AN AGILE SYSTEMS DEVELOPMENT APPROACH FOR ENHANCING E-GOVERNMENT USER ADOPTION

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By

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ABSTRACT

The expansion of technological developments in all areas of society has seen governments taking advantage of new technologies to enhance public service delivery, disseminate information and promote participation by the public in government decision-making. This phenomenon is known as electronic government, or e-Government.

However despite the socio-economic benefits inherent in the implementation of e-Government systems, an overwhelming number of government projects – particularly in developing countries – struggle to successfully implement e-Government systems. e-Government project failure is more pronounced in developing countries, with more than half of these projects either partially or completely failing. The failure of e-Government projects undermines government investments, as well as the potential socio-economic benefits that could be realised by the citizens.

Arguably, while the failure or success of an e-Government project is attributed to a myriad of factors, low user adoption is one of the key factors that contribute to e-Government project failure.

Therefore this thesis seeks to investigate the phenomenon of low e-Government user adoption and determine whether the use of an Agile system development approach can positively influence e-Government user satisfaction as well as buy-in and adoption.

A Mixed-Methods, multi-case study approach was used through the perspective of Post-Positivism. The researcher examined four (4) South African e-Government projects – using an online questionnaire and in-depth interviews with members of the system development team – to determine whether the use of an Agile approach has merit in enhancing e-Government user adoption. The use of a Mixed-Methods approach allowed for data triangulation so as to verify the findings; while the use of multiple case studies enabled for cross-case analysis.

The findings indicate that the use of Agile practices, as listed in the proposed Agile-informed User Engagement Guidelines, can ensure that the e-Government system developed meets user needs; and, that users are satisfied with, and make use of the e-Government system.

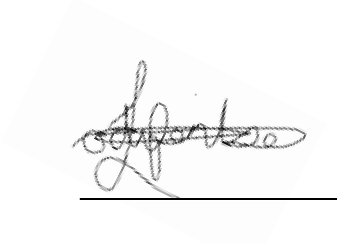
However since most large e-Government projects make use of a traditional Waterfall development approach, it is recommended that the Agile practices (proposed guidelines) be incorporated into the structured Waterfall approach – to create a hybrid, or blended system development approach.

In conclusion, the use of the proposed Agile-informed User Engagement Guidelines can enhance e-Government user adoption; and, subsequently, contribute towards nurturing the success of e-Government projects.

KEYWORDS: Project Management; e-Government; User Adoption; Traditional Systems (Software) Development Methodologies; Agile Systems (Software) Development Methodology; User Engagement.

Declaration

I declare that the Dissertation /Thesis entitled, *An Agile Systems Development Approach for Enhancing e-Government User Adoption*, which I hereby submit for the degree, Masters of Commerce at Rhodes University, is my own work. I also declare that this thesis /dissertation has not previously been submitted by me for a degree at this or any other tertiary institution and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



Odifentse Mapula-e Lehasa (*signed*)

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I wish to thank my supervisor, Chris Upfold, for believing in me and supporting me throughout this very challenging journey. Without his professional supervisory guidance, the completion of this project would not have possible. It is mainly because of his supervisory input that I am of the view that this research project will also directly or indirectly benefit the advancement of the broader body of academic knowledge and practice of Information Systems Development.

I would like to thank my loving parents, Thapelo and Lebogang Lehasa, for ensuring that I remained mentally and emotionally strong. Thank you most especially for believing in me and constantly praying for my success.

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"No matter how bad it is, or how bad it gets, I'm going to make it" – Les Brown

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CHAPTER 1: INTRODUCTION

***Abstract**: This chapter introduces the research area; by presenting the research problem, and research questions, that will guide this investigation. In addition, this chapter presents a summary of what the thesis will cover.*

1.1. Introduction

In this introductory chapter, the research phenomena is presented to initiate the investigation into the use of an Agile approach for improving e-Government user adoption. First, the foundation is set by outlining the research context in the background section. This is followed by the identification of a problem area – whereby the author postulates the problem that this research seeks to investigate (in the problem statement section).

Secondly, the research problem is divided into manageable chunks – known as the purpose statement and research questions – which will be used as a roadmap throughout this thesis to adequately examine the research phenomena.

Lastly, this chapter will explain the methodology that will be used to undertake the investigative work of the research; and illustrate the outline or trajectory that this thesis will follow.

1.2. Background

1.2.1. Information Technology (IT) Project Management

The implementation of Project Management practices, tools, and techniques, is a vital organisational exercise; which leads to the attainment of project-specific objectives within the stated time and budget constraints (Olateju, Abdul-Azeez and Alamutu, 2011) for the purpose of achieving business goals. According to Schwalbe (2014), a leading authority on IT Project Management, knowledge and use of contemporary Project Management (or Systems Development) practices is a key success factor for all organisations.

