Evaluating citizen satisfaction with the quality of e-government information services provided by Southern Africa Development Community governments

by

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DECLARATION BY CANDIDATE

I hereby declare that I, Caroline Mukumbareza claim the work presented here as my own and that it has not been submitted anywhere for any award. All sources used in this work have been acknowledged.

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ABSTRACT

This dissertation reports on an empirical evaluation of citizen satisfaction with e-government information services provided by Southern African Development Community (SADC) governments, since citizens perceive service quality as an effective indicator of e-government shortfalls. Few studies have been conducted in SADC countries to empirically evaluate the satisfaction of regarding e-government services. An e-government satisfaction model was applied, which is a non-linear framework with interactive quality proxies. A total of 364 respondents was used for data collection. An analytic modelling technique of Partial Least Squares (PLS) was used to predict the factors that most influence citizen satisfaction with e-government information services provided by SADC governments. The resulting model fits the data with a high goodness of fit (GoF) of 0.62 and a model predictive power (R^2) of 0.60 for the global model. In addition, the results of this study show that perceived quality is the most influential factor affecting citizen satisfaction with e-government information services, followed by citizen complaint handling and then citizen expectation. Finally, this study used PLS to rank the SADC countries involved in this study in terms of which country is offering the best level of e-government information services and customer satisfaction. The results indicate that South Africa was ranked highest and Tanzania lowest.

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ABBREVIATIONS

CSI   Customer Satisfaction Index

ACSI   American Customer Satisfaction Index

SADC   Southern African Development Community

AHP   Analytical Hierarchical Process

PLS   Partial Least Squares

SEM   Structural Equation Modelling

CR   Composite Reliability

AVE   Average Variance Expected

GoF   Goodness Of Fit

CE   Citizen Expectation

CT   Citizen Trust

PQ   Perceived Quality

CS   Customer Satisfaction

CC   Citizen Complaint Handling

EGOVASAT Electronic Government Satisfaction Model

ATIS   Advanced Transportation Information Systems

COBRAS   Cost Opportunity, Benefit, Risk And Analysis Satisfaction

NCSI   National Customer Satisfaction Index

KMO   Kaiser-Meyer-Olkin

CI   Communality Index

G-CSI   Government Citizen Satisfaction Index

EGOV-ACSI E-Government American Customer Satisfaction Index

EUSI   European User Satisfaction Model

E-SQ   Electronic Service Quality

E-S-QUAL	Electronic Service Quality
E-GovQual	Electronic Government Quality
SERVQUAL	Service Quality
LV	Latent Variables
MV	Manifest Variables

1. CHAPTER ONE: INTRODUCTION

1.1 Background to the study

This dissertation reports on original work that develops a citizen satisfaction measurement model to measure citizen satisfaction with e-government information services. Six Southern African Development Community (SADC) English speaking countries, namely, South Africa, Zimbabwe, Botswana, Namibia, Tanzania and Lesotho were involved in the study. The concept of e-government is usually associated with the use of Information and Communication Technology (ICT) such asWeb 2.0, mobile web services, grid computing and cloud computing to improve government service delivery. These technologies promote efficient and effective government, facilitate easy access to government services, provide greater public access to government services and enable government to be accountable to citizens (Yao and Zhao, 2010; Farelo and Morris, 2006; Prybutok *et al.,* 2008). As a result, governments of many countries across the world are embarking on an effort to provide quality e-government services to their citizens (Onyancha, 2007).

In this study, e-government services hosted on government portals were evaluated. African countries, compared to any other parts of the world, have limited ICT necessary for e-government services, due to lack of infrastructure, low literacy rate, low economic development and cultural factors. Despite these deficiencies, many African countries, including those in the SADC region, have made noticeable progress in e-government implementation (Rorissa and Demissie, 2010). There has recently been an escalation of e-government initiatives in the SADC region, with South Africa, Mauritius, Seychelles and Botswana taking a lead in e-government service delivery (Bwalya and Healy, 2010; Mutula, 2008). Individual websites of SADC countries were evaluated by several researchers who found out that all the countries have e-government and the majority of them are at the second stage of e-government development (interaction stage), which has low to medium e-government usage. The following countries' e-government services have been studied:

- Botswana (Nkwe, 2012);

- Namibia (Kuzma, Yen and Oestreicher, 2009).

- Zambia (Coates and Nikolaus, 2010);

- South Africa (Kaisara and Pather, 2011; Korsten and Bothma, 2005); and

- Mauritius (Vencatachellum and Pudaruth, 2010).

E-governance involves new ways of accessing governments, new styles of leadership, new methods of transacting business, new systems of organising and delivering information and services like in any other organisation (Finger and Pecoud, 2003). E-government also refers to the quality of delivery of government information online through the internet or other related technologies (Kumar *et al.*, 2007). The quality factor provides critical information about the services and this includes electronic services (e-services) when measuring citizen satisfaction (Wilkin and Hewett, 1999). Citizen satisfaction is one important reflector of e-government service performance (Yao and Zhao, 2010). For the consumers of e-services to be satisfied, they expect access to a reliable system at any time; they also expect the system to provide what they want and match their expectations (Mishra *et al.,* 2010).

To measure citizen satisfaction with a citizen-focused e-government services, quality factors such as service quality and user satisfaction must be included (Kaisara and Pather, 2011). Characteristics such as completeness, accuracy, conciseness and relevance are considered important factors to attract wide citizen patronage of e-government, and need to be measured. Korsten and Bothma (2005) state that the crucial element of effective e-government is the availability of content that is comprehensive and current. In order to effectively evaluate the performance of e-government, practical and theoretical measures of citizen satisfaction must be included (Yao and Zhao, 2010; Gupta and Jana, 2003). In a user-centric evaluation of e-government services, citizens need to express their perceptions of the quality of services provided by the government, and the best evaluation methods are themselves user-centric (Farelo and Morris, 2006). In order to discover effective implementation strategies for e-government services, formative evaluations can be used.

The purpose of e-government is to provide digital information services to enable massive citizen participation in government activities. Generally, citizen activities on government websites are either looking for relevant government information or completing some kind of transaction such as online registration, online application, database access, downloading of forms, online complaints, government contact details, government news,

vacancies, call for tenders, department calendar of upcoming events, links to related or useful sites and site map (Wang, Bretschneider and Gant, 2005).

Government services can be classified as services for residents including: health, services for organizations e.g. registration or deregistration of a company, services for foreign nationals e.g. permanent residence, and metro municipal services, as indicated on different government portals (Chen, 2002). The e-government process requires constant input and feedback from citizens who use the government services (Ferelo and Morris, 2006; Thompson, McClure and Jaeger, 2002). For a detailed list of e-government services found on SADC region countries' portals used in this study, refer to Appendix 1.

Evaluating citizen satisfaction with e-government services enables researchers to come up with accurate requirements and expectations of citizens and discover how citizens perceive their e-government service encounter. These elements assist researchers to identify factors that influence citizen satisfaction with e-government and help guide governments and government web designers to know what changes to make during the maintenance of government portals. This knowledge helps to point out significant factors in citizen satisfaction and e-service quality, in general.

A series of steps were taken in the methodology of this study to evaluate citizen satisfaction with e-government services, starting with identifying the factors considered important for accessing levels of citizen satisfaction with e-government information services. These factors were used to determine the country that offers the best e-government according to the level of citizen satisfaction with e-government information services. This study uses the model of an e-government citizen satisfaction index (CSI) and employs the Partial Least Squares (PLS) algorithm to establish the criticality of factors. CSIs and service quality metrics have proved suitable for service satisfaction evaluation (Xue and Yang, 2008; Gronroos, 1990). The latent variable index was used to rank countries according to their citizens' satisfaction level with e-government information services.

1.2 The problem situation

The citizens of a country can choose how they want to interact with government (Finger and Pecoud, 2003). There are, however, contradictions as to how citizens feel about using e-government services (Kunstelj, Jukic and Vintar, 2010; Kaisara and Pather, 2009). Kaisara and Pather (2009) found that citizens prefer to choose e-government rather than visit physical offices. On the contrary, Kunstelj, Jukic and Vintar, (2010) found that e-government is being enhanced, but citizens do not expect much from it and they do not show interest in e-government which indicates that e-government has not added much value to their lives. According to research, there continues to be high expectations of governments in respect of improved delivery of services and of close consultation with citizens. Such expectations are not unique to one country (Kaisara and Pather, 2009). This indicates a possibility of malfunctioning e-government services making continuous citizen satisfaction evaluation important. Technology is also advancing and satisfying citizens with e-government information services will continue to be difficult as the expectations of citizens change. The continuous evaluation of the present e-government systems is therefore necessary with the aim of improving these systems and indirectly satisfying citizens and gaining citizen buy-in for improved access to e-government information services.

The open issues that need to be addressed in e-government research are: identifying what problems are holding back advances in e-government, whether e-government is sustainable, whether e-government will improve the current poor quality of services provided by the government, what progress has been made in e-government and how to assess failure or success without monitoring and evaluating e-government services. According to research, 35% of e-government projects in developing countries have failed, 50% partially failed and only 15% are successful (Alanezi, Mahmood and Basri, 2011; Al-Shehry, 2008). Motivated by these open issues and observations, there is a need to evaluate citizen satisfaction with e-government information services provided by SADC countries.

Measuring citizen satisfaction can be a difficult task, especially identifying measurement factors when a criterion is not specified. Yao and Zhao (2010) stated that measuring e-government citizen satisfaction is still in its early stage and research on constructing factors of e-government satisfaction measurement is ongoing. There is a dearth of

in-depth research on citizen satisfaction with e-government information services and critical factors that can enable citizen continuous patronage of such services have not been fully uncovered (Yao and Zhao, 2010; Rorissa and Demissie, 2010). In order to identify measurement criteria, there is a need to find the gaps in e-service quality and more importantly, quality of e-government services from the citizens' point of view. Governments can use this information to help improve the quality of their e-services. This is a way of closing the gaps in citizen satisfaction with e-government information services and thereby developing a priority list of which gaps to focus on first. Studying the quality of e-government information service from the citizens' perspective provide governments with a competitive advantage in international business (Kaisara and Pather, 2011). Due to social and contextual dimensions of technology evaluation, user satisfaction is a continuous process (Kaisara and Pather, 2011; Sheibani and Fariborzi, 201; Yao and Zhao, 2010).

Many developed countries have significantly committed to e-government and a number of studies on e-government evaluation have been conducted (Sheibani and Fariborzi, 2011, Freed, 2011; Zhao, 2010; Ray, 2011; Abhichandani and Horan, 2006). At present, intra-country evaluation of citizen satisfaction with e-government services provided by SADC has not been researched (Bwalya and Healy, 2010). Even though a variety of studies have been conducted to measure service quality in e-government, no conclusions have been drawn on the factors used for measurement (Alanezi and Basri, 2010; Connolly and Ingle, 2006; Yoo and Dontu, 2001).

As is evident from the above discussion, there is still a need to develop methods that can be used for evaluating citizen satisfaction with e-government information services. The main challenge therefore is identifying appropriate criteria to evaluate citizen satisfaction with e-government information services. This research study has contributed to knowledge by answering the following questions:

a) What set of criteria will be suitable to evaluate citizen satisfaction with e-government information services provided by SADC countries?

b) What critical factors affect the satisfaction of citizens with e-government information services?

c) Which country is ranked highest in terms of citizen satisfaction with e-government information services in the SADC region?

1.3 Research goal and objectives

The main goal of this research is to use the CSI model to evaluate citizen satisfaction with e-government information services provided by SADC countries. The following objectives were set to realize the goal of the study and by achieving these objectives, the research questions would have been answered.

a) To discover a set of suitable criteria to evaluate the satisfaction of citizens with e-government information services provided by SADC countries,

b) To discover the criteria that contribute most to citizen satisfaction with e-government services provided by SADC countries by applying an algorithm, and

c) To identify the SADC country that is experiencing the best level of citizen satisfaction with e-government information services.

1.4 Significance of the study

Almost all countries around the world, including those in the SADC region, have introduced e-government services, but at different levels (Rorissa and Demissie, 2010). Individual e-governments in SADC have been evaluated, for example, Tanzania (Kaaya, 2009), Zambia (Coates and Nikolaus, 2010), Angola (Meerman, 2010) and South Africa (Kaisara and Pather, 2011). This study evaluates SADC countries at the regional level with the goal of identifying the country that offers the best level of citizen citizen satisfaction with e-government information services. This study provides insight into and validates the usefulness of CSIs in e-government evaluation especially in Africa. This study theoretically contributes to the ranking of SADC region countries based on their citizens' satisfaction with e-government information services. The Latent Variable Index (LVI) generated with the Partial Least Squares (PLS) algorithm was used for this purpose. In the past, ranking of e-government was done using methods such as Fuzzy Analytical Hierarchical Process (FAHP) (Fei, Yao and Yu, 2008), but little is recorded about the use of LVI to rank e-government. There are also practical contributions of this research, when different countries in the SADC will identify if their citizens are satisfied with the e-government services being provided and the factors

affecting them. This will help to improve the quality of e-government services provided to meet the needs of the citizens and to make e-government more user friendly.

1.5 Summary of contributions

The unique contributions made by this research on citizen satisfaction with e-government information services are enunciated as follows:

a) The use of e-government CSI to evaluate citizen satisfaction with e-government services provided by SADC countries;

b) The systematic identification of a set of suitable criteria to evaluate citizen satisfaction with e-government services provided by SADC countries;

c) The use of PLS to evaluate citizen satisfaction with e-government information services provided by SADC countries; and

d) The application of PLS to predict latent variable index for ranking the selected SADC countries based on citizen satisfaction with e-government information services.

1.6 Chapter synopsis

Chapter One provides the introductory part, problem statement and research questions. The research goal, objectives, significance of the study and study contributions are also presented. Chapter Two provides a comprehensive overview of the existing related literature that lays the theoretical foundation for the research model and the research objectives of this study. This chapter provides detailed information about citizen satisfaction with e-government information services and e-service quality. Chapter Three presents a detailed account of all the steps carried out to achieve the objectives of this study, including the selection of research techniques to solve the questions posed. Chapter Four presents the results with an emphasis on statistical data analyses in detail. Chapter Five provides the conclusion, summary and future intentions of this study.

2. CHAPTER TWO: LITERATURE REVIEW

This chapter provides a comprehensive review of the research domains that are relevant to this study. This review includes theories, concepts, models and factors of citizen satisfaction with e-government information services. The aim is to systematically guide the process of solving the research question and to achieve the objectives specified in this research. Citizen satisfaction with e-government information services measurement is to introduce the theory and methods of e-government performance as a way of measuring the state of e-government performance and construction.

E-government is defined as the delivery of government-oriented information and services online through the internet or by other digital means to citizens, business partners, employees and other government entities (Zhao, 2010; Abhichandani and Horan, 2006). E-government concentrates on information, transaction processes and interactive items mainly provided on government portals (Yao and Zhao, 2010). The final goal of every government is to provide citizens with more complete and convenient services. This can only be effectively accomplished by assessing the level of e-government services from the citizens' point of view. In doing so, it is believed that e-government might transform the relationship between citizens and government (Zhao, 2010).

In general, satisfaction is a person's feeling of pleasure or disappointment resulting from the performance of a service in relation to expectations (Albert, Njanike and Mukuch, 2011). In order to discover the performance of e-government, it's level of service to citizens must be assessed. Citizens are increasingly interacting with government services online resulting in a growing expectation of effective service delivery (Kaisara and Pather, 2009; Horan and Abhichandani, 2006). Hence, evaluating citizen satisfaction with e-government information services has become a popular topic of research (Hao, 2011; Alanezi, Mahmood and Basri, 2011; Horan and Abhichandani, 2006). In e-government there is a two-way interaction between government and citizens, whereby citizens can send and receive information via the internet thereby improving the delivery process of government services (Jinmei, 2011). Identifying if citizens are satisfied when doing a transaction between an individual and an e-government services is an appropriate unit for evaluating e-government

information service, especially when directly involving citizens (Wang, Bretschneider and Gant, 2005). Even though there is a high percentage of citizens searching for information, research on evaluating citizen's satisfaction e-government information services is still limited. Hence, there is a need to evaluate citizens' satisfaction with e-government information services (Barnes and Vidgen, 2006; Carter and Belanger, 2005; Wang, Bretschneider and Grant, 2005.

