social influences to appeal to non-adopters and maintain continued use. These influences in turn have strongly predicted effective use, which is the desired outcome of this study. This is also consistent with prior studies by Rodrigues et al. (2016); Venkatesh et al. (2016); Lee and Levy (2014); Johnston and Warkentin (2010), with particular focus on trust.

Also derived from UTAUT, the Facilitating conditions construct, has been found to significantly influence the citizens' behavioural intention to use an e-government application. Wang et al. (2006) have suggested the use of an enhanced UTAUT model to further understand the citizen's behavioural intention to use an IT system. This present study has done that and found that two additional conditions of support and accessibility must be met to influence actual usage and therefore the effective use of the application.

Self-efficacy has been found to be a weak predictor and moderator of a relationship between a dependent and an independent variable. This is consistent with similar findings by Jung (2008), where self-efficacy insignificantly influenced Actual Usage. Interestingly, Wang (2002) postulate that although a direct causal relationship between self-efficacy and Actual Usage exists, such a relationship does not necessarily exist between it and effective use. However, according to Chen, Jubilado, Capistrano, Yen (2015), where self-efficacy is high, the quality of an online application does not affect the user's intention to use a technology, specifically where factors such as computer literacy, urbanisation and digital divide are concerned. This study has proven this. Self-efficacy is a poor moderator of a relationship between dependent and independent inferable variable, effective use.

Prior studies on SDT (Venkatesh et al. 2016; Roca and Gagné 2008) have shown the existence of a positive outcome where citizens perceived themselves to be competent and supported by their social setting in using IT systems. This has resulted in an increased level of autonomous and supportive motivations rather than outcomes of control (Baard et al. 2004; Deci et al., 2001). The current study is one of the first to demonstrate the influence SDT has on actual usage and effective use. This is useful to studies in the IS Domain, particularly for the new concepts of e-government and Smart City.

Consistent with prior studies (Roca and Gagné 2008), this study demonstrates the fact that citizens are more willing to continue using e-government applications when they feel that they are supported by their social circles in using it. Perceived relatedness literature has concluded that the basic support influences the user's motivation and behavioural intention to continue using an e-government application (Roca and Gagné 2008). The feeling of connectedness and support (perceived relatedness) by those around them to use the e-government application motivates users to easily and conveniently use the application.

5.2 Recommendations

Abrahams and Newton-Reid (2008) have suggested the use of SMS (Short-service Messages), used similarly for advertising and online banking payments processing services may need to be explored as an avenue for e-government (transformational stage). This study emphasises similar exploration, but suggest the use of mobile-based e-government to roll out in order to address the needs of poor citizens. More so, prior studies have shown that a large number of people make use of a mobile phone. Consequently, this innovation may increase adoption and use and lead to effective delivery of key information and services to citizens. Additionally, concerns of free and wide-ranging internet accessibility concerns need to be addressed to encourage adoption and subsequent effective use.

5.3 Implications

This study has multiple implications, both to academic research and practice. Firstly, to academic research, this study is pioneering as it extends the user behavioural intention and motivational theories to explain how well technology is being used. This is a much-awaited deviation from the norm in research studies and theories of use, which traditionally focussed on behavioural intention and actual usage. The behavioural theories such as TAM, TPB, DOI, UTAUT and SDT can be furthered to move beyond use. More significantly, this study has introduced and applied a newly introduced variable of Self-efficacy in the UTAUT research model.

In practice, the study highlights implementation considerations for governments to roll out technologies that are: (i) user-friendly with all the necessary services, safety and security features and functionalities, (ii) meet the needs of citizens in accessing key government information and services (iii) encourage transparency between government and citizens, between government and business and between governments and governments. Further implications are highlighted for improving the efficiency and effectiveness of a citizen-centric government, leading to improved trust in governments.

5.4 Future Research

This study has paved a new path in behavioural studies that focused on the value-driven patterns of use. An opportunity exists to replicate this study in future researches across a more representative sample of an African Smart City. A wider range of variables should be assessed and tailored towards e-government and other aspects of a Smart City. In fact, a detailed positivist study should be undertaken to further understand other divergent reasons for an e-government use. Although the reasons for non-adopters have been explored, there's evidence suggesting a need for targeted and deliberate approach on wide-ranging awareness campaigns. Non-adopters who prefer traditional methods of attaining government information and services may be unwilling to adopt e-government in preference of other government services. Further causality studies are necessary to test adoption, before effective use can be fully determined. A special focus on causal impact of PE (66%), EU (65%), PR (65%), PC (65%) and PA (60%) is necessary on actual usage and effective use.