1.2.2. e-Government Projects

However, it is noted that an overwhelming number of e-Government projects in developing countries have been recorded as partial or complete failures, with e-Government researchers quoting more than 50% project failure (Anthopoulos, Reddick, Giannakidou and Mavridis, 2016).

e-Government projects are a type of public sector Information Technology (IT) project, which are aimed at enhancing public service delivery; government information dissemination; and public engagement, through the use of Information Communication Technologies (ICTs) (Alhomod and Shafi, 2012). The United Nations (2016) asserts that e-Government is one of the main implementation priorities of governments around the world.

e-Government projects have been instrumental in ensuring socio-economic development through the improvement of public service delivery; administrative cost reductions (arising from better operational efficiencies); allowing citizens to partake in policy making; and stimulating the growth of ICT innovation in developing countries, among other things (Makene, 2009; Alshehri and Drew, 2010; Drew, 2010; Kaaya, 2012).

1.2.3. e-Government Adoption Challenges

However while e-Government projects yield numerous socio-economic benefits, the alarming failure of these e-Government projects – especially in developing countries can be attributed to a myriad of factors. These factors are categorised as (a) Implementation Challenges (to name a few: inadequate ICT infrastructure; use of inappropriate Systems Development Methodology, for example.); (b) adoption or (c) Post-Implementation Challenges ‘such as lack of requisite IT skills; resistance to adopt the new system (Rana, Dwivedi and Williams, 2013).

Central to the failure of e-Government systems is low user adoption (Alghamdi and Beloff, 2014; Alsufayri, 2014). Two out of the top three ranked African countries on the 2016 e-Government Development Index, Mauritius and South Africa respectively (United Nations, 2017), have also experienced the challenge of low e-Government user adoption – which impedes the success of such e-Government initiatives (OUTA, 2016; Lallmahomed, Lallmahomed and Lallmahomed, 2017).

The selection of an appropriate Systems Development methodology is arguably central to the success of the very technology being produced (Ditibane, 2014). The widespread use of a Waterfall Systems Development approach has seen e-Government systems lag in technological advancements, and, thus experience low user adoption and satisfaction.

Mutula and Mostert (2010) investigate the problem of low user adoption and satisfaction in their study of e-Government systems at the local and provincial level in South Africa, citing difficulties users experience when using or accessing internet-based government services. They indicate that the user's sense of discouragement when interacting with e-Government systems leads to low adoption of the systems (Mutula and Mostert, 2010). Poor user adoption and usability also pose a risk to widening the digital divide through excluding citizens from accessing public services (Pretorius, 2012).

1.2.4. An Agile approach to address e-Government User Adoption

Low e-Government user adoption is in part a result of e-Government systems that are developed without adequate user involvement or engagement (Holgersson, 2014). Holgersson (2014) recommends user participation practices such as the use of an Agile Systems Development methodology during the development of e-Government systems, to improve e-Government user adoption. Weerawarana *et al*. (2012) advocate for Agile e-Government for its potential to improve the success of e-Government projects.

An Agile approach to developing e-Government technology supports the constant interaction between stakeholders and e-government project team, addressing expectations; as well as by regularly demonstrating working software to stakeholders (Weerawarana *et al*., 2012). Ditibane (2014) also supports the use of an Agile systems development approach in delivering e-Government projects in South Africa as a means to advance user satisfaction and adoption; user involvement; system quality and, thus, establish overall e-Government success.

The Agile Systems Development approach (also referred to as Agile Software Development) is an iterative practice of developing technology, comprising of collaborative stakeholders, whereby the aim is to quickly and efficiently deliver components of the final deliverable, with the flexibility of accommodating changing stakeholders' needs (Hajjdiab and Taleb, 2011). On the other hand, the reverse of the Agile approach is the Waterfall Systems (or Software) Development approach, which is characterized by a longer development cycle, with typically one release of the final product and little room for changing user requirements or stakeholder engagement (Hajjdiab and Taleb, 2011).

The Agile approach is receiving increasing attention since its introduction in 2001. Project Management researchers recommend the Agile approach as a methodology that promotes systematic collaboration between IT and business teams throughout the development of IT systems (Raslan and El-Licy, 2012). However according to Ditibane (2014), generally, e-Government project teams in South Africa do not make use of an Agile methodology; but instead continue to use the traditional Waterfall Systems Development (Waterfall) approach.