Accessing the level of citizen satisfaction will help to understand the needs of citizens in order to determine the development stages of an e-government portal. This is achieved by putting in place theoretical and practical constructs for measuring citizen satisfaction and reaction of citizens when using e-government (Yao and Zhao, 2010; Abhichandani and Horan, 2006). There has been a widespread request for government to provide e-government services that satisfy citizens making e-government more user-centric (Horan, Abhichandani and Rayalu, 2006; Scott, Golden and Haughes, 2005; Theans, Boogers and Poelmans, 2004).

2.1 Citizen satisfaction with e-government service

In order to measure citizen satisfaction, there must be the inclusion of the quality factor to provide important information regarding the quality of services (Wilkin and Hewett, 1999). This makes e-government and e-service quality a key to the success or failure of online organisations and institutions (Alanazi and Basri, 2010; Kim, Im and Park, 2005). Research on e-government service quality is still limited and at an early stage in its development (Yao and Zhao, 2010; Kasubiene and Vanagas, 2007). For this reason, research on factors related to an e-government evaluation index is still minimal.

E-government services can be evaluated depending on the level of development they attain, publish, interact or transact, which can be found in the different stages of e-government development, especially on the World Wide Web (Kenstelj and Vintar, 2004). The four different characteristic stages of e-government development are:

        a) A web presence where the government portal publishes certain basic information;

b) An interaction, which refers to a government portal providing more information, saving and printing forms, communication with employees via email, search engines;

c) A transaction where a website offers transactions ranging from triggering of process, electronic form of full electronic implementation of service and corresponding processes, including cash handling, final product and payment, if required; and

d) A transformation stage, which refers to integrated services where many processes can occur without the citizen being involved (Layne and Lee, 2001; United Nations Global e-government survey, 2003; Kunstelj and Vintar, 2004).

According to Kunstelj and Vintar (2004), most countries reach the second level and a few are making an effort to reach stage three.

A study by Carter and Belanger (2005) found out that, in business, 67% of customers use websites to search for information, 61% make a purchase online, while, in e-government, 83% use a web site to gather government information and 66% use the web to complete a government transaction. If citizens cannot complete a government transaction online, they get frustrated and this will decrease the future use of e-government services (Carter and Belanger, 2005). Research shows that information searching is higher, but research on e-government service interaction is limited, so there is a need to evaluate if citizens are satisfied in their engagement with e-government services (Barnes and Vidgen, 2006; Carter and Balanger, 2005; Wang, Bretschneider and Grant, 2005). Interaction involves a government process that focuses on how a task is conducted and this involves measures like time spent to complete an activity as well as sending and receiving e-mails from government (Wang, Bretschneider and Gant, 2005). This research, therefore, will concentrate on evaluating citizen satisfaction with interactive e-government information services.

E-government is a special type of e-service. E-service is defined as all interactive services that can be delivered on the internet using advanced telecommunications, information, and multi-media technologies. The concept of e-service quality is the extent to which a web site enables the efficient delivery of e-services (Al-Tarawneh, 2012). Citizens will realize the benefits of using the internet when good quality e-services are provided. The general benefits of e-services are flexibility, convenience, efficiency and enjoyment while

security, risk of obsolescence, lack of personalisation and control are negative themes of online services (Kasubiene and Vanagas, 2007; Parasuraman, 2000). Most of these factors are related to service quality, which is set as the "more specific" judgement and a component of satisfaction (Oliver, 1993).

A general definition of service quality by Parasuraman, Zeithaml and Berry (1985) is the direction and level of consistency between customers' perceptions and expectations. Service quality can also be defined as the difference between customers' expectations for service performance prior to a service encounter and their perception of the service received (Connolly and Ingle, 2006). Perceived service quality is, therefore, the gap between perceptions and expectations of a customer. In an e-government environment, quality can be achieved when citizens' expectations are met regarding the services delivered (Saha, 2008). Due to rapid development in technology, citizens' expectation of good quality e-government services is also increasing (Jinmei, 2011). This is supported by Kasubiene and Vanagas (2007) who state that in general, online customers expect higher levels of service quality compared to offline customers. In order to measure citizen satisfaction with e-government services or any other e-services quality factors are considered. Quality of e-government information services can be compromised if security, trust, communication, site aesthetics, design, and access are not addressed resulting in citizens being hesitant to use e-government (Kaisara and Pather, 2009).

Perceived e-service quality can be defined as the citizens' evaluation of and opinions about the excellence of e-service delivery (Alanazi and Basri, 2010; Santos, 2003). In an e-government environment, e-service quality is measured by realisation of the potential advantages of the internet for the benefit of citizens in their interaction with government (Alanazi and Basri, 2010). E-government service quality is therefore the degree to which an e-government web site enables citizens, businesses or agencies to achieve their governmental transactions. If the quality of e-government services improves, e-government efficiency and citizen satisfaction also increases.

Citizen satisfaction is the core measurement of e-government service quality (Jinmei, 2011). E-government systems should provide services conveniently, sending and receiving information even when physical offices are not open. This is achieved when citizen satisfaction index (CSI) of e-government will assess the service performance from an external

publicity angle which reflects the overall quality and operational level of e-government and makes e-government user-centric (Hao, 2011; Horan, Abhichandani and Rayalu, 2006; Scott *et al.*, 2005; Centre for Digital Government, 2005).

Citizens are likely to trust e-government services which satisfy them, are citizen-centric and address their needs timeously (Kasubiene and Vanagas, 2007). Citizen satisfaction leads to trust in e-government and is when citizens prefer to use digital services rather than any other form such as mail or counter (Kasubiene and Vanagas, 2007). Citizens who are satisfied with e-government information services will recommend these services to others and have the confidence to continue using the same service in the future (Hao, 2011). Understanding the quality dimensions of e-government services improves citizen satisfaction and trust in e-government services and enables government organisations to work towards improving the areas of their e-government that are not working properly. According to Papadomichelaki Magoutas and Halaris (2006), there are three main areas that affect the quality of e-government services, summarised in Table 2.1 below.

Table 2.1: Areas influencing quality of e-government services.

Services	
Content	System
This area deals with quality dimensions that have to do with information and presentation issues. This includes accuracy, correctness, timeliness, completeness, relevance, ease of understanding (Papadomichelaki, Magoutas and Halaris, 2006)	This area deals with quality issues such as availability, accessibility, reliability, system integrity, performance, interoperability, regulatory and security.
Organisation	
This area comprises dimensions such as leadership, human resources and strategy.	

Adapted from Papadomichelaki, Magoutas and Halaris, (2006)

Besides the key areas of e-government service quality evaluation stated above, Halaris, Mogoutas and Papadomihelaki, (2007) propose a summary of quality assessment layers, as illustrated in Figure 2.1.

a) **Customer satisfaction** – deals with quality issues as perceived by citizens compared to their expectations;

b) **Site quality** – deals with the website usability and interface characteristics;

c) **Technical performance –** technical aspects of the web site; and

d) **Process performance** – quality aspects typically related to traditional government services.
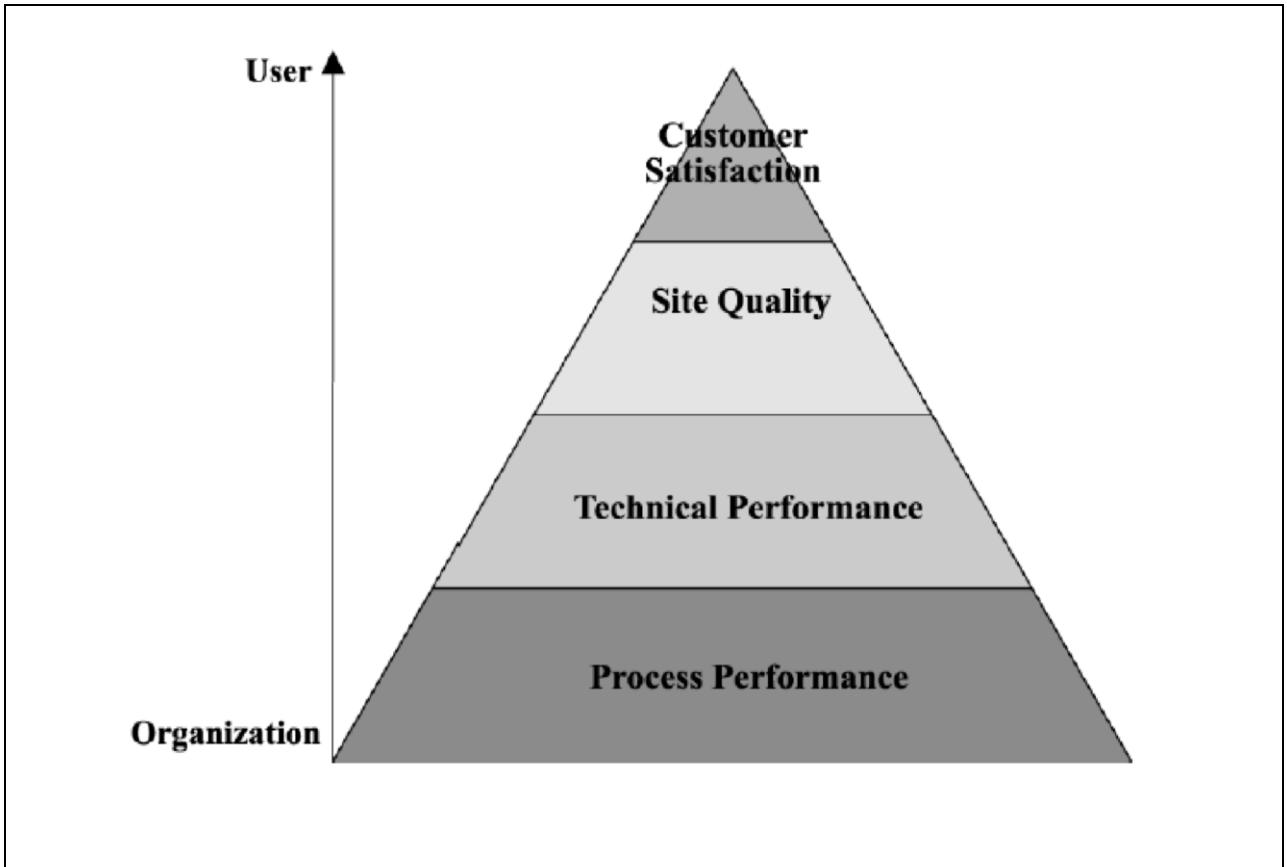
Figure 2.1: Layers of quality assessment adapted from (Halaris, Mogoutas and Papadomechelaki, 2007)

There are many models that can be used to measure citizen satisfaction with e-government information service, such as SERVQUAL, SITEQUAL, ATIS, EGOVSAT, ISO/IEC 9126 and e-government citizen satisfaction indexes or models such as egov-ACSI, EUSI, g-CSI Taiwan. Some of these models and factors of citizen satisfaction with e-government information services and e-government services will be discussed as background to the selection of the evaluation criteria.

2.1.1 EGOVSAT

The EGOVSAT model is used to evaluate government to citizen web-based initiatives in terms of satisfaction derived by users (Abhichandani, Horan and Rayalu, 2005). This model consists of features which promote confidence, trust, openness and citizen–centric delivery derived from other perspectives of e-government evaluation from other researchers such as West (2004); Wang Bretschneider and Gant (2005); Eschenfelder and Miller (2005). Emotional responses of users are the dependent variable in this model, as shown in Figure 2.2 (Horan, Abhichandani and Rayalu, 2006; Abhichandani and Horan, 2006).

In this model, satisfaction has other affective responses of varying intensity which signifies various emotional responses. Abhichandani and Horan (2006) extended emotional factors to include frustration, pleasantness and confidence. The construct of "utility" refers to the usefulness of the website, "reliability" refers to websites functioning well in terms of technology and accuracy of content, "efficiency" refers to the accessibility, availability on information and organisation of website features, "customisation or personalisation" refers to the website ability to change so as to meet the needs of the users and "flexibility" and "customisation" cater for the digital aspect of the website so that the website is user-centric (Abhichandani and Horan, 2006).

Factors in the EGOVASAT model were expanded by Sheibani and Fariborzi (2011) to include performance features of e-government efficiency, reliability, accessibility, completeness, customization and usability. Results show that customization, reliability and accessibility have slight influence on overall satisfaction, but all the other factors have moderate to high influence on satisfaction. The data collected also shows that perceived completeness was low whilst efficiency and usability were high. Horan and Abichandani (2006) used the EGOVSAT model to evaluate citizen satisfaction with e-government. They collected data from 401 citizens using Advanced Transportation Information Systems (ATIS), an online service delivery offered by the government. Data analysis was done using structural equation modelling (SEM) and the overall results indicate there is value in utilizing a robust measure of citizen satisfaction such as EGOVSAT. A summary of factors and characteristics of the EGOVASAT model is presented in Table 2.2.
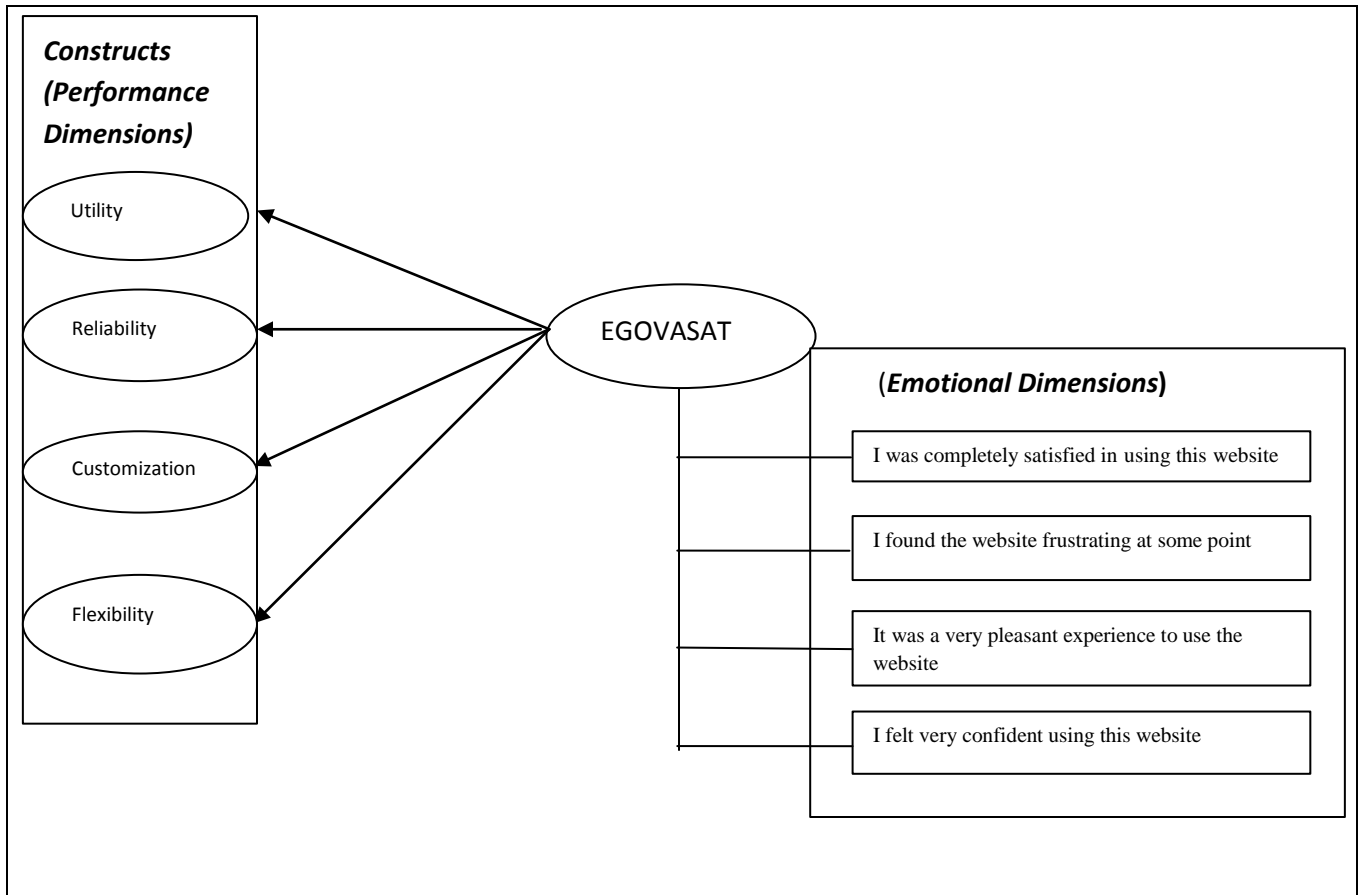
Figure 2.2: EGOVSAT model (adapted from (Abhichandani and Horan, 2006)