Secondly, research to investigate PEOU and PU is required for e-government platforms to be more functional, usable and accessible, beyond the mere implementation initiatives (Rodrigues and Balasubramanian 2016). By doing this, e-government systems can be transformed to be more citizen-centric to provide online services and products tailored to the specific needs of citizens (Levy 2012). Thirdly, more research is required to explore in detail, various circumstances of effective e-government use in order to derive more value. Fourthly, other characteristics of a Smart City should be explored, primarily focussing on the unique circumstances of an African Smart City. Finally, an opportunity for future research exists to extend this body of knowledge by informing the globally accepted definitions and characteristics of a Smart City. E-government represent small component of a Smart City model, which involves multiple technologies and services. Further data collection is necessary to validate the model against other constructs of use. E-government is broad and implemented based on the complexity, societal maturity and technology efficacy. Continued research is necessary to validate e-government in the context of other smart city services.

Effective use

This study had aimed at shifting the dominant research paradigm and to play a role in influencing future studies of behavioural and intentional use, to focus of value-driven research (Burton-Jones and Grange 2011). Although further research is required to explore the specific factors in order to quantify the actual value derived from using an IT system. Companies may use this study as a basis to measure value of IT in terms of how effective it is being used.

Also, governments may use this study to better understand the needs of citizens and drive focussed government initiative to meet these needs. Moreover, an opportunity arises to enhance current e-government platforms to increase continued use and attract behavioural intentions of non-adopters. This study, further suggests a more citizen-driven, inclusive and democratic information and service delivery to all citizens, despite their location and economic positioning.

E-government

The findings also suggest that an online technology adoption literature is an appropriate theoretical perspective for studying e-government, in the absence of specific and related literature. Overall, similar factors of trust, perceived ease of use and perceived usefulness significantly influenced usage. The findings suggest that factors that influenced people who use e-government are significantly distinct from factors that affect those who did not.

Meanwhile, people who use e-government perceive it to be convenient, easy to use and safer than those who do not. This supports the view that citizens who believe that they have the requisite capabilities to self-identify knowledge of IT systems and are supported by their social setting are likely to continue use IT (Burton-Jones and Grange 2011).

Cost

Value in terms of cost has not been identified as a determinant of this and prior studies of technology use. However, cost may be a determining factor where use is voluntary (Nam 2014; Argawal et al. 2007; Wang et. al 2006). Cost can serve as a deterrent despite the benefits of usage to the individual or to society as a whole. Future studies that focus on effective use should attempt to quantify the cost to citizens and government of using and implementing such e-government platforms.

5.5 Conclusion

This current study emphasises four key points. The first point is that of trust. The prior studies have found trust to be a key determining factor for adoption, continued and effective use. As suggested by Rodrigues et al. (2016); Chen et al. (2015); and Lee and Levy (2014), the perceptions that governments are untrustworthy and technology is unreliable have an adverse impact on citizens' attitude towards a trusted e-government platform. Therefore to improve these perceptions, issues of information quality, privacy and system performance must be established. Secondly, the improved functionality and design of an e-government application by introducing other features and improving the 'look and feel' must be focussed on.

Thirdly, another concern highlighted by citizens is the inefficiencies in e-government processes that adversely impact usage and quality perceptions. In terms of improvements, the system quality and supporting processes must be prioritised. These improvements will enable an effective and efficient information and service delivery to citizens. Overall perceptions and attitudes will continue to be negative (Chen et al. 2015; Helbig 2009; Helbig et al. 2013; Twinomurinzi et al. 2012; Cloete 2012; Argawal et al. 2007) because of failures to satisfy expectations (Floropoulos et al., 2010; Weerakkody et al., 2013). Lastly, governments must consider the user experience to continually enhance the e-government application. This is not only important to maintain continued use, by to also encourage non-adopters to use it. This is critical to the overall e-government success and value (Chen et al. 2015).