An observation made by Weerawarana *et al.* (2012) indicates that there appears to be a correlation between the high failure rate of e-Government projects (referred to earlier), and the use of the traditional Waterfall (systems development) approach. A review of literature by Weerawarana *et al*. (2012), on e-Government projects in South Africa, indicates the partial use of the Agile methodology during e-Government system development. This is further supported by Ditibane (2014).

The bulk of the body of e-Government research is deemed to fall into three (3)categories, which are: (i) identifying factors which influence e-Government adoption (Alomari *et al*., 2012; Alghamdi and Beloff, 2014; Lu and Nguyen, 2016); (ii) the usability of e-Government systems (Pretorius, 2012); (iii) types of Systems Development approaches used to construct e-Government systems (Ditibane, 2014); and (iv) techniques to entice e-Government user participation (Holgersson, 2014). All these research topics have the common aim of investigating ways to improve the adoption and success of e-Government systems.

Still, none of these studies have investigated the use of an Agile Systems Development approach – with its focus on user engagement as a solution to improving e-Government user adoption; and thus, e-Government project success in the manner that this research seeks to achieve.

1.3. Problem Statement

More than half of the e-Government projects in developing countries fail completely or partially (Anthopoulos, Reddick, Giannakidou and Mavridis, 2016). The failure of e-Government projects can be attributed to the inappropriate use of project management (systems development) tools; as well as low user adoption or acceptance (Mutula and Mostert, 2010; Lin, Fofanah and Liang, 2011; Thakur and Singh, 2013; Alghamdi and Beloff, 2014).

For instance, Weerawarana *et al*. (2012) and Ditibane (2014) state that the use of a Waterfall Systems Development Approach – rather than an Agile Systems (Software) Development approach for developing e-Government systems, is more likely to result in project failure and low user adoption. This is due to insufficient user engagement, which further exacerbates the already high rate of e-Government project failure. The Waterfall Systems Development approach leads to the development of e-Government systems without the constant engagement (or involvement) of end users; and, thus, neglects the expectations of these target users (Holgersson, 2014). Holgersson (2014) furthermore suggests that e-Government developers need to focus on engaging the targeted users throughout the e-Government systems development process in order to improve the user acceptance, adoption, and buy-in of e-Government systems: and, thus, the overall success of the e-Government project.

This thesis will investigate the problem of low e-Government user adoption from a pre-implementation perspective: which assumes that low user adoption is a result of inadequate user engagement, or lack of involvement, during the development of the e-Government system. This study will examine the use of an Agile Systems Development Methodology as a proposed solution to increasing e-Government user adoption.

1.4. Goals of the Research

This section seeks to present the objective of this research. This is done by presenting the purpose statement, followed by the research questions – which will guide the inquiry into the above stated research problem.

1.4.1. Purpose Statement

While acknowledging that there, firstly, is a problem; and that the problem of e-Government project failure in developing countries can be attributed to many causes: arguably, one of the main contributing factors to this failure (and determinant to successful e-governance) is user-adoption. Consequently, this research seeks to contribute towards improving the user-adoption of e-Government systems in South Africa through the recommendation of Agile Systems Development Informed User Engagement Guidelines.

This will thus contribute towards addressing the bigger problem of the high failure of e-Government projects in developing countries, as mentioned.

As e-Government user adoption is a broad topic, this research will be focusing on pre-implementation e-Government user-adoption.

1.4.2. Research Objective

To contribute towards improving the user-adoption of e-Government systems, through the development of Agile Systems Development (SD) informed user-engagement guidelines

1.5. Research Questions

The following section will present the main research question and sub-questions, shaped by the purpose statement (section 1.4.1), together with the problem statement (section 1.3) above, which will initiate the researcher's understanding into the research phenomenon.

1.5.1. Main Question

How can an Agile Systems Development approach enhance e-Government user engagement, in support of greater user adoption?

1.5.2. Sub-Questions

1. What are the key factors that influence e-Government user-adoption?

   The purpose of this question is to gain an understanding of the e-Government adoption context, as well as to determine whether there are any pre-implementation factors that may influence user adoption.
2. Which of the Agile systems development practices are fundamental for user engagement in the development phase?
   The purpose of this question is to highlight only those Agile SD practices which are relevant for user engagement, and will thus inform the Agile user engagement guidelines.
3. How do e-Government project teams currently engage end users in the development of e-Government systems, to ensure user-adoption or buy-in?
   The purpose of this question is to gain an understanding of the practices and experiences of e-Government project teams with regards to user engagement.
4. How can Agile user engagement guidelines be applied in the e-Government context?
   The purpose of this question is to determine whether the Agile SD inspired user engagement guidelines are applicable and can be implemented in the e-Government context, to improve e-Government user-adoption.

1.6. Overview of