Table 2.2: Summary of EGOVSAT model

Factors	Characteristics
Utility	completeness, usefulness, coverage
Reliability	Uptime, accuracy
Efficiency	Ease of use, presentation
Customization	Customized access, customized content
Flexibility	Flexible planning, dynamic content

2.1.2 ISO/IEC 9126 standard

The ISO/IEC 9126 standard model is used to evaluate whether e-government services meet the needs of the citizens. This model was developed in 1991 by the International Organisation for Standardisation (ISO) as a framework to measure software quality (Quirchmayr, Funilkul and Chutimaskul, 2003). It describes internal and external software quality. External quality

describes the behaviour of the system, while internal quality describes the product itself (Quirchmayr, Funilkul and Chutimaskul, 2003). In order to evaluate e-government services, this model considers the quality needs and satisfaction with service provided by government organisations and access to these services by citizens. Factors considered in this model for e-government information services satisfaction evaluation are: functionality, reliability, usability, efficiency, maintainability and portability (Quirchmayr, Funilkul and Chutimaskul, 2003). Figure 2.3 is a diagrammatic representation of the ISO/IEC 9126 standard model showing the quality characteristics.
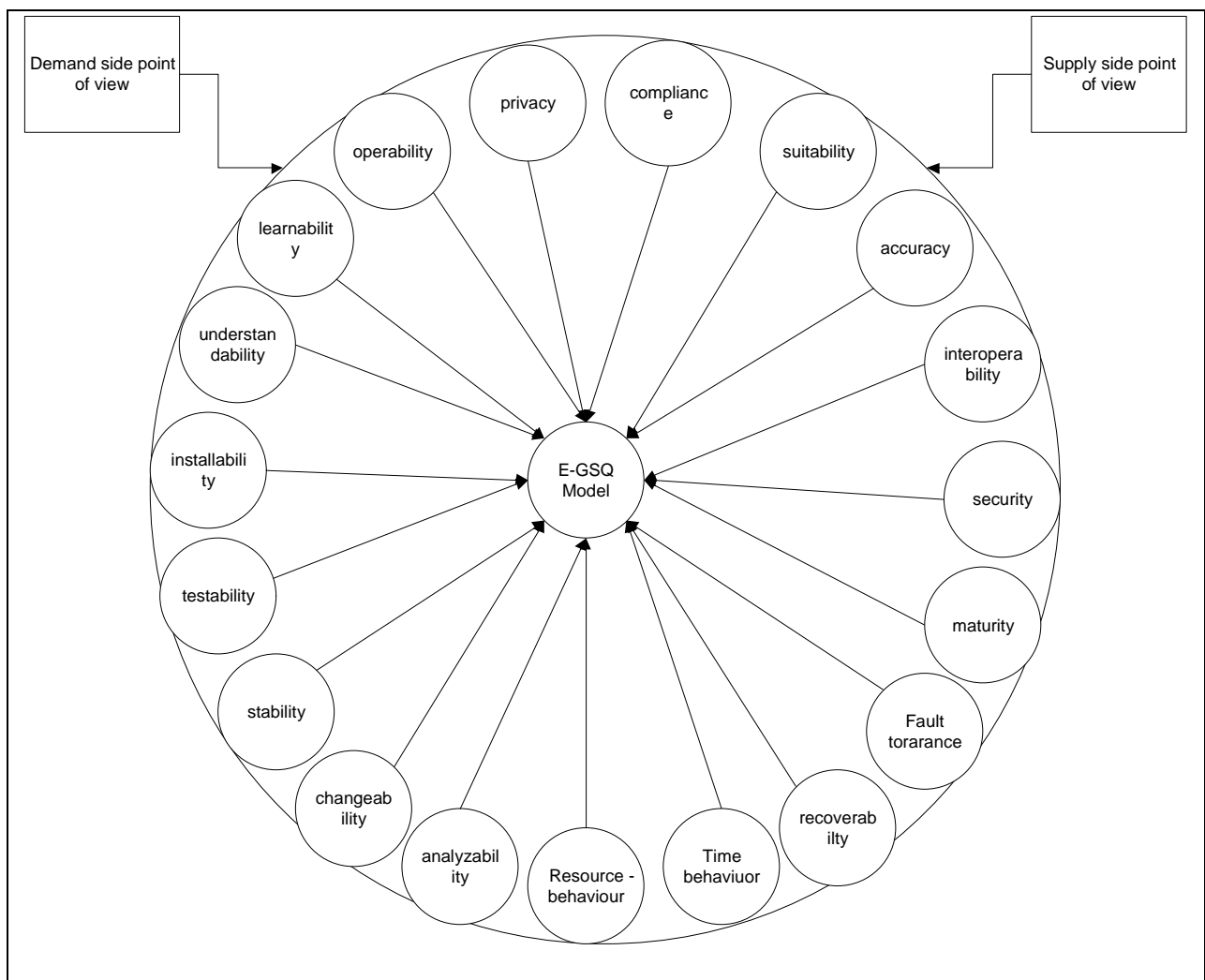
Figure 2.3: The quality model of e-government services (e-GSQ model) adapted from (Quirchmayr, Funilkul and Chutimaskul, 2003)

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According to this model, the supply side refers to e-government services that comply with aimed rules or targets, which are cost reduction services, and services that meet the demand of citizens at appropriate times (Quirchmayr, Funilkul and Chutimaskul, 2003). The demand side has five quality characteristics: understandability, learnability, operability, compliance and privacy and the other quality characteristics are on the supply side. The privacy characteristic is not found in the original model, but was included for evaluating e-government to protect the personal information of stakeholders. According Quirchmayr, Funilkul and Chutimaskul (2003), who conducted research in two successful European and Australian countries, this quality model for e-government delivers ease-of-use, efficient, safe and stable services to citizens.

2.1.3 SERVQUAL

Originally, service quality (SERVQUAL) was designed by Parasuraman (1988) to measure service quality based on inputs from focus groups within the marketing sector. Measuring service quality in the public sector was less considered compared to the private sector (Burkley, 2003). SERVQUAL has been used for evaluating service quality and extended in a variety of sectors and organizations; nonetheless, the original dimensions of SERVQUAL are tangibles, reliability, responsiveness, assurance and empathy (Parasuraman, 1985). SERVQUAL was mainly used in physical market services because of the difference in methods of measuring service quality in e-government and the physical market. There was a need to reformulate scale items so that they could be used in online government contexts and these include some technical dimensions (Alanezi and Basri, 2010).

The SERVQUAL model supplies detailed information regarding: perceptions of citizens with regard to service; levels of performance as seen by the citizens; suggestions and comments of citizens; and personal impressions from citizens in relation to citizens' satisfaction and perceptions. Jinmei (2011) considered characteristics of government agencies and perceived quality perspective drafted SERVQUAL dimensions to be used for e-government service quality environment as follows:

a) Tangibles – this refers to e-government systems, which are visually appealing, nice and decent and clear to read;

b) Reliability – this refers to services that citizens can depend on;

c) Responsiveness – this refers to services that allow citizens to receive feedback promptly and for employees tp provide help to citizens when required;

d) Assurance – refers to services that make citizens feel safe and confident when using them and services that are reliable; and

e) Empathy – refers to e-government systems that give citizens individual attention and consider the needs of citizens.

This model uses questionnaires to ask citizens their perceived service needs and evaluates their service quality perceptions of a particular organisation or institution (Parasuraman *et al*., 1994). It uses a 22-Likert scale item to identify a gap between citizens' expectation and perceptions of service provided (Kassim and Bojei, 2002, Parasuraman *et al.,* 1994).

When Parasuraman (2002) started to examine the issue of e-service quality, he managed to reduce the previous 11 dimensions of service quality to four dimensions, namely: efficiency, fulfilment, reliability and privacy (Buckley, 2003). Literature also indicates that user satisfaction can be measured using the SERVQUAL instrument (Alanazi and Basri, 2010; Parasurama, 2002). A study by Alanazi and Basri (2010) proposed a seven dimensional and 26 item scale that is important for measuring citizen satisfaction with e-government information services. The dimensions are: web site design, reliability, responsiveness, security or privacy, personality, information and ease of use.

Among the offsprings of SERVQUAL was the development of electronic service quality (e-SQ) with dimensions from the provider or customer's point of view. E-SQ measures service quality considering information availability and content, ease of use or usability, privacy or security, graphic style, and reliability or fulfilment (Alanezi and Basri, 2010; Zeithaml, Parasuraman and Malhotra, 2002). More scales for measuring service quality were proposed, but could not provide a comprehensive evaluation of e-services. For example, the WebQual scale uses 12 dimensions, but did not provide specific service quality measures from the customer's point of view, instead concentrating on information fit to task (Loiacono, Watson and Goodhue, 2000).

Site quality (SITEQUAL) is another commonly used scale to measure e-service quality. The scale proposes that online service quality can be measured through ease of use,

aesthetic, processing speed and interactive responsiveness. However, SITEQUAL lacks the ability to evaluate service quality of websites (Connolly and Ingle, 2006; Yoo and Donthu, 2001). E-S-QUAL is another commonly used model to evaluate e-service quality. Electronic service quality (E-S-QUAL) defines 22 items from four dimensions, namely: efficiency, fulfilment, system availability and privacy.

Measuring e-government service quality cannot be the same as measuring e-service quality for other domains like e-commerce, for example, because the quality criteria for e-commerce cannot be the same as those for e-government. This initiated the development of electronic government quality (e-GovQual), an improvement of SERVQUAL models specifically designed for the e-government environment. After review of previous research by Papademichelaki and Mentzas (2012) on e-service quality, an e-GovQual model was designed to measure e-government service quality, as illustrated in Figure 2.4. They identified six factors of citizen satisfaction with e-government service quality:

a) Ease of use consisting of factors such as navigation and personalisation;

b) Technical and efficiency (Papademichelaki and Mentzas, 2012; Santos, 2003);

c) Trust comprising of privacy and security as factors (Papademichelaki and Mentzas, 2012; Zhao and Zhao, 2010);

d) Functionality of interaction environment (e.g. support in completing forms) (Papademichelaki and Mentzas, 2012; United Nations, 2008);

e) Reliability refers to correct and on-time delivery of e-government services. This dimension consists of factors such as availability and accessibility (Papademichelaki and Mentzas, 2012); and

f) Content and appearance, which measures the quality of information and its layout (Papademichelaki and Mentzas, 2012; Hoffman and Krauss, 2004). Citizen support (interactivity) refers to help provided by the government when citizens are searching for information or doing transactions (Papademichelaki and Mentzas, 2012; Zithaml *et al.,* 2002).
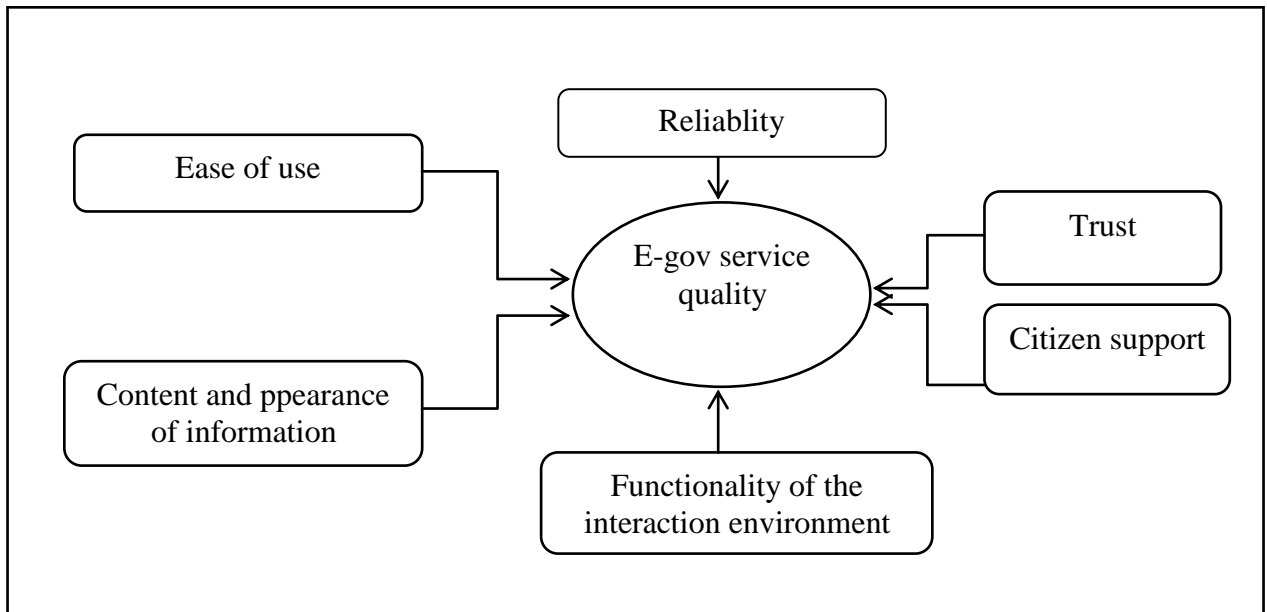
Figure 2.4: E-GovQual model for e-government service quality adapted from (Papadomchelaki and Mentzas, 2012)

From the discussion above, there is no one author who has proposed a complete view of digital service quality requirements in e-government. Some e-government service quality factors that can be used to determine citizen satisfaction are summarised in the Table 2.3.

Table 2.3: list of e-government service quality characteristics and description

E-government service quality characteristics	Description
Trust	This represents the level of confidence citizens have regarding e-services. This also involves trustworthiness of the government and that the citizens will not feel betrayed and is achieved by the government fulfilling its tasks. This measure involves privacy and communication security (interception of secret information, abuse of personal information).
Usability	It represents the citizens' ease of benefiting from e-government services. It can also be defined as the degree of interaction between the user and the service. Usability can be detailed as understandability, learnability, compliance and attractiveness. a) **Understandability** – is how citizens perceive the significance of the information and how the service works. b) **Learnability** – measures how the services help citizens learn how to use it. c) **Compliance** – is how the service works in harmony with the traditional government system. Stakeholders are able to request e-

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| | government services from a government organisation from any place, through any channel that is convenient and suitable any time according to their needs and satisfaction. |
	d) **Attractiveness** – a measure of how the digital service is able to attract citizens compared to traditional service.
Suitability	The direction of e-government services that are suitable, quick and time saving.
Accuracy	The accuracy of e-government related services provided to stakeholders.
Accessibility	Refers to the e-government service being used by people of all abilities without any modifications.
Reliability	The ability of the e-government portal to deliver e-services consistently, producing, exceeding and meeting services specifications. This factor also encompasses the availability of the e-services.
Information quality	Describes the quality of information system and measure of value which the e-portal provides the citizen.
Ease of use	The usability of the site during citizen navigation. This reduces customer frustration and results in citizen satisfaction.
Content	Useful and current information which is well presented.
Customization	The process of tailoring pages to individuals' preferences of characteristics.
Interoperability	Represents the amount of cooperative work among the government applications, software agents and services in different development environments.
Performance	This is how fast a service request can be completed. It is measured by the speed a task is completed using a response time, latency and execution time.
Self-service	Refers to formats that allow citizens to access services without help faster and convenient.
Interaction	The quality of interaction experienced by citizens when accessing e-government services, for example, when doing a transaction, and also involves the issue of information, security, customization and communication with government agents. Researchers have discovered that citizen prefers to use interactive websites more than static ones (Alanezi, Mahmood and Basri, 2011).
Efficiency	This refers to simplicity of an e-government website both in use and in access. If a site is complex, slow to download information and difficult to understand the content, citizens will be dissatisfied and look for alternative methods of accessing government services.
Fulfilment	The degree at which the promised service performs at the promised time, for example, reply to emails, providing confidence of delivering the right service and correct charges. If promises are met, citizens will gain trust

	with e-government and ultimately increase satisfaction with e-government service quality.