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Appendix A - Ethical Considerations

Consideration of the key ethical concerns were undertaken to protect the privacy of chosen participants, the integrity of the findings and the reputation of the University of Witwatersrand as an institution:

Right to privacy

The key part of data collection and scientific research is the maintenance of trust between the respondent and researcher. Unauthorized disclosure and destruction of confidential research knowledge and data is forbidden. Participants' right to privacy was maintained at all time during this research project. Integrity – I have continually and consistently considered whether my involvement is deceitful, impartial and is tantamount to plagiarism. Due to the reputational damage that may be caused by the behaviours that are inconsistent with the university ethical principles, the resultant risk is that this may lead to legal action, fines and cause damage to institution's reputation, locally and globally.

Informed Consent

As a researcher I am required to obtain official consent from by academic institution before proceeding with a research. Due to my involvement in the research as main researcher, I am obligated to disclose the research intent, scope and research methodologies to be employed to my candidate participants. I have upheld the highest standard of ethical code throughout the research project and fully understand that the participants may, at any point of their choosing, withdraw their participation from this research.

Protection from harm

I endeavor to seek institutional and professional advice regarding any potential risk that may place the participants and I at any risk. No harm, physical or otherwise, was caused to humans and animals through this research.

Appendix B – Approvals

Research Ethical Clearance

Faculty of Commerce, Law and Management University of the Witwatersrand, Johannesburg		
School of Economic and Business Sciences Private Bag X3, WITS, 2050, South Africa • Telephone: +27 11 717 8004 • email: Shyabonga.Molaba@wits.ac.za		
<u>CLEARANCE CERTIFICATE</u>	<u>PROTOCOL NUMBER:</u> CINFO/1131	
<u>PROJECT:</u> DETERMINANTS FOR EFFECTIVE USE OF E-GOVERNMENT APPLICATION - CONTEXT OF AN AFRICAN SMART CITY		
<u>INVESTIGATOR:</u>	Bende Mark	
<u>STUDENT NUMBER:</u>	881297	
<u>SCHOOL:</u>	SEBS	
<u>DATE CONSIDERED:</u>	25 August 2016	
<u>DECISION OF THE ETHICS COMMITTEE:</u>	Approved	
<u>NOTE</u>		
Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application. Please remember to include the protocol number above to your participation letter.		
<u>DATE:</u> 06/09/2016	<u>CHAIRPERSON:</u> Jean-Marie Bancilhon	
cc: Supervisor: Prof Ray Kekwaletswe		
<u>SCHOOL OF ECONOMIC & BUSINESS SCIENCES</u>		

Research Topic Approval



Private Bag 3 Wits, 2050
Fax: 0270865536132
Tel: 02711 7178005

Reference: Ms Makgethoa.Makgoga
E-mail: Makgethoa.Makgoga@wits.ac.za

06 January 2017
Person No: 881297
PAG

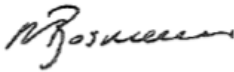
Mr B Mark
The Franklin
4 Pritchard Street
Johannesburg
2001
South Africa

Dear Mr Mark

Master of Commerce: Approval of Title

We have pleasure in advising that your proposal entitled *Antecedents to effective use of an e-Government application: the context of smart city* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

A handwritten signature in black ink, appearing to read 'M Bosman'.

Mrs Marike Bosman
Faculty Registrar
Faculty of Commerce, Law & Management

Company Research Approval

Retail and
Business Banking

Retail Markets

28th Floor [REDACTED] Towers
160 Main Street, Johannesburg, 2001
PO Box 7735, Johannesburg 2000

Tel: +27 (0)11 350 4000

Swift Address: [REDACTED] II
[REDACTED].za

Kleinhandels- en
Besigheidsbankdienste

Kleinhandel Markte

28ste Verdieping [REDACTED] Toringhous
Mametrust 160 Johannesburg, 2001
Posbus 7735 Johannesburg 2000

Tel: +27 (0)11 350 4000

Swift-Adres: [REDACTED] II
[REDACTED].za

Company Name: [REDACTED] Bank

Date: 02/09/2016

We hereby support Bende Mark's application, a Masters by Coursework student from the University of the Witwatersrand, to conduct a survey with our employees for a period September to November 2016. Permission is granted to Bende Mark subject to his obtaining ethical clearance to conduct research from the Ethics Committee of the University of the Witwatersrand, Johannesburg and by abiding to its terms.

I have been informed of Bende Mark line of research and of the nature of the intervention (e.g. Respondents filling in a questionnaire).

Name: Penny Futter (CIO: Retail and Business Bank, Africa Technology)

Signature:



Appendix C – Research Questionnaire

E-Government Effective Use - Smart City

Introduction

Good day,

My name is Bende Mark, a Masters student at Wits University studying towards a degree in Information Systems. I have designed a survey to assess how effectively the www.joburg.org.za website is being used. As one of the aspects of a Smart City, the website is a platform for citizens, businesses and government entities to interact with the City of Johannesburg more efficiently.