2.1.4 E-government Citizen Satisfaction Index (CSI)

There are many methodologies and models designed to measure citizen satisfaction, as explained in the above sections and CSI is one of them. According to Halaris, Mogoutas and Papadomechelaki (2007), the idea of CSI was introduced in the offline world and then migrated to the online world. The structure and setup of CSI has been changing over the years based upon established theories, approaches, customer behaviour, customer satisfaction and service quality (Fornell, 1992). CSI is a customer evaluation that cannot be measured directly as an overall measure; it does not look at consumption experience, but is forward looking (Anderson and Fornell, 2000). CSIs are multidimensional; the indexes consist of manifest variables (those that measured the survey) and latent variables (inferred by manifest variables) (IDeA and LGA Publications, 2006). In addition customer satisfaction represents a global satisfaction, which is an indicator of past, present and future performance of an organization (Duarte, Raposo and Alves, 2012) and has been identified in the marketing industry. CSI methodologies identify key drivers of satisfaction and sum up their relationship to come up with overall satisfaction.

Besides marketing, CSIs have been used in other domains such as job satisfaction, income evaluation, consumer satisfaction (Anderson and Fornell, 2000) and in e-government citizen satisfaction (Johnson *et al.,* 2000). For citizen satisfaction with e-government information services evaluation, the original CSI models were adjusted for the e-government environment. This development saw the emergence of models such as government customer satisfaction index (g-CSI), European user satisfaction index (EUSI) and electronic government customer satisfaction index (egovACSI) (Halaris, Mogoutas and Papadomechelaki, 2007). These models consist of quality dimensions such as accessibility, accuracy of information, ease of transaction, transparency, interactivity, cost of services, expertise and kindness. Citizen satisfaction indexes were developed upon the idea of cumulative satisfaction.

Cumulative satisfaction, also called the economic psychology-based approach, has gained more acceptances over the years. According to this approach, satisfaction is a citizen's overall experience to date with a service (Welch, Hinnant and Moon, 2004; Johnson *et al.,* 2000; Johnson and Fornell, 1991). Cumulative satisfaction is better than transaction-specific because it can predict subsequent behaviours and service performance. Cumulative satisfaction is customer welfare and this made cumulative satisfaction the foundation of the prominent National Customer Satisfaction Indexes (NCSIs) and subsequent models thereafter. Besides being cumulative, satisfaction CSI models allow comparison of different countries or agencies of e-government (Kim, Im and Park, 2005).

2.1.4.1 E-government Citizen Satisfaction Index (g-CSI)

The g-CSI was specifically designed for evaluating e-government service quality satisfaction as a means of overcoming the shortfalls of the original CSI for e-government (Kim, Im and Park, 2005). Customer satisfaction has been introduced at a national level with the development of National Satisfaction Barometers and indices in countries such as Sweden (1992), Norway (1998) and USA (1996). The constructs used for measuring customer satisfaction continue to be adapted and improved over time. The introduction of g-CSI was a solution to the problems of the original CSIs not concretely fitting to e-government (Kim, Im and Park, 2005). It is also called the Korean g-CSI and was developed on the ACSI model and therefore, has many similarities. The ACSI model could not cater for or consider the internet environment. The introduction of g-CSI was for e-government evaluation to produce results that would expand the mind of management to offer citizen-oriented services and enable management to provide competitive service quality.

The g-CSI omits or rephrases two factors not valid for e-government environment, that is, perceived value and customer loyalty. The perceived quality comes with other related government activities (Kim, Im and Park, 2005), as shown in Figure 2.5. The quality dimensions considered in this model are information accuracy, information easiness, cost of service, expertise and kindness concerning citizen service. G-CSI helps predict how an increase in citizen satisfaction will affect the future behaviour of citizens (return visits and referrals to the site). G-CSI has cause and effect relationships between the latent variables,

which include manifest variables that act as concrete proxies for latent variables. Citizen satisfaction is the latent variable at the centre of the model. According to this model, citizens are not only receiving services, but also giving suggestions about government problems (Kim, Im and Park, 2005). Kim, Im and Park (2005) carried out a survey to evaluate citizen satisfaction with e-government in Korea using the e-CSI model. The result of this model demonstrates that g-CSI can be used effectively in an e-government internet environment where the ordinary CSI models could not. They also used feature weighting and selection to identify improvement points in e-government. In this case, information has a higher degree of importance and contribution. It must therefore be managed well.
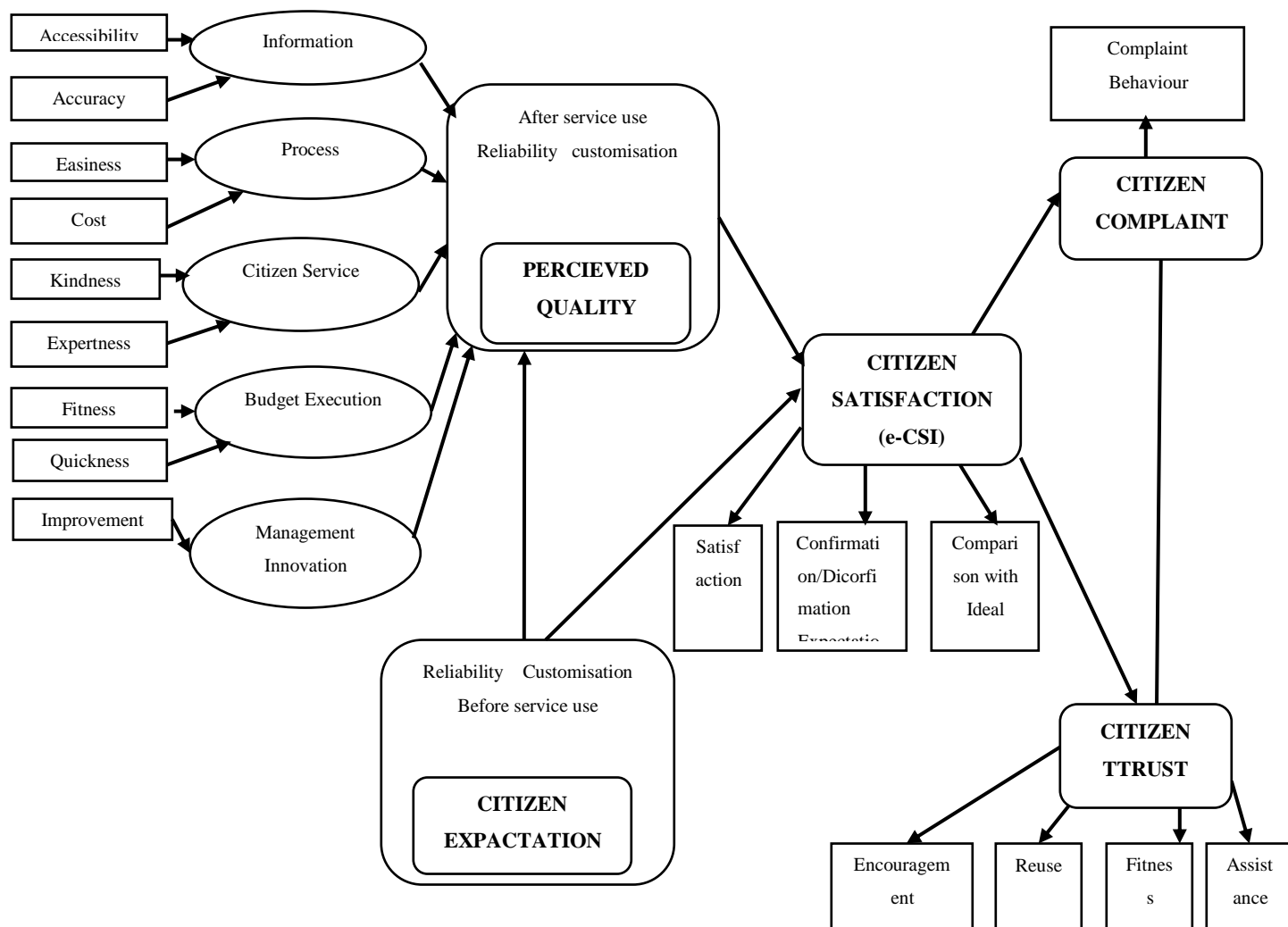
Figure 2.5: G-CSI model for e-government adapted from (Kim, Im and Park, 2005)

2.1.4.2 E-government American Customer Satisfaction Index (egov-ACSI)

ACSI was developed in 1994 by building upon the Swedish customer satisfaction barometer (SCSB) model (Gronholdt, Martensen and Kristensen, 2010; Johnson *et al.,* 2000). ACSI allows government entities to track citizen satisfaction with the quality of their services over time (Sheibani and Feribozi, 2011). ACSI is powered by Yuan-yuan *et al.* (2007) in recent years. ACSI is a standard metric in the United States used in both the private and public sectors. When it was introduced, it was used to evaluate customer satisfaction in about 200

companies from 34 major industries (Johnson *et al*., 2001; Fornell *et al*., 1996). According to IDeA and LGA Publications (2006), ACSI refers to citizens' opinions of e-government information services. Satisfaction with e-government mostly includes elements such as content, functionality, navigation, site performance, look and feel and search (Sheibani and Feribozi 2011; IDeA and LGA Publications, 2006). ACSI is one of the most comprehensive and representative reflections of the citizen experience with government websites with more than 300,000 surveys conducted during the first quarter of 2011 in the United States of America (Freed, 2011). The egov-ACSI was developed in 2006 as the more established model in this category (American Customer Satisfaction Index, 2006). It is used to evaluate more than 90 online e-government services quarterly grouped as transactions or e-commerce, news, or information, portal or department, recruitment or carriers (Halaris, Mogoutas and Papadomechelaki, 2007).

Egov-ACSI has the cause and the effect of the metric relationship between various items of the model and this interaction helps predict the attitude of citizens in the future. The cause and effect nature also helps the government to predict the impact of web site enhancement in a particular area such as navigation. ACSI measures the quality of services as experienced by those that use them (Andertson and Fornell, 2000). This method helps predict how an increase in citizen satisfaction will affect desired future site visits or referral visits (Sheibani and Feribozi, 2011; Halaris, Mogoutas and Papadomechelaki, 2007).
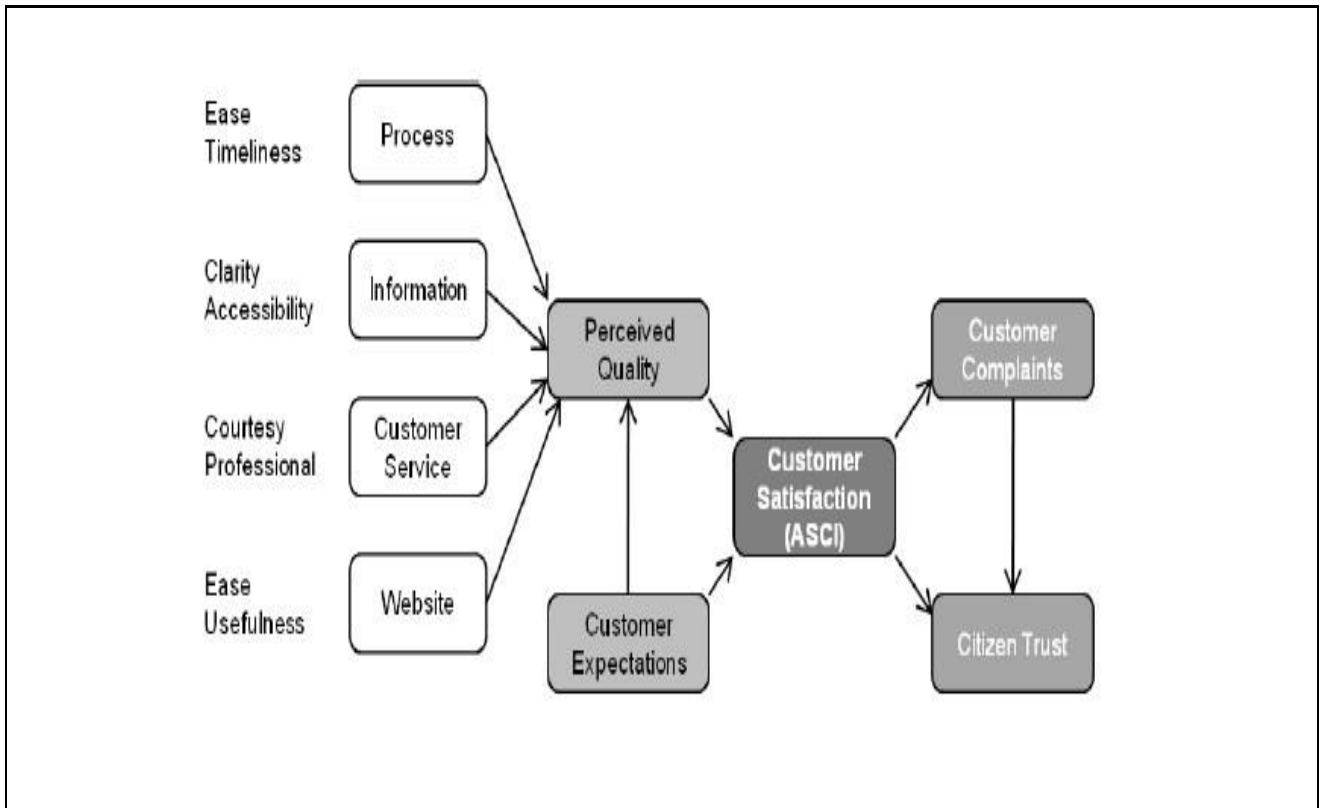
Figure 2.6: The measurement model for E-government American Customer Satisfaction Index (egov-ACSI) (adapted from American Customer Satisfaction Index, 2006)

E-government ACSI surveys will provide tangible examples of how the results of ACSI surveys can be utilized as they refer to visible features that can be adjusted without complications (VanAmburg, 2004). This model has three antecedents that are perceived quality, customer expectations and customer satisfaction, which is the latent variable at the centre of the model, as shown in Figure 2.6 above (Halaris, Mogoutas and Papadomechelaki, 2007; Andertson and Fornell, 2000). Egov-ACSI roposes that, to measure citizen satisfaction, the factors customer expectation, perceived quality, customer satisfaction, citizen trust and customer complaints must be studied (Yuan-yuan *et al*., 2007). Perceived value is not a construct in e-government and citizen-trust construct replaces the price-related outcomes found in the private factor (repurchase intention). In a study, Yuan-yuan *et al.* (2007) used

ACSI to evaluate e-government in China using five quality factors: site usability and ease-of-use; functional service; information service; transaction service and democratising content.