I would highly appreciate your assistance in completing a 15 minutes survey below within 5 days of receiving this invite.

Your contribution will not only assist me in completing my research, but will add immense value in helping the City of Johannesburg to drive the Smart City agenda of effective service deliver to citizens.

Topic: *"Determinants for Effective Use of E-government Application - Context of an African Smart*

Note: If you have not used the website before, please complete Part One and Part Four of the survey.

Thank you in anticipation.

Regards, Bende Mark
Wits University

Disclaimer:

Participation

Please note you were randomly selected to participate in this study and your participation is voluntary.

Confidentiality

Any study records that identify you will be kept confidential to the extent possible by law and will only be reviewed only by individuals tasked with the responsibility of ensuring proper execution of the research according to methodological ethical conduct. My academic supervisor, Prof. Ray

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Kekwaletswe (ray.kekwaletswe@wits.ac.za), can be contacted for further clarity or concerns. Otherwise, the University Academic Research Office ([Ethics-SEBS@wits.ac.za.

All study records will be destroyed after the completion and marking of my research assignment. I will refer to you by a code number in the research and any further publication.

Benefits

No immediate benefits to you are anticipated as a result of your participation, however your assistance will assist in improving the way information and services are delivered to citizens in the future.

E-Government Effective Use - Smart City

PART ONE

This part of the questionnaire is intended to understand the respondent's knowledge of a Smart City. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

SMART CITY AGENDA

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
I have sufficient knowledge of the Smart City concept.	☐	☐	☐	☐	☐
I believe that that City of Johannesburg (COJ) has aspects of a Smart City.	☐	☐	☐	☐	☐
The City of Johannesburg www.joburg.org.za website helps it to become a Smart City.	☐	☐	☐	☐	☐

E-Government Effective Use - Smart City

PART TWO

This part of the questionnaire is intended to obtain the respondent's use and experience of the www.joburg.org.za website.

Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

I use the www.joburg.org.za website:

- ☐ Daily
- ☐ At least once a week
- ☐ Once a Month
- ☐ Rarely or hardly ever
- ☐ I have never used it

E-Government Effective Use - Smart City

PART THREE

This part of the questionnaire is intended to understanding of how well they use the www.joburg.org.za website.

PERFORMANCE EXPECTANCY

Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I would use www.joburg.org.za website for accessing services and doing other activities.	☐	☐	☐	☐	☐
Using www.joburg.org.za website enables access all services I need quickly.	☐	☐	☐	☐	☐
Using the www.joburg.org.za website saves my time.	☐	☐	☐	☐	☐
The www.joburg.org.za website allows me to use it from anywhere.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Performance Expectancy?

PART THREE**EFFORT EXPECTANCY**

Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
Becoming skillful at using www.joburg.org.za website is easy for me.	☐	☐	☐	☐	☐
The content on www.joburg.org.za website is clear and understandable.	☐	☐	☐	☐	☐
Interaction with www.joburg.org.za website is easy for me to use.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Effort Expectancy?

PART THREE**SOCIAL INFLUENCE**

Services available on the www.joburg.org.za website for the City of Johannesburg residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
People who are important to me think that I should use www.joburg.org.za website.	☐	☐	☐	☐	☐
People who are familiar with me think that I should use www.joburg.org.za website.	☐	☐	☐	☐	☐
The public marketing campaigns have influenced me to use the www.joburg.org.za website.	☐	☐	☐	☐	☐
Most people surrounding me use www.joburg.org.za website.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Social Influence?

PART THREE**FACILITATING CONDITIONS**

Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
My internet access at work enables me to use an www.joburg.org.za website.	☐	☐	☐	☐	☐
My internet access at home enables me to use an www.joburg.org.za website.	☐	☐	☐	☐	☐
My internet access at in public places enables me to use an www.joburg.org.za website.	☐	☐	☐	☐	☐
The online support enables me to use www.joburg.org.za website to help resolve my query.	☐	☐	☐	☐	☐
My query gets resolved quickly and satisfactorily when I log it on the www.joburg.org.za website.	☐	☐	☐	☐	☐
The FAQ site available on the www.joburg.org.za website helps me to easily use the website.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Facilitating Conditions?

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PART THREE

SELF-EFFICACY

This part of the questionnaire is intended to obtain the profile of a respondent. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
I could use www.joburg.org.za website if I had the built-in help guidance for assistance.	☐	☐	☐	☐	☐
I could use www.joburg.org.za website if someone showed me how to do it.	☐	☐	☐	☐	☐
I could use www.joburg.org.za website if I had seen someone else using it.	☐	☐	☐	☐	☐
I could use www.joburg.org.za website if I could call someone for help.	☐	☐	☐	☐	☐
I could use www.joburg.org.za website if I had just the built-in help facility for assistance.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Self-Efficacy?

PART THREE

PERCEIVED COMPETENCE

This part of the questionnaire is intended to obtain the profile of a respondent. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
I could complete my online activities using the www.joburg.org.za website even if I had never used a website like it before	☐	☐	☐	☐	☐
I am able to navigate the www.joburg.org.za website by following the relevant links.	☐	☐	☐	☐	☐
I am able to find the information I need to use the services on the www.joburg.org.za website.	☐	☐	☐	☐	☐
I have the necessary knowledge to understand how use all services on the www.joburg.org.za website.	☐	☐	☐	☐	☐
My ability to access services I need at the right time has improved since using the www.joburg.org.za website.	☐	☐	☐	☐	☐
My ability to budget more precisely has improved with the COJ www.joburg.org.za website service;	☐	☐	☐	☐	☐

Any comments you would like to share regarding Perceived Competence?

PART THREE**PERCEIVED AUTONOMY**

This part of the questionnaire is intended to obtain the profile of a respondent. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
I feel unrestricted to browse the www.joburg.org.za website for the information and services I need.	☐	☐	☐	☐	☐
I feel that the www.joburg.org.za website provides me choices and options.	☐	☐	☐	☐	☐
The customer support agents spend time understanding my needs before addressing them.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Perceived Autonomy?

PART THREE

PERCEIVED RELATEDNESS

This part of the questionnaire is intended to obtain the profile of a respondent. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
I feel more comfortable in using an www.joburg.org.za website when support is provided timely by the COJ consultant.	☐	☐	☐	☐	☐
I feel comfortable logging my query on the www.joburg.org.za website because I am confident that it will be resolved.	☐	☐	☐	☐	☐
The online support on the www.joburg.org.za website gives me sufficient guidance on how to navigate the website.	☐	☐	☐	☐	☐
I found the COJ consultant helpful in helping me complete my tasks on the www.joburg.org.za website.	☐	☐	☐	☐	☐
The support I have received from the COJ consultant and the www.joburg.org.za website increase my motivation to use the website.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Perceived Relatedness?

PART THREE**ACTUAL USAGE**

This part of the questionnaire is intended to obtain the profile of a respondent. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
I have been using the www.joburg.org.za website for: less than 1 year, between 1 and 5 years or more than 5 years. <i>(Infrequently)</i>	☐	☐	☐	☐	☐
I use the www.joburg.org.za website: between zero and two times a month, between three and five times a month or more than five times a month. <i>(Frequently)</i>	☐	☐	☐	☐	☐
I visit the www.joburg.org.za website whenever I need specific information or access municipal services.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Actual Usage?

PART THREE**EFFECTIVE USE**

This part of the questionnaire is intended to obtain the profile of a respondent. Services available on the www.joburg.org.za website for the City of Johannesburg (COJ) residents, businesses and other government offices include: tariffs payments, drivers and business licence registration, tender submissions etc. This study is particularly focussing on citizens' use and effective use of this website.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
The www.joburg.org.za website is easy to use and to navigate other online services.	☐	☐	☐	☐	☐
The www.joburg.org.za website is set up to provide me enough information and support I need.	☐	☐	☐	☐	☐
I can access the www.joburg.org.za website conveniently and easily.	☐	☐	☐	☐	☐
I believe that I am using the www.joburg.org.za website correctly.	☐	☐	☐	☐	☐
Using the www.joburg.org.za website helps me access all the services I need.	☐	☐	☐	☐	☐

Any comments you would like to share regarding Effective Use?

PART FOUR

This part of the questionnaire is intended to obtain the profile of a respondent.

Highest Qualification (e.g. Cert., Dip., BSC, MsC., PhD):

Gender of respondent:

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

Total number of years of working experience:

Age of respondent in completed years [Age at last birthday]:

PART FOUR

Please elaborate on your non usage of the www.joburg.org.za website and then complete the biographical questions which are asked for statistical purposes only.