2.1.4.2.1 Citizen satisfaction index factors

Citizen satisfaction indexes for e-government service evaluation consist of latent variables such as citizen expectation, perceived quality, citizen satisfaction, government trust, citizen trust and citizen complaint handling (Alanezi Mahmood and Basri, 2011; Yao and Zhao, 2010; Kim, Im and Park, 2005). The inclusion or exclusion of these or other factors depends on the authors. Yao and Zhao (2010) constructed a satisfaction index system with the following factors: citizen expectation, perceived ease of use, perceived usefulness, perceived quality and perceived ability to use, citizen satisfaction, government image, citizen reliability and citizen participation. Some of the latent variables in these models have manifest variables that act as concrete proxies of the latent variables as shown in Table 2.3 above.

a) Citizen expectations

An expectation is the level of e-government service quality that citizens expect to receive before citizens use the services (Di Nisio and Di Battista, 2010; Yao and Zhao, 2010). It evaluates the citizen expectations for the overall quality, for service quality and fulfilment of personal needs. Citizens' confidence in their expectations with regard to a service will have much impact on satisfaction (Spreng and Page, 2001). Wirtz and Bateson (1999) illustrated that the uncertainty and ambiguity of expectations strongly influence the satisfaction process. According to research, there continues to be high expectations of government in most countries in terms of improved delivery of service and citizen participation (Kaisara and Pather, 2009).

b) Perceived quality

Perceived service quality is the overall evaluation of online service quality after citizens have used government e-services and also measure the reliability of a service (Yao and Zhao, 2010; Zalm *et al.,* 2010). Perceived quality also refers to citizens' judgments of a service against their expectations. Perceived quality is the citizens' judgments about an entity's overall

excellence or superiority (Zeithaml, 1987), and is the evaluation of recent consumption experience of services such as access to information accuracy of information, and citizen service (Kim, Im and Park, 2005; Loughlin and Coenders, 2002). Most of these quality factors are summarised in Table 2.3 above. Quality also evaluates customization and reliability of service (Kim, Im and Park, 2005). Customization refers to the degree that a service meets citizen requirements and reliability accesses, whether an organisation is offering services that are reliable, standardized and free from deficiencies (Turkyilmaz and Ozkan, 2012). It is the citizens who provide a service quality measure by expressing their views about a service by providing judgments of some service aspects (Eboli and Mazzulla, 2009). The quality factor for evaluating e-government citizen satisfaction differs from one model to another.

c) Citizen complaint handling

Citizen complaint handling refers the to intensity of complaints and the way in which government manages these complaints (Turkyilmaz and Ozkan, 2012; Di Nisio and Di Battista, 2010). Generally, defining customer complaint is the disagreement between an organisation and their customers (Fornell *et al*., 1996). The government must be responsive to the needs and queries of citizens and that service quality is satisfactory. The relationship between citizen trust and citizen complaint handling level depends on the government's efficiency in handling complaints and if a government agent handles complaints effectively, it will be able to turn dissatisfied citizens to loyal ones (Fornell, 1992). If the government puts more effort to reduce citizen complaints, the level of citizen satisfaction will rise and in turn, the government will realise a citizen-participated e-government (Kim, Im and Park, 2005).

d) Citizen satisfaction

Citizen satisfaction indicates how many citizens are satisfied and how well their expectations are met (Zalm *et al.*, 2010). It is an estimation of a customer, supported by previous experiences with the use of services (Howard and Sheth, 1969). It evaluates whether the performance of e-government services is meeting the ideal and overall citizen satisfaction (Hafeez and Hasnu, 2010; Kim, Im and Park, 2005). Citizen satisfaction is the latent variable that is at the centre of the model, between the cause and effect variables. Customer

satisfaction with e-services is related to citizen perception of e-services that are convenience in terms of transaction, transparency, and interactivity (Saha, 2008).

e) Citizen trust

In the private sector, maintaining customer loyalty and reducing customer complaints are the main goals with the final gain of increased profits. Yet, in e-government, the main aim of citizen satisfaction is to gain citizen trust (Hao, 2010). The results of trust in e-government are reusability, assistance, justice and encouragement (Kim, Im and Park, 2005). Satisfied citizens are also identified by returning to use the same e-government services and refusing to switch on to other alternative methods (Di Nisio and Di Battista, 2010; Hsu, 2008; Anderson and Sullivan, 1993).

Previous research on citizen trust indicates that when citizens are satisfied they continue to use the e-government services, recommend to friends and relatives and use the e-government services as their primary source. For example, in a research study conducted by Freed (2005) on e-government citizen satisfaction evaluation, it was discovered that the likelihood of using the site as a primary source ranked low, which means citizens were still using other sources/channels to assess government services. In other research by Freed (2011) on e-government citizen satisfaction, the study findings were that when citizens are satisfied, 50% are likely to return to the website and 79% will recommend it to their friends, family and colleagues. When compared to those who are dissatisfied, highly satisfied website visitors report being 80% more likely to return to the website and 79% more likely to recommend it to others (Mich, 2011). Citizen trust is an antecedent of citizen satisfaction and citizen complaint.

2.2 Summary of literature review

This discussion highlights the significance of citizen satisfaction with e-government. Citizen satisfaction is defined in many ways, but, for the purposes of this study, citizen satisfaction can be defined as the level of satisfaction of the citizen in relation to the expectations of the citizen being met and exceeded after e-government service delivery. There are many citizen satisfaction models that can be used to measure the quality of e-government services and each

one of these models is unique in its own way. The researcher is able to select a set of suitable criteria evaluation criterion for evaluating citizen satisfaction with the quality of e-government services in SADC countries by considering the level of e-government usage and stage of e-government development in the region. Table 2.4 provides a comparison of previous studies conducted on e-government service quality and the analysis method employed. The context of the research, sources of data, independent variables, analysis methods and major results were presented for each research.

Table 2.4: Comparison of previous studies on citizen satisfaction

	Context Theory of Model	**Source of Data**	**Independent Variables**	**Analysis Method**	**Major Results**
Nilashi *et al.* (2012)	Find out and rank factors for improving government portal	Used questionnaire to solicit information from citizens	Interaction, citizen insight, generation, citizen support, content, security, participation, services, bonus	TOPSIS	Services ranked highest, followed by interaction and citizen insight ranked low
Alanezi, Mahmood and Basri, (2011)	Presented a conceptual model to measure e-government service quality and determine the relationship between e-government service quality dimensions	On-going research	Eleven dimensions, including efficiency, availability, interactivity, fulfilment etc	Uses statistical analysis method	Identified dimensions for measuring e-government service quality and relationship between the dimensions and user satisfaction and trust, respectively
Sheibani and Foriborzi (2011)	Accessed citizen satisfaction level of Electronic	Questionnaires were distributed to users of the system	Efficiency, reliability, accessibility, completeness, customisation	Descriptive statics and correlation	Perceived complete-ness was low whilst efficiency and

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	Value Added Tax (EVAT) in Iran		and usability		usability were high
Osman *et al.* (2011)	Successful actors that impact e-government satisfaction; Cost, Opportunity; Risk and Analysis for Satisfaction (COBRAS) e-SQ	Questionnaires distributed to TurkSat citizens	Information quality, system quality	SEM	Confirmed that COBRAS is a useful tool and that information and system quality has an impact on citizen satisfaction
Sarsdedt and Ringle (2010)	Uncover unobserved heterogeneity using complex path modelling	German telecommunication sector	Prior information	FIMIX-PLS	Aggregate analysis of reputable data is misleading but by including a priori information the model fit is increased
Yao and Zhao (2010)	Used AHP to build e-government satisfaction model	Data was collected in China using a questionnaire	Citizen expectation, perceived ease of use, perceived usefulness, perceived usability, perceived quality, citizen satisfaction, government image, citizen reliability, citizen participation	Fuzzy comprehensive evaluation	"Citizens expect" satisfaction of government website ranked medium

Zhao (2010)	Evaluate status of web-enabled public to the citizens service maturity methodology	Data collected from local municipalities in Yangtze River Delta	Quality and usage	Quantitative analysis using mean and averages	Results showed that all city governments are moving from traditional to electronic methods of accessing government services.
Papadomechelaki and Mentzas (2009)	Developed and tested multi-item scale for e-government measurement e-GovQual	Web-based questionnaire	Reliability, efficiency, citizen support, trust	Cronbach's coefficient and explanatory factor analysis	All factors have an effect on the overall service quality of e-government
Yuan-yuan *et al.* (2007)	Modified ACSI model for government evaluation Public ACSI model	Collected data from Harbin municipality using questionnaires	Five service quality factors, site usability, ease of use, functional service, transaction service, information service and democracy service	SEM-PLS	Five factors have impact on perceived quality and, in turn, on citizen satisfaction
Eriksson, Friman and Norman (2007)	Evaluate overall satisfaction when using web based information E-S-QUAL	Questionnaires distributed to road users in Varmland, Sweden	Efficiency, system availability, fulfilment	Regression analysis	Efficiency affects the overall satisfaction more even though availability and fulfilment also affect overall satisfaction

Horan and Abichandani (2006)	Evaluate citizen satisfaction with e-government EGOVSAT	Advanced Transportation Information systems (ATIS) online	Utility Reliability Efficiency Customization flexibility	SEM	There is value in utilizing a robust measure of citizen satisfaction using EGOVSAT
Barnes and Vidgen (2006)	Evaluated quality of UK e-government website	Using E-Qual questionnaire and got 420 respondents	Access to good information, design, aesthetics, return likelihood	Used data triangulation	Good information was the most important factor, and that information seeking citizens is more satisfying than those who attempted to interact with the system
	E-Qual				
West (2006)	Ranked e-government websites	Checked for the presence of various features	Information availability, service delivery, public access point	Used e-government scores by region	North America had the highest score followed by Asia and Africa ranked low
Kim, Im and Park (2005)	Introduced the g-CSI to overcome the weaknesses of the CSI model in e-government evaluation g-CSI	Korea	Modified ACSI model for private sector	Feature weighting and positioning	Information has the highest degree of importance and contribution, so it must be monitored well.

Kuo, Huang, C. and Wu (2005)	Analyse customer satisfaction and user perception of South Africa e-government portal quality SERVQUAL	An online questionnaire	Empathy, accessibility, ease of use, information quality	Regression analysis, KMO and Bartett sphere test.	Empathy, accessibility, ease of use, information quality has an effect on customer satisfaction with e-government portal

3. CHAPTER THREE: RESEARCH METHODOLOGY

This chapter presents the methodology of this study. The study uses the customer satisfaction index modelling concept to set up an e-government citizen satisfaction model. In order to achieve the research objectives of this study as outlined in Chapter One, a series of steps were followed. The evaluation criteria of citizen satisfaction with e-government information services has been discussed. The research model followed by measurement instrument, instrument validation, e-government evaluation and, finally, the ranking algorithm, will now be presented. The methodological sequence of steps taken to achieve the objectives of this research is summarised as follows:

a) An e-government citizen satisfaction index and e-government satisfaction evaluation criteria were selected based on literature, as lucidly described in section 3.2 of this study. The aim was to discover a suitable set of evaluation criteria to evaluate citizen satisfaction with e-government information services;

b) A logical procedure, based on structural equation modelling and citizen satisfaction index, was followed, as described in section 3.3 of this study. This was to identify a set of criteria that contributes more to citizen satisfaction with e-government information services; and

c) The structural equation modelling latent variable index was used, as explained in section 3.4 to identify the SADC country that provides e-government information services that best satisfy the citizens.

3.1 Evaluation model

The methodology to evaluate citizen satisfaction with e-government information services draws inspiration from the National Customer Satisfaction Index (NCSI) models such as American Customer Satisfaction Index (ACSI) and European Customer Satisfaction Index (ECSI). These original models were used to evaluate customer satisfaction with products and services in the private and public sectors. They could not be used for e-government

evaluation. Hence, they were modified for e-government citizen satisfaction evaluation with the introduction of models such as egov-ACSI and g-CSI so that they can reflect e-government characteristics (Sheibani and Feribozi, 2011; Halaris, Mogoutas and Papadomechelaki, 2007; Kim, Im and Park, 2005). As compared to the original NCSI, the e-government citizen satisfaction model does not include perceived value and customer loyalty. Customer loyalty is, therefore, replaced by citizen trust since it is no longer limited to increasing profits, but gaining trust from citizens (Yuan-yuan *et al.,* 2007). Measuring value in e-government is not mandatory (Kim, Im and Park, 2005), so this factor was not included in this study.

There are a variety of models discussed in Chapter Two for evaluating citizen satisfaction with e-government information services. This study considers an e-government citizen satisfaction model with interaction (transaction) quality items that act as concrete proxies of the latent variable of perceived quality to evaluate citizen satisfaction with e-government information services. Factors identified for evaluating citizen satisfaction with e-government services were citizen expectation, perceived quality, citizen satisfaction, citizen complaint handling and citizen trust (Adeyemo, 2011; Mutula, 2008; Yuan-yuan *et al.,* 2007; Alshawi, Alahmary and Alalwany, 2007; Kim, Im and Park, 2005). In this study, perceived quality was measured for interactivity (transaction) because countries in the SADC region are mainly at this stage of e-government development (Adeyemo, 2011; Mutula, 2008; UN e-government survey, 2008; Alshawi, Alahmary and Alalwany, 2007; Ndou, 2004). Factors used to evaluate citizen satisfaction with e-government information services can be adopted for a specific country situation, if they apply in that situation (Alshawi, Alahmary and Alalwany, 2007). Perceived quality factors in this study were selected according to the maturity of e-government in the SADC region.

According to literature, most countries are still at the interaction stage, which is the second stage of e-government development. At this stage, e-government usage is still low to medium, especially in developing countries with few working towards stage three (Cater and Belanger, 2005; Kunstelj and Vintar, 2004; West, 2004; UN Global E-government Survey, 2003). This second stage involves activities such as looking for information or completing a transaction. This for example, includes online registrations, online complaints, form downloading, sending and receiving messages using e-mails (Janssen and Veenstra, 2005;

Moon, 2002). Interactive stages in these countries are at some point unidirectional from government to citizens and interactive, which is two-way, with access to a wide range of government institutions and services (Adeyemo, 2011).

In general, most SADC countries have reached stage two or are moving out of stage two of e-government development. Sub-Saharan countries such as South Africa, Tanzania and Mauritius are emerging as the ICT powerhouses (Bwalya and Healy, 2010; Bwalya, 2009, Mutula, 2008). Zambia has introduced online applications such as application for work permits and visas (Bwalya and Healy, 2010; Simenda, 2009, Mutula, 2008; Ndou, 2004). Countries, like Lesotho, Namibia, Zambia, Swaziland and Zimbabwe, are lagging behind the other SADC countries in terms of their development in e-government (Mutula, 2008; Ndou, 2004).

Below is a brief description of factors used in this research.

a) Citizen expectations

Citizen expectation, in this study, describes the outcome of prior experience with e-government information services satisfaction (Di Nisio and Di Battista, 2010; Yao and Zhao, 2010). It measures the expectation of the citizens for e-government services, meeting their needs, being reliable and overall quality of e-government information services (Kunstelj, Jukic and Vintar, 2010; Zalm *et al.*, 2010). Citizens' confidence in their expectations with regard to a service should definitely have much impact on satisfaction (Spreng and Page, 2001).

Citizen expectation proxies considered in this study are:

i) **Meeting personal needs** – This measures the expectations of citizens on e-government services to meet their personal needs when doing a transaction (Di Nisio and Di Battista, 2010; Yao and Zhao, 2010).

ii) **Reliability** – This measures citizens' expectation of e-government to deliver services consistently, producing, meeting and exceeding service specifications and also the availability of the services (Kunstelj, Jukic and Vintar, 2010; Zalm *et al.*, 2010).

iii) **Overall quality** – this measures the citizens' expectation of e-government to meet the overall quality expected (Kunstelj, Jukic and Vintar, 2010; Zalm *et al.*, 2010).

b) Perceived service quality

Perceived service quality is the overall evaluation of online service quality after citizens have used government e-services (Yao and Zhao, 2010). It measures perceived guidelines, the simplicity of using e-government services and timely response to citizens' request during a service transaction. It evaluates customization and reliability of service (Turkyilmaz and Ozkan, 2012). Perceived service quality has a positive effect on citizen satisfaction (Zalm *et al.*, 2010; Kunstelj, Jukic and Vintar, 2010).

Perceived quality interaction proxies considered in this study are:

i) **Response timeliness** – This is how fast a service request can be completed. It is measured by the speed a task is completed, by response time and execution time (Sheibani and Fariborzi, 2011);

ii) **Ease of use** – The usability of the website during citizen navigation. This reduces customer frustration and results in citizen satisfaction (Papademichelaki and Mentzas, 2012) and;

iii) **Perceived guidelines** – Help provided by the government when citizens are searching for information or doing a transaction (Papademichelaki and Mentzas, 2012; Zithaml *et al.,* 2002). Citizens will find it easy to interact with government online when they get help from the website whenever they need it and this will result in citizens being satisfied with the e-government services provided.

c) Citizen complaint handling

Citizen complaint handling refers to intensity of complaints and the way in which the government manages these complaints (Turkyilmaz and Ozkan, 2012; Di Nisio and Di Battista, 2010). It is measured in terms of ease of lodging complaints, response time to complaints lodged, and how well the complaints are handled (Chen, Huang and Hsiao, 2006).

If a government can handle complaints effectively, citizens will be satisfied and have trust in e-government (Fornell, 1992).

Citizen complaint handling proxies used in this study are:

i) **Complaints handling** – How fast and well citizen complaints are handled (Chen, Huang and Hsiao, 2006).

ii) **Easy lodging of complaints** – How easy citizens finds it to lodge a complaint with government and the response time taken by government to resolve the complaints (Turkyilmaz and Ozkan, 2012).

iii) **Rate of complaining** – How often citizens lodge complaints with government (Chen, Huang and Hsiao, 2006).

d) Citizen satisfaction

Citizen satisfaction indicates how many citizens are satisfied and how well their expectations are met (Zalm *et al.*, 2010). It evaluates whether e-government performance is meeting the ideals of e-government, fulfilment of expectations and overall citizen satisfaction (Hafeez and Hasnu, 2010). Citizen satisfaction with online services is related to citizens' perception of online services to determine if they are convenient in terms of transaction, transparency, and interactivity (Saha, 2008).

Citizen satisfaction proxies used in this study are:

i) **Overall satisfaction** – This measures overall citizen satisfaction with e-government information services (Hafeez and Hasnu, 2010).

ii) **Meeting ideal e-government** – This measures whether e-government services provided are meeting the ideal e-government expected by citizens (Hafeez and Hasnu, 2010).

iii) **Fulfilling expectations** – This measures whether e-government is fulfilling the expectations of the citizens (Zalm *et al.*, 2010).

e) Citizen trust

Citizen trust measures the level of experience the citizen has in relation to the e-government service transaction from the time of accessing it up to the last stage of service interaction. This also involves trustworthiness of the government and that the citizens will not feel betrayed.

This can be achieved by the government fulfilling its tasks. Citizen trust evaluates if citizens are going to continue using e-government services and not switch to other sources, recommend the use of e-government services to others and increase participation in accessing e-government service methods (Di Nisio and Di Battista, 2010; Hsu, 2008; Anderson and Sullivan, 1993). Studies show that citizen trust is an antecedent of citizen satisfaction (Jung and Yoon, 2011; Hsu, 2008, Oliver, 1997).

Citizen trust proxies used in this study are:

i) **Continuous participation** – This evaluates if citizens are going to continue using e-government services and not switch to other resources (Di Nisio and Di Battista, 2010).

ii) **Increase participation** – This evaluates if citizens are going to increase the rate at which they use e-government services (Hsu, 2008).

iii) **Participation in recommending e-government** – This evaluates if citizens are going to recommend the use of e-government services to their families, friends and co-workers (Anderson and Sullivan, 1993).

Table 3.1 shows measurement items that were drafted from the factors and proxies stated above using various sources. Citizen expectation was measured with three items adapted from Yuan-yuan e*t al*. (2007); Kim, Im and Park (2005); and Chatelin, Vinzi and Tenenhaus (2002). Perceived quality was measured with three items drafted from Landrum *et al.* (2009), Chatelin, Vinzi and Tenenhaus (2002) and Johnson *et al.* (2000). Perceived value was measured with two items adapted from Yuan-yuan e*t al*. (2007), Kim, Im and Park (2005) and Chatelin, Vinzi and Tenenhaus (2002). Citizen complaint handling was measured with three items from Chatelin, Vinzi and Tenenhaus (2002) and Bayol *et al.*, 2000. Citizen satisfaction was evaluated using three items from Yuan-yuan *at al*. (2007), Kim, Im and Park (2005) and Chatelin, Vinzi and Tenenhaus (2002) and citizen trust was measured with three items from Di Nisio and Di Battista (2010), Chatelin *et al*. (2002) and Bayol *et al.* (2000). All factors were measured using a scale of 1 to 10. 1 expresses a very low point of view on the e-government service satisfaction and 10 denotes a very high view point on e-government service satisfaction (Chatelin, Vinzi and Tenenhaus, 2002). A ten point scale was selected because it is more suitable and better when measuring citizen satisfaction since citizens can

easily think in terms of percentages as compared to a five point or seven point scale (Dawes, 2012).

Table 3.1: Conceptual measures of citizen satisfaction

Citizen Expectation	
CE1	Expectation of e-government service meeting my personal needs
CE2	Expectation of e-government service reliability
CE3	Expectation of overall e-government service quality
Perceived Quality	
PQ1	Perceived guidelines to access e-government service
PQ	Perceived simplicity of completing e-government service transactions
PQ3	Perceived timely response in e-government service transactions
Citizen Complaint handling	
CC1	Complaints on e-government service are well handled
CC2	Lodging a complaint with e-government service is easy
CC3	Rate of e-government complaint is low
Citizen Satisfaction	
CS1	Satisfaction with e-government service fulfilling expectations
CS2	Satisfaction with e-government service compared to ideal government service
CS3	Overall satisfaction
Citizen Trust	
CL1	Increase participation in accessing e-government service
CL2	Continuous participation in accessing e-government service
CL3	Participation in recommending e-government service to others

3.1.1 Research Model

An e-government citizen satisfaction index (CSI) model was used in this study to evaluate citizen satisfaction with e-government information services, using factors indicated in the previous section. CSI models can directly investigate how well online services perform concerning the needs and expectations of citizens even if they have never transacted with such services (Fitsilis, Anthopoulos and Gerogiannis, 2009; Wang, Bretschneider and Gant, 2005).

The research model used was selected based on the fact that it is widely used as a quantitative method of measuring citizen satisfaction (Yuan-yuan *et al*., 2007). CSI models are known to be famous and have been demonstrated to be flexible across various domains (Insch and Florek, 2008; Johnson *et al*. 2001; Fornell *et al*., 1996). For example, the ACSI model was used to evaluate 35 industries and more than 200 corporate organizations (Turkyilmaz and Ozkan, 2007; Fornel *et al*., 1996). Therefore, a government CSI was selected for this study. The research model (Figure 3.1) shows the relationship between the factors selected for this study as explained in section 3.1 above
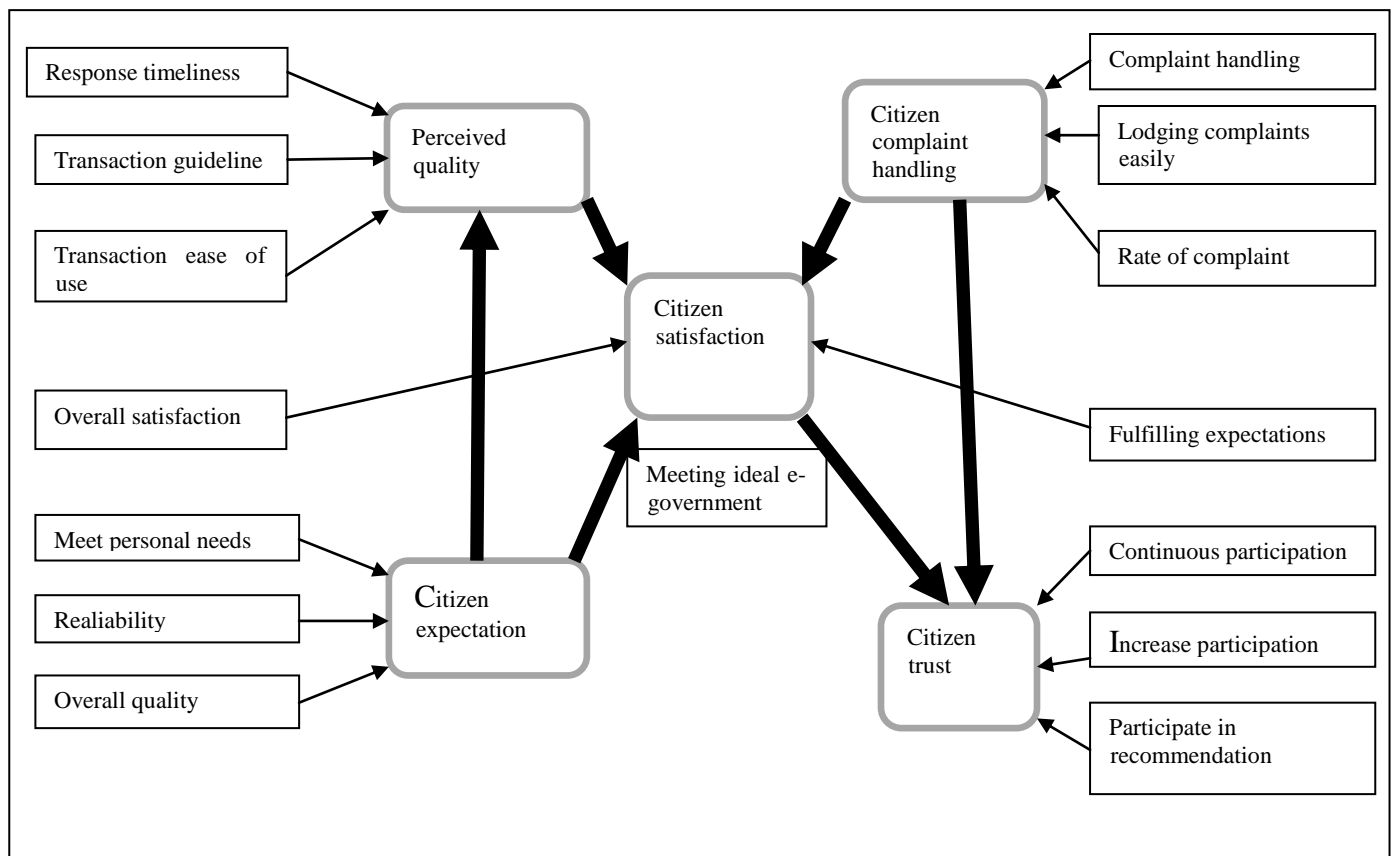

Figure 3.1: The relationship between e-government information service and citizen's satisfaction factors

3.1.2 Instrument validity

A measurement instrument was used to collect data for model validation. The conceptual measures in Table 3.1 constitute the measurement instrument used to identify the critical

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factors that affect citizen satisfaction with e-government services. The measurement instrument was developed and hosted online using Google Docs forms. The web address of this measurement instrument is https://docs.google.com/spreadsheet/viewform?fromemail=true&formkey=ddzzmzzbadbzqlpl sfb_vszi3qvutzve6mq. The measurement instrument was administered to SADC countries e-government users and the targeted users ages ranged between 14-70 years.

The strength of an online survey lies in its potential to collect a large amount of data in a relatively short period of time from respondents who are geographically far apart from each other (Wright, 2005). The online method was found more appropriate for this study since it was focusing on citizens from different countries. There are various ways of hosting online surveys, for example launching it on an organisation's website or using e-mail lists (Wright, 2005). The researcher decided to distribute the survey by attaching the instrument link to individual e-mails. The email addresses were obtained from the Head of Departments (HODs) of randomly selected government departments where permission was granted. This made it possible for the researcher to make a follow-up and motivate respondents to fill in the questionnaire through their respective HODs and secretaries of the selected departments. Overall, 400 surveys were attached to email addresses of sampled e-government users comprising mainly university employees from different SADC countries. Out of the 400 emails sent with the survey link attached, 370 surveys were completed and submitted. Among the completed surveys, six were unusable because they had cases of respondents not having experience in e-government leading to 364 useable survey responses, a response rate of 93%.

3.1.3 Respondent demography

The analysis of the demographic data reflects that 4% of respondents were in the age group of 14-20 years. Forty five percent of respondents were in the age group of 21-30 years, 38% in the age group of 31-40 years, 10% in the age group of 41-50, 2% in the age group of 51-60 and 1% in the age group of 61-70. It is important to mention that the majority of respondents were from the age group of 21-30 years. This implies that they can make a better judgment of their use of e-government services. About 79% of respondents had more than 2 years of experience using computers, 12% had close to two years of experience with computers and

9% had less than six months of experience of using computers. About 92% of respondents had access to the internet daily, 7% had access to the internet monthly, while 1% had access to internet yearly. In all, 80% of respondents were from the urban environment, 16% were from semi-urban areas and 4% were from rural areas. This implies that most of the respondents have access to internet services and are, therefore, able to access government services online.

Table 3.2: Profile of respondents (N= 364)

Characteristics	Content	Frequency	Frequency %
Age (Years)	14 – 20	14	4
	21 – 30	162	45
	31 – 40	139	28
	41 – 50	37	10
	51 – 60	8	2
	61 – 70	4	1
Gender	Female	169	46
	Male	195	54
Experience with computers	Below six months	31	9
	Close to two years	45	12
	Above two years	288	79
	Never	0	0
Access to the internet	Never	0	0
	Daily	335	92
	Monthly	26	7
	Yearly	3	1
Location	Urban	293	80
	Rural	14	4
	Semi-urban	57	16
Country	South Africa	173	48
	Botswana	31	8
	Zimbabwe	51	14
	Lesotho	34	9
	Namibia	35	10
	Tanzania	40	11

As can be seen from Table 3.2, the country that received the highest number of citizen evaluation is South Africa with 48% (173). This was followed by Zimbabwe with 14% (51), Tanzania with 10% (40), Namibia 10% (35), Lesotho 9% (34) and Botswana had the least number of respondents 8% (31).

The survey instrument used to elicit data for this study had 15 measurement items. Section A was designed to reflect the demography of respondents and their computer and internet skills as indicated in Table 3.2 above. In section B, respondents were asked to answer simple objective questions in relation to their expectation, perception, complaint, trust and satisfaction with e-government information service, as indicated in Appendix 1.

3.2 Factors that affect citizen satisfaction

In order to identify factors that affect customer satisfaction with e-government information services, the Structural Equation Model-Partial Least Squares (SEM-PLS) analytic technique was used, as employed in SmartPLS software. SEM is a multivariate method that allows the simultaneous examination of the relationship among the exogenous (independent) latent variables (LV) and endogenous (dependent) LV within a model (Kline, 1998). PLS has the ability of working with unobserved latent variables and can account for measurement error in the development of LV (Chin, 1998). In this study, the e-government citizen satisfaction index model has exactly 5 latent variables, namely, citizen expectation, perceived quality, citizen satisfaction, citizen trust and citizen complaint handling, as indicated in the model Figure 3.1 above.

Structural Equation Models (SEM) (Kaplan, 2000; Bollen, 1989) include a number of statistical methodologies meant to estimate a network of causal relationships. This is defined according to a theoretical model, linking two or more latent complex concepts, each measured through a number of observable indicators. The complexity in a system can be studied taking into account a causal network among LV, each measured by several observed indicators usually defined as Manifest Variables (MV). It is in this sense that SEM represents a joint-point between Path Analysis (Alwin and Hauser, 1975; Tukey, 1964) and Confirmatory Factor Analysis (CFA) (Thurstone, 1931).

The PLS (Partial Least Squares) approach to Structural Equation Models, also known as PLS Path Modelling (PLS-PM), is a component-based estimation method (Tenenhaus, 2008). Essentially, PLS-PM is made of a system of interdependent equations based on simple and multiple regressions. PLS-PM is an iterative algorithm that estimates the network of relations among the latent variables and also links between the manifest variables and their own latent variables.

Most researchers and business practitioners use path modelling as a potent tool to analyse the cause and effect relationships between latent variables. According to Ringle, Sarstedt and Mooi (2010), PLS path modelling has gained increasing dissemination, especially in the field of consumer and service research. The main advantages of PLS path modelling are that it can be used effectively, especially when sample size are small, the data are non-normally distributed and when non-convergent results are likely, because complex models with many variables and parameters are estimated (Fornell and Bookstein, 1982).

The two sub-models of structural equation modelling are the Measurement model (outer model) and the Structural model (inner model). The structural model takes into account the relationship among the latent variables, whilst the measurement model takes into account the relationship between latent variables and their corresponding manifest variables.

3.2.1 Measurement model

There are three different types of measurement models available, that is the reflective model (outwards directed model), formative model (inwards directed model) and MIMIC model (multiple effect indicators for multiple causes).

The reflective model assumes a uni-dimensional or homogeneous condition, which states that all MVs of a block, which are positively correlated, have to be confirmed on practical data by estimating the model reliability. The individual item reliability is the extent to which the measurement of factors, measured with a multiple item scale, reflects the true scores on the factors relative to the error (Hulland, 1999; Aibinu and Al-Lawati, 2010). In the context of Cronbach's alpha (α) a block of MVs is considered homogenous when (α) is larger than 0.7. The (α) (Cronbach, 1951) measures how well a set of MVs measure a single homogeneous factor and it is called internal consistency. The internal consistency of a factor

estimates how consistently individuals respond to the items within a scale (Shin, 2009). In a reflective model, a block of manifest variable related to a latent variable is assumed to be homogeneous and unidirectional. The reflective model operates under the hypothesis or assumption that the error ϵ_{pq} has a zero mean and is uncorrelated with the LV of the same block. In the reflective model, each manifest variable is related to the corresponding latent variable by a single regression model.