I have never used it because:

- ☐ I have never heard of it before.
- ☐ Not all services I need are available.
- ☐ I do not trust the website.
- ☐ Other (please specify)

Highest Qualification (e.g. Cert., Dip., BSC, MsC., PhD):

Gender of respondent:

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

Total number of years of working experience:

Age of respondent in completed years [Age at last birthday]:

Appendix D – Demographics

A Structural Equation Modeling was used to assess the effect of moderation between dependent and independent variables. However these results were deemed inappropriate for this study as they did not definitively provide this relationship.

Results below:

1. Is there a relationship between gender and Actual use?

Descriptives

Actual usage

	N	Mean	Std. Devia tion	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Male	93	2.77	.831	.086	2.599	2.942	1.00	5.00
Female	64	2.78	.819	.102	2.577	2.986	1.33	5.00
Prefer not to say	3	2.89	1.018	.588	.359	5.419	2.00	4.00
Total	160	2.78	.824	.065	2.648	2.906	1.00	5.00

ANOVA

Actual usage

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.043	2	.021	.031	.970
Within Groups	107.896	157	.687		
Total	107.938	159			

The results show that there is no significant relationship between gender and actual use (F-value = 0.031 and p-value = 0.970) since the p-value was greater than 0.05.

2. Is there a relationship between qualification and Actual use?

Descriptives

Actual usage

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Matric	7	2.52	.716	.271	1.861	3.186	1.67	3.67
Certificate	15	2.62	.755	.195	2.204	3.040	1.67	4.33
Diploma	34	2.73	.904	.155	2.410	3.041	1.33	5.00
Degree	43	2.93	.930	.142	2.644	3.217	1.67	5.00
Postgraduate degree	49	2.73	.655	.094	2.540	2.916	1.00	4.00
Total	148	2.77	.812	.067	2.634	2.898	1.00	5.00