In the formative model, each MV or a sub-block of MVs represents a different dimension of the underlying notion. Therefore, unlike the reflective model, the formative model does not assume homogeneity or uni-dimensionality of the block. The LV is defined as a linear combination of the corresponding MVs, thus each MV is an exogenous variable in the measurement model. The MIMIC model is a mixture of reflective and formative models within the same block of MVs. The standardised LV scores $\left(\xi_Q\right)$ associated to the q-th LV $\left(\xi_Q\right)$ are computed as a linear combination of its own block of MVs by means of weighted relation.

Path coefficients between egov-CSI models' factors are tested for significance by means of a bootstrapping procedure with 500 resample of construct level sign change and the number of cases equal to the original sample size. However, as a prerequisite for any path analysis procedure, the quality of the research model must be tested through the evaluation of reliability, validity and predictive power.

3.2.1.1 Reliability and Validity

Reliability was measured by the estimate of internal consistency and composite reliability. Individual item reliability is the extent to which the measurements of factors measured with multiple-item scale reflects the true score of the factors relative to the error (Hulland, 1999; Aibinu and Al-Lawati, 2010). Internal consistency of a factor estimates how consistently individuals respond to the items within a scale (Shin, 2009). Composite reliability is a measure of the overall reliability of a collection of heterogeneous, but similar items (Roca *et al.,* 2009). Composite reliability (CR) is estimated in terms of the outer loading of an item λ_i

to represent correlations between item and factor and is calculated as (Henseler, Ringle and Sinkovics, 2009):

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum (1 - \lambda_i^2)} \tag{1}$$

Internal consistency was calculated for the number of model items (N) and mean intercorrelation between items (r_-) using Cronbach alpha (α). The Cronbach alpha measures how well a set of items or factors measures a single uni-dimensional factor and is calculated as (Cronbach, 1951):

$$\alpha = \frac{N - \bar{r}}{1 + (N - 1) - \bar{r}} \tag{2}$$

Validity was measured by the estimate of convergent validity and discriminate validity of model factors. Validity tells whether a measuring instrument measures what it is supposed to measure in the context in which it is applied (Raykov, 2011). Convergent validity is the extent to which items of a factor represent the same factor (Fornell and Larcker, 1981). Discriminate validity indicates the extent to which a given factor differs from other factors (Pahnila and Warsta, 2010). Convergent validity is measured by Average Variance Expected (AVE), which is calculated to determine the amount of variance that a factor captures from its measurement items and is calculated as (Henseler, Ringle and Sinkovics, 2009):

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum (1 - \lambda_i^2)} \tag{3}$$

Discriminate validity was measured by calculating the Pearson product moment correlation between all pairs of factors. The Pearson product moment correlation r between the factors x and y with the means x overbar and y overbar respectively is calculated as (Spiegel, 1972):

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 (y_i - \bar{y})^2}} \tag{4}$$

3.2.1.2 Model predictive power

The coefficient of determination (R^2) of a dependent factor and GoF is the criteria often used to assess the predictive power of a research model. R^2 is the amount of variation in a dependent factor that is explained by the research model and is computed as (Cornell and Berger, 1987):

$$R^2 = 1 - \frac{\sum (y_i - \overline{y})^2}{\sum (y_i - \overline{y})^2}$$ (5)

where y_i is the ith observation of the dependent factor, x_i is the value of the independent factor at, which y_i is observed, $\_y_i$ is the predicted responses at each point x_i obtained with a fitted regression equation and y overbar is the mean of y_i.

A global evaluation criterion for model quality is also assessed by goodness of fit (GoF) proposed by Tenenhaus *et al.* (2005). Its purpose is to account for the PLS model performance at both measurement and structural model focusing on the overall prediction performance of the model. The GoF is the geometric mean of the average Communality Index (CI) and average R^2, computed as (Tenenhaus *et al.* 2005):

$$GoF = \sqrt{\overline{CI} * \overline{R^2}}$$ 6)

3.2.1.3 Effect size

The test for the effect of each of the independent factors of the independent factor was acquired by computing the R^2 values for independent factor citizen satisfaction when each factor was excluded and when it was included and then testing for its significance. The effect size f^2 is calculated in terms of R^2 (*i*) with each factor excluded at a time and R^2 (*e*) with main effects as (Helm, Eggert and Garnerfeld, 2010):

$$f^2 = \frac{R^2(i) - R^2(e)}{1 - R^2(i)}$$ (7)

The effect size is considered large, medium and small if greater than 0.35, 0.15 and 0.02, respectively (Cohen, 1988). The significance of the effect size is tested using the F-test as (Aibinu and Al-Lawati, 2010).

$$F = (f^2)(N - M - 1) \tag{8}$$

3.3 Ranking SADC countries

After testing of the reliability, validity, predictive power of the research model and identifying critical factors that affect citizen satisfaction with e-government information services, the latent variable index for citizen satisfaction for each country was calculated. This latent variable index was then used to rank the six selected SADC countries according to their level of citizen satisfaction with e-government information services.

3.3.1 Latent variable index

The structural model can be used to calculate the latent variable index and, in this study, the citizen satisfaction index was used to rank countries. The LV is defined as a linear combination of the corresponding MVs, thus each MV is an exogenous variable in the measurement model. The inner model defines a linear system of equations that relates the causal links between LVs.

There are many ways of predicting the value of latent variables, for example, the LISREL model, which is oriented on parameter estimation, thus yielding a better structural model because LV are space free (Lauro and Vinzi, 2004). The structural equations can be estimated by individual Ordinary Least Squares (OLS) multiple regressions where the LVs are replaced by their estimates. However, the use of OLS multiple regression may be disturbed by the presence of strong multi co-linearity between the estimated LVs. PLS can also be used and this method can predict both MV and LV, thus yielding a better measurement model because LVs are constrained in the space of MVs (Lauro and Vinzi, 2004). The latent variable index calculated using PLS-PM's system of independent equations is based on simple and multiple regressions, which is a network of relations among the MVs and their corresponding LVs, and also among LVs inside the model. Each LV is estimated as a linear combination of its own

indicators. In this study, the PLS regression was applied instead (Teanenhaus *et al.*, 2005) and the structural model is represented using the following equation:

$$\xi_j = \beta_{0j} + \sum_{q:\xi_q \to \xi_j} \beta_{qj}\xi_q + \zeta_j$$

(9a)

where ξ_j = (j=1,..., J) is the generic endogenous latent variable, β_{qj} is the generic path coefficient interrelating the q-th exogenous latent variable to the j-th endogenous one and ζ_j is the error in the inner relation. The structural equation of the citizen satisfaction index model (R^2 and path coefficient β_1 to β_5) in Figure 3.1 is described as the following system of equation as stated in (Teanenhaus *et al.*, 2005):

a) Citizen satisfaction = β_{03} + β_{43} perceived quality + β_{53} citizen expectation + β_{23} citizen complaint handling

where, Citizen satisfaction (β_{03}) = mean of citizen satisfaction – (β_{43} perceived quality + β_{53} citizen expectation + β_{23} citizen complaint handling);

b) Perceived quality = β_{04} + β_{54} Citizen Expectation

where, perceived quality (β_{04}) = mean of perceived quality – (β_{54} Citizen Expectation); and

c) Citizen trust = β_{01} + β_{21} Citizen complaint handling + β_{31} Citizen Satisfaction

where citizen trust (β_{01}) = mean of citizen trust – (β_{21} Citizen complaint handling + β_{31} Citizen Satisfaction).

(9b)

This structural model can be summarised by a matrix of 0 or 1 with dimensions equal to the number of latent variables (Table 3.3). A cell (i, j) is filled with 1 if the latent variable i explains latent variable j and 0 if not, where I is the latent variables in the row and j is the latent variables in the column. This matrix is called the inner design matrix (Chatelin, Vinzi and Tenenhaus, 2002).

Table 3.3: Inner design matrix for e-government-CSI model

	Citizen expectation	Perceived Quality	Citizen Satisfaction	Citizen Complaint	Citizen Trust
Citizen expectation	0	0	0	0	0
Perceived Quality	1	0	0	0	0
Citizen Satisfaction	1	1	0	1	0
Citizen Complaint handling	0	0	0	0	0
Citizen Trust	0	0	1	1	0

Each LV is estimated by considering its links with the adjacent LVs as follows:

$$\xi_j = \Sigma_q \beta_{qj} \xi_q$$

(10)

where ξ_j is the standardised inner estimate of the j-th LV, ξ_j and each inner weight β_{qj} is

equal to the sign of the correlation between the outer estimate ξ_j of the j-th LV, and the outer

estimate of the q-th LV$^{\xi_q}$.

In the ECSI model, as proposed by Lauro and Vinzi (2004), the latent variables are built as a weighted average of the rescaled manifest variables pertaining to their own block. This can be obtained by the following formula (Bayol *et al.*, 2000, Fornell, 1992).

$$\xi_p = \frac{\sum_h \overline{w_{pq} x_{pq}}}{\sum w_{pq}}.$$

(11)

In this operation, it is assumed that all normalised weights are positive. If some are not, the

corresponding variable x_{pq} should be removed as this variable does not correctly describe the

variable. In order to estimate the LV score, the weights w_{pq} to be associated to each MV and

the path coefficient linking the LVs (Trinchera and Russolillo, 2006) are calculated. There are

three schemes available in the literature for obtaining inner weights and they are centroid

(Wold, 1973), factorial (Lohmoller, 1989) and path weighting (Vinzi, Yves and Tenenhaus,

2002).

The path weighting scheme was used in this research because it detects errors better in casual path (Halkenman, 2013). The procedure of calculating latent variable index starts by choosing arbitrary weights W_{pq}, and then the external estimation.

3.3.2 Estimating weights

Criteria weighting reflects the relative importance that decision makers would naturally associate with criteria to prioritize their wants and provide the means to better understand their needs and desires for a decision alternative. In addition, criteria weights' estimation reveals the criterion that contributes more e-government information service satisfaction. Weights W_{pq} are calculated using the outward mode way of calculation. The weight is the covariance between the manifest variables and the internal estimation:

$$W_{pq} = \text{cov}\left(x_{pq}, z_p\right) \tag{12}$$

where x_{pq} is the latent variable and z_p is the internal estimation. This is a formative way of linking MVs to LVs. PLS algorithm has an arbitrary choice of weights W_{pq} at the beginning, for example, W_{p1} is fixed to 1 and all other W_{pq} to 0. The external and internal estimation process is iterated using Equations (9), (11) and (13). This process was done using SmartPLS tool. The next chapter will present the empirical results of this study.

4. CHAPTER FOUR: EMPIRICAL RESULTS

This chapter presents the empirical results of citizen satisfaction evaluation with e-government information services using Partial Least Squares (PLS). The PLS results of the structural model are first presented to discover the critical factors that influence citizen satisfaction with e-government information services provided by the SADC countries. The latent variable index of citizen satisfaction of each of the six SADC countries (Zimbabwe, South Africa, Zambia, Namibia, Botswana and Tanzania) was then predicted using the structural equation in order to obtain country ranking according to the level of citizen satisfaction with e-government information services.

4.1 Critical factors influencing citizen satisfaction with e-government information services

In order to identify critical factors influencing citizen satisfaction with e-government information services using standard PLS, the validity of all factors used in the model need to be verified using confirmatory factor analysis (CFA). This is achieved by observing the item loadings, Cronbach's alpha composite reliability (CR) and average variance expected (AVE) value to determine if they meet the minimum requirements. Discriminate validity will assess if all factors are distinct from each other.

The predictive power of the research model of this study was determined after the estimation of model quality, which was assessed in terms of reliability and validity metrics. Equations (1) to (4) can manually be used for this purpose. However, to achieve greater efficiency, CFA was performed using SmartPLS Version 2.0 software to test the quality of the research model of this study. For the CFA analysis, all measured items were specified as reflective indicators of their corresponding factors and each factor was allowed to co-vary freely with all other factors. The raw dataset was used as input to the PLS software and path significances were estimated using the bootstrapping re-sampling technique with 500 sub-samples.

4.1.1 Reliability and validity

Convergent validity of scale items was assessed using three important criteria: (a) all item factor loadings should be significant and exceed 0.50 (Hair *et al.*, 2006; Pahnila and Warsta, 2010); (b) composite reliability for each factor should exceed 0.70 with the least value of 0.81 for citizen complaint handling as indicated in Table 4.2 (Pahnila and Warsta, 2010); and (c) average variance extracted for each factor should exceed 0.50 (Fornell and Larcker, 1981; Bhattacherjee and Sanford, 2009; Pahnila and Warsta, 2010). Table 4.1 shows the results of CFA, wherein it can be seen that item loadings were significant at $p < 0.05$ and exceeded 0.50, with a minimum loading of 0.69 for citizen complaint handling item CC3.

Table 4.1: Confirmatory factor analysis

Factor	Item	Item Mean	Std Dev	Item Loading	T-value
Citizen Complaint handling	CC1	4.38	2.00	0.81***	17.99
	CC2	4.17	2.04	0.80***	17.35
	CC3	4.20	2.15	0.69***	7.63
Citizen Expectation	CE1	5.26	2.40	0.85***	24.57
	CE2	5.55	2.35	0.87***	28.98
	CE3	5.51	2.47	0.87***	27.63
Citizen Satisfaction	CS1	4.85	2.29	0.84***	22.83
	CS2	5.00	2.06	0.83***	19.93
	CS3	5.31	2.17	0.84***	22.63
Citizen Trust	CT1	5.32	2.64	0.89***	33.98
	CT2	5.52	2.62	0.89***	38.19
	CT3	5.48	2.68	0.86***	25.91
Perceived Quality	PQ1	4.73	2.17	0.85***	23.31
	PQ2	4.88	2.24	0.83***	24.56
	PQ3	4.80	2.41	0.87***	32.62

***p<0.0001,**p<0.01 and *p<0.05

Discriminate validity was assessed using the criterion that the square root of AVE for each factor should exceed the correlations between that and all other factors (Fornell and

Larcker, 1981; Bhattacherjee and Sanford, 2009; Pahnila and Warsta, 2010). Table 4.2 shows the results of scale properties, wherein it can be seen that the highest correlation between any pair of factors in the CFA model is 0.76 (citizen trust and citizen satisfaction). Composite reliabilities of all factors also exceeded the required minimum of 0.70, with the lowest value being 0.81 for the citizen complaint handling factor. The results for Cronbach's alpha shows that all the other four factors' MVs measure well the corresponding factors (internal consistency) with a score of more than 0.70 except for citizen complaint behaviour with a score of 0.65 (Shin, 2009; Cronbach, 1951). Furthermore, the smallest AVE value among all five factors in the CFA model was 0.59 for satisfaction which was greater than the desired minimum of 0.50. Hence, all three conditions for convergent validity were met except for one factor with a slightly lower Cronbach's alpha score.

Table 4.2: Scale properties

Inter-factor correlation (Discriminate validity)					
Factors	1	2	3	4	5
1. Citizen Complaint handling	1.00				
2. Citizen Expectation	0.38	1.00			
3. Citizen Satisfaction	0.60	0.56	1.00		
4. Citizen Trust	0.56	0.55	0.76	1.00	
5. Perceived Quality	0.58	0.60	0.73	0.73	1.00
Internal Consistency (Alpha)	0.65	0.83	0.79	0.86	0.81
Composite Reliability	0.81	0.90	0.88	0.91	0.89
AVE	0.59	0.75	0.70	0.78	0.72

4.2.2 Model predictive power

The structural model was estimated after the determination of reliability and validity to assess the predictive power of the research model. The predictive power (R^2) of the research model was calculated using Equation (5). Figure 4.1 shows this result wherein perceived quality, citizen satisfaction and citizen trust have R^2 values of 0.36, 0.60 and 0.59, respectively. This result suggests that the model fit to the data is of an acceptable level of citizen satisfaction (R^2 = 0.60).