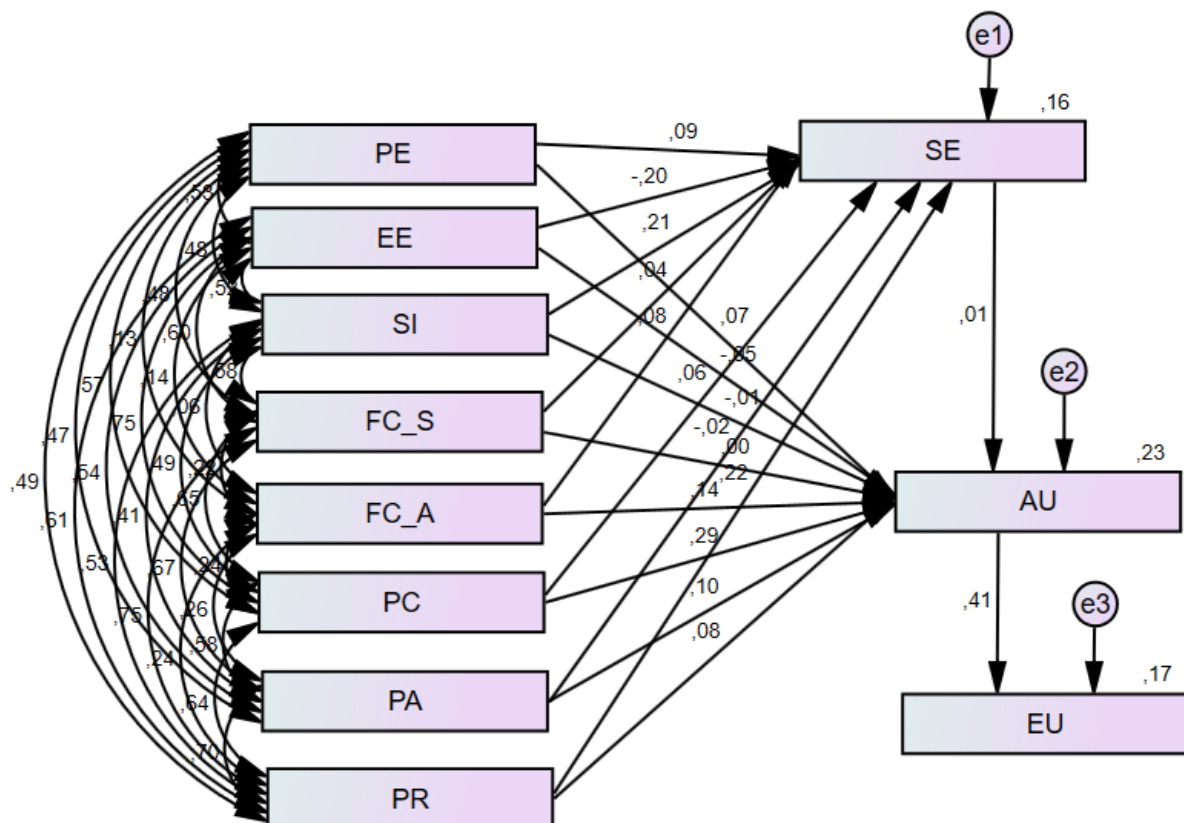
ANOVA

Actual usage

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.007	4	.502	.756	.556
Within Groups	94.984	143	.664		
Total	96.991	147			

The results show that there is no significant relationship between qualification and actual use (F-value = 0.756 and p-value = 0.556) since the p-value was greater than 0.05.

Structured Equation Modelling - Model



Estimates

- Estimates (Group number 1 - Default model) - Scalar Estimates (Group number 1 - Default model)
- Maximum Likelihood Estimates - Regression Weights: (Group number 1 - Default model)

		Estimate	S.E.	C.R.	P
SE <---	PE	,092	,094	,974	,330
SE <---	EE	-,182	,105	-1,734	,083
SE <---	SI	,185	,083	2,225	,026
SE <---	FC_S	,037	,110	,338	,735
SE <---	FC_A	,107	,099	1,085	,278
SE <---	PC	,066	,132	,498	,619
SE <---	PR	,239	,139	1,721	,085
SE <---	PA	-,024	,125	-,190	,850
AU <---	PE	,073	,094	,772	,440
AU <---	EE	-,044	,106	-,416	,677
AU <---	SI	-,005	,084	-,055	,956
AU <---	FC_S	-,002	,110	-,022	,983
AU <---	FC_A	,191	,099	1,927	,054
AU <---	PC	,325	,132	2,460	,014
AU <---	PA	,113	,124	,910	,363
AU <---	PR	,090	,140	,643	,520
AU <---	SE	,008	,079	,099	,921
EU <---	AU	,373	,066	5,618	***

Standardised Regression Weights: Group number 1 - Default model

			Estimate
SE	<---	PE	,091
SE	<---	EE	-,202
SE	<---	SI	,212
SE	<---	FC_S	,042
SE	<---	FC_A	,083
SE	<---	PC	,062
SE	<---	PR	,216
SE	<---	PA	-,021
AU	<---	PE	,070
AU	<---	EE	-,047
AU	<---	SI	-,005
AU	<---	FC_S	-,003
AU	<---	FC_A	,142
AU	<---	PC	,293
AU	<---	PA	,096
AU	<---	PR	,078
AU	<---	SE	,007
EU	<---	AU	,407

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
SE	,163
AU	,234
EU	,166

Matrices: (Group number 1 - Default model)

Total Effects (Group number 1 - Default model)

	PR	PA	PC	FC_A	FC_S	SI	EE	PE	SE	AU
SE	,239	-,024	,066	,107	,037	,185	-,182	,092	,000	,000
AU	,092	,113	,325	,192	-,002	-,003	-,045	,073	,008	,000
EU	,034	,042	,121	,071	-,001	-,001	-,017	,027	,003	,373

Direct Effects (Group number 1 - Default model)

	PR	PA	PC	FC_A	FC_S	SI	EE	PE	SE	AU
SE	,239	-,024	,066	,107	,037	,185	-,182	,092	,000	,000
AU	,090	,113	,325	,191	-,002	-,005	-,044	,073	,008	,000
EU	,000	,000	,000	,000	,000	,000	,000	,000	,000	,373

Indirect Effects (Group number 1 - Default model)

	PR	PA	PC	FC_A	FC_S	SI	EE	PE	SE	AU
SE	,000	,000	,000	,000	,000	,000	,000	,000	,000	,000
AU	,002	,000	,001	,001	,000	,001	-,001	,001	,000	,000
EU	,034	,042	,121	,071	-,001	-,001	-,017	,027	,003	,000

The only significant relationship was between SI and SE, (p-value = 0.026), PC and AU (p-value = 0.014) and between AU and EU (p-value < 0.01)