A global evaluation criterion for model quality is assessed through the goodness of fit (GoF index) proposed by Tenenhaus *et al*. (2005). Its intention is to account for the PLS model performance at both the measurement and structural model with a focus on the overall prediction performance of the model. The GoF index is obtained as the geometric mean of the average commonality index and the average R^2 value calculated using equation (6) (Tenenhaus, 2005). The results showed that overall the model to data fit of 0.62 is of higher level.
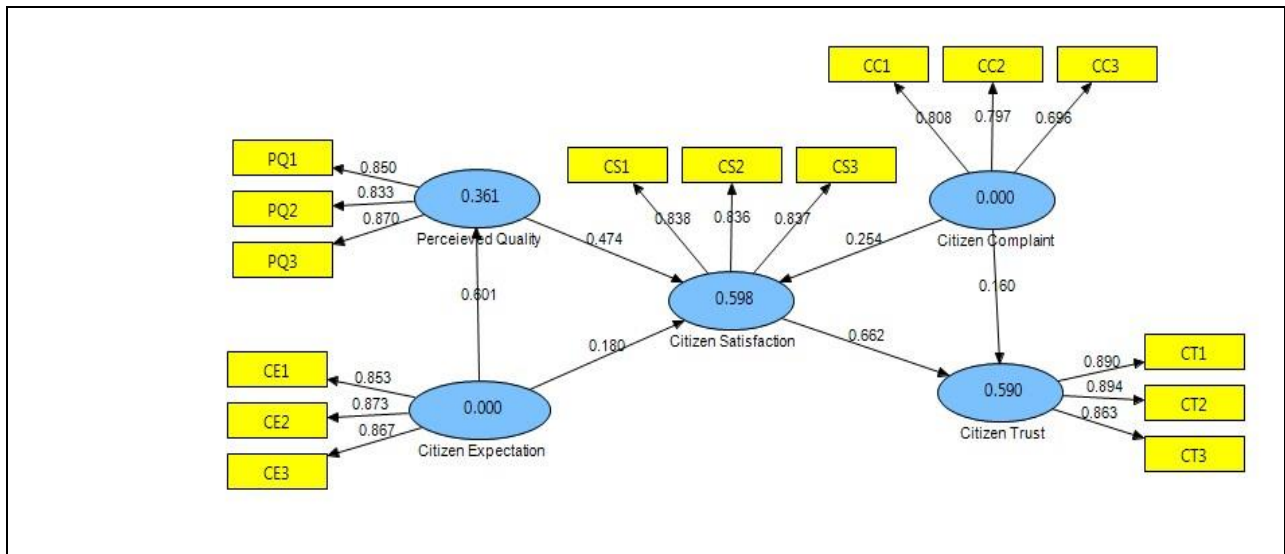
Figure 4.1: Structural model estimation

4.1.3 Direct Effect

In order to establish the robustness of the developed research model, this study tested the direct effect between model factors. The path coefficient, standard deviation and t-value of hypothesized casual paths were obtained using the SmartPLS 2.0 bootstrapping procedure. Table 4.3 shows this result. It can be seen that there is a direct impact of citizen complaints handling on citizen satisfaction with an estimated path coefficient of 0.2581, t-value of 3.1326 and p-value of 0.0019. This result shows that citizens' complaints will have a direct impact on citizen satisfaction with e-government information services provided by SADC countries. It is also evident from the results that citizen expectation has a direct effect on citizen satisfaction with the path coefficient of 0.1819, t-value of 2.1141 and p-value of 0.0352. This means that

citizen expectation has a direct impact on citizen satisfaction with e-government information services provided. However, the impact of citizen expectation on citizen satisfaction is weak, as indicated by the p-value. Citizen expectation has a direct effect on the perceived quality with the path coefficient of 0.6062, t-value of 10.2326 and p-value of 0.001. This shows that the citizens' expectation has a direct impact on their perceived quality.

Citizen satisfaction has a direct effect on citizen trust with the path coefficient of 0.6713, t-value of 6.8131 and p-value of 0.001. One can conclude that citizen satisfaction has a direct impact on citizen trust. Perceived quality has a direct effect on citizen satisfaction with the path coefficient of 0.4689, t-value of 4.8275 and p-value of 0.001, meaning that perceived quality has an impact on citizen satisfaction. Results also show that there was no direct relationship between citizen complaint handling to citizen trust with a path coefficient of 0.1530, t-value of 1.5447 and a p-value of 0.1233. This means that there is no impact of citizen complaint handling on citizen trust.

Table 4.3: Test of direct path coefficients

Factor Relationship	Path Coefficient	Std Dev (STDEV)	T-Values	P-Value
Citizen Complaint handling -> Citizen Satisfaction	0.2581	0.0809	3.1326**	0.0019
Citizen Complaint handling -> Citizen Trust	0.1530	0.1036	1.5447	0.1233
Citizen Expectation -> Citizen Satisfaction	0.1819	0.0851	2.1141*	0.0352
Citizen Expectation -> Perceived Quality	0.6062	0.0587	10.2326***	0.0001
Citizen Satisfaction -> Citizen Trust	0.6713	0.0971	6.8131***	0.0001
Perceived Quality -> Citizen Satisfaction	0.4689	0.0981	4.8275***	0.0001

$***p<0.0001, **p<0.01$ and $*p<0.05$

4.1.4 Effect size of independent factors

Table 4.4 illustrates the results of the effect size of citizen expectation, perceived quality, citizen complaint handling, and citizen trust on the R^2 value of citizen satisfaction calculated using equations (7) and (8). Perceived quality had the highest effect size of 0.215 followed by citizen complaint handling with 0.095 and then the citizen expectation with 0.47. These results entail that perceived quality is the most imperative factor in the prediction of citizen

satisfaction after service consumption, whereas customer expectation is the least important factor with regards to citizen satisfaction with e-government information services.

Table 4.4: Effect size of independent factors

| Factors | R² | | f² | F-test | P-Value |
	Included	Excluded			
Citizen Complaint handling	0.598	0.556	0.095	33.959	0.0001
Citizen Expectation	0.598	0.578	0.047	17.014	0.0001
Perceived Quality	0.598	0.488	0.215	77.129	0.0001

4.2 Country ranking

Table 4.5 below shows the values of each latent variable for each country and at the global level. Each latent variable is calculated using equations (9a and 9b). The latent variable index for citizen satisfaction is used to rank the countries. South Africa has the highest latent variable index of 6.071, followed by Botswana with an index of 5.8032, Zimbabwe 5.1274, Namibia 4. 1597, Lesotho 3.2052 and Tanzania with an index value of 2.9152. The index value of global data for citizen satisfaction is 5.13.

Table 4.5: Latent variable index values

Country	Citizen Complaint handling	Citizen Expectation	Citizen Satisfaction	Citizen Trust	Perceived Quality
Botswana	5.4369	5.1115	5.8032	5.9579	5.5238
Global	4.2207	5.3567	5.1332	5.4337	4.8657
Lesotho	3.1813	2.1983	3.2052	2.8707	3.2608
Namibia	4.331	3.6971	4.1597	4.2796	3.9317
South Africa	4.6721	6.4073	6.071	6.8376	6.0678
Tanzania	2.34	5.4679	2.9152	2.4744	2.3907
Zimbabwe	3.6934	5.0025	5.1274	5.0672	3.8115

The latent variable index (score) for citizen satisfaction can be used to compare satisfaction levels of different countries (Chiu *et al.*, 2011). The higher the latent variable index for citizen satisfaction, the higher the level of citizen satisfaction with e-government information services in that country.

Table 4.6: Final ranking of SADC countries

Country	Latent Variable Index	Ranking Position
South Africa	6.0710	1
Botswana	5.8032	2
Zimbabwe	5.1274	3
Namibia	4.1597	4
Lesotho	3.2052	5
Tanzania	2.9152	6

Table 4.6 shows that citizens in South Africa are the most satisfied with their e-government information services, followed by Botswana, Zimbabwe, Namibia, Lesotho and Tanzania.

4.3 Discussion

The results of this study show that the e-government citizen satisfaction index model is suitable and can be used to evaluate citizen satisfaction with e-government information services not only in the SADC region but any other e-government information service worldwide. This can be justified by the results of this study which show that the model fits to data by a predictive power of 0.598 and GoF of 0.62. The e-government citizen satisfaction index model developed in this study can further be tested only in the realm of e-government

The results of this study show that perceived quality is the greatest determinant of citizen satisfaction with e-government information services. This is not surprising, because when citizens are interacting with government online they get responses timeously, find it easy to interact with government online and get guidelines to help them during interactions to

determine whether they are satisfied or not. From previous research, perceived quality has proved to be one of the greatest determinant of citizen satisfaction (Sheibani and Foriborzi, 2011; Zalm *et al.*, 2010; Halaris, Mogoutas and Papadomechelaki, 2007). This implies that each government in the SADC region must improve their e-government services so that they are reliable, user-friendly and easy to use.

Citizen complaints handling is another critical factor that affects citizen satisfaction with e-government information services. When citizens do not send complaints more often, their complaints are well handled and the complaints are attended to on time. This result in citizens being satisfied with e-government information services provided. Governments in the SADC region must put in place mechanisms to assist citizens whenever they launch a complaint online, minimise citizen complaints and provide means of making complaints easier so that citizens will be satisfied with e-government information services provided.

Citizen expectation is not a determinant of citizen satisfaction since the results of this study shows that it has a p-value of 0.05. There are conflicting findings on what citizens expect when they want to use government information services. Some researchers found out that citizens prefer to use e-government rather than visit government physical offices (Kaisara and Pather, 2009), whilst other researchers found out that citizens do not have an interest in e-government because they do not expect much out of it (Kensleji *et al.*, 2010). Government needs to create awareness amongst citizens so that they have confidence in e-government services.

Since this study was mainly focusing on factors that determine citizen satisfaction with e-government information services, citizen trust is a minor component of this model. Even so, it is important to note that citizen complaints handling does not have an effect on citizen trust, but citizen satisfaction has an impact on citizen trust. When citizens are satisfied with e-government information services, they gain trust in it, continue to use e-government services instead of any other alternative methods and also tell their families and friends to use the services

The results of this study have also proved that the latent variable index can be used for ranking besides the commonly used multi-criteria decision making (MCDM) methods. According to these results, South Africa ranked the highest and Tanzania ranked the lowest in terms of citizen satisfaction with e-government information services. These results align with

research findings by the United Nations e-government survey (2010) that most high income countries have top rankings in the e-government development index. Developed countries can afford to invest in telecommunication infrastructure, education, online services and human capital component. South Africa and Botswana are the top two Southern African countries in terms of e-government development. This is enabled by their governments who have put in place institutional and regulatory frameworks to advance e-government implementation (Bwalya and Healy, 2010). The higher the quality of the e-service, the more citizens are satisfied with e-government information services (Zalm *et al*., 2010; Kunstelj, Jukic and Vintar, 2010).

The level of citizen satisfaction is also enhanced by the presence of internet facilities in the country. Zimbabwe ranked third in this study, largely contributed by many of its citizens having access to the internet. Internet World Stats (2009) found that Zimbabwe had a greater number of internet users (12.5%) penetration population compared to most of its neighbours. Tanzania and Lesotho were the two last countries on the list. This could be as a result of the level of their online services. According to United Nations (2010), Lesotho and Tanzania were ranked amongst the least developed countries in terms of online services, meaning that even though they have introduced e-services, citizens are not satisfied with the interaction quality. Their citizens expect more than what they are experiencing during e-government interaction. SADC countries' governments need to focus more on improving the quality of their services so as to satisfy their citizens.

4.4 Conclusion

The results show that the e-government citizen satisfaction index model can be used to predict citizen satisfaction with e-government information services in the SADC region and that the PLS algorithm can be used to analyse data for citizen satisfaction with e-government. The critical factors affecting citizen satisfaction with e-government information services was perceived quality, citizen complaint handling and citizen expectation, in that order. These factors were used to rank SADC countries according to their level of citizen satisfaction with e-government information services. Results show that South Africa ranked highest and Tanzania ranked lowest. These results also show that the presence of internet infrastructure

and resources contribute to citizen satisfaction with e-government information services. The next chapter presents a summary, future research and the conclusion of this research.

5. CHAPTER FIVE: SUMMARY, FUTURE RESEARCH AND CONCLUSION

This chapter presents a summary of the research work conducted, highlights the future work that can be done and presents some concluding statements.

5.1 Summary

The aim of this study was to evaluate the level of citizen satisfaction with e-government information services provided by SADC countries. This was accomplished through a series of activities which included identification of a set of suitable evaluation criteria, selecting critical factors of citizen satisfaction with e-government information services using the PLS analytic modelling technique, and ranking of countries using a latent variable index for citizen satisfaction generated using the PLS algorithm. These activities were performed systematically to realize the following research objectives that were set at the beginning of the study:

a) To discover a set of suitable criteria to evaluate citizen satisfaction with e-government information services provided by SADC countries;

b) To use an algorithm to discover the criterion that contribute most to citizen satisfaction with e-government information services provided by SADC countries; and

c) To identify the SADC country that is offering the best level of e-government information service that satisfies citizens.

The set objectives of the study were systematically realized as expected. The e-government citizen satisfaction index model was selected with e-government quality characteristics specifically for e-government at stage 2 of development. Citizen complaint handling, perceived quality, citizen trust, citizen satisfaction and citizen expectation were the e-government citizen satisfaction index model factors identified to measure citizen satisfaction with e-government information service. These criteria were used to set up the measurement instrument for citizen satisfaction with the quality of e-government information service.

Perceived quality was discovered to be the most influencing factor that contributes to citizen satisfaction with e-government information services provided by the SADC region. The latent variable index was predicted by applying the PLS algorithm to the data collected by means of the developed measurement instrument to reveal the ranking of selected SADC countries according to their level of citizen satisfaction with e-government information services. South Africa ranked highest in citizen satisfaction with e-government information services, while Tanzania ranked lowest.

This study has made the following contributions to research:

(a)   Introduced an e-government citizen satisfaction index model with interactive perceived quality proxies to evaluate citizen satisfaction with e-government information services;

(b)   Utilised partial least squares to evaluate citizen satisfaction with e government information services provided by SADC countries;

(c)   Identified a set of suitable criteria to evaluate citizen satisfaction with e-government information services provided by countries at the second stage of e-government development; and

(d)   Made use of PLS to predict the latent variable index for citizen satisfaction to rank SADC countries, according to the level of citizen satisfaction with e government information services.

5.2 Future Research

The result of the citizen satisfaction evaluation of e-government information services was slightly comparable to other existing ranks of e-government. Research studies evaluating and ranking countries' e-government services has been conducted previously, this is the first time that research on citizen satisfaction with e-government information services has been conducted, but those results could be compared to the results of this study. Not all SADC countries were used for evaluation in this study because of resource limitation. Future research will endeavour to rank all the sixteen SADC countries. In addition, for future research, the researcher plans to use the research model used in this study in different domains to evaluate citizen satisfaction with e-services. Furthermore, the researcher wishes to evaluate

different e-government information services and rank the services according to the level of citizen satisfaction.

5.3. Conclusion

Generally, the e-government citizen satisfaction models shows that perceived quality is the most important determinant of citizen satisfaction with e-government information services followed by citizen complaints handling and citizen expectation. Citizen complaints and citizen trust were anticipated to have influence on citizen trust, but results show that only citizen satisfaction has influence on citizen trust. This implies that citizens can only have trust in their e-government information services when they are satisfied with the e-services provided. According to the model used, citizen satisfaction depended on the citizens' expectations being fulfilled by allowing citizens to have their ideal e-government which in turn raised their level of satisfaction.

In conclusion, results indicate that citizens in South Africa are more satisfied with their e-government information services as compared to any other SADC country evaluated. Generally, the level of satisfaction was not extremely high in all countries evaluated. Therefore, all governments in the SADC need to improve the quality of their e-government information services. The governments in SADC need to provide e-government services which are easy to use, have guidelines and respond timeously to citizens' complaints and requests. The governments need to improve their service provisioning in terms of attending to the citizen complaints' queries and making it easy for citizens to lodge complaints. All these elements will enable citizens to trust their e-government services and in turn, citizens will recommend their friends and relatives to use e-government services as a better option and also use e-government services as the only way to access government information.

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APPENDIX 1

List of services used in the survey

Birth registration	Transport registration
Health care	Deregistration of business
Education and training	Communication service application
World of work	Temporary residence application
TV and postage	Driving licencing
Information retrieval	Communicate with embassies
Retirement and old age	Departmental facilities
Parenting	Presidential office facilities
Social benefits	Banking
Relationships registration	Disability grant application
Export goods	Report corruption
Labour related matters registration	Retrieve electoral information
Permanent residence application	National disaster helpline
Citizenship application	Mineral right application
Law facility	Land distribution
End of life registration	Applying for agricultural facilities
Business/organisation registration	A place to live application
Change business/organisation registration	Import goods
Tax registration and processing	Application for permits, licences and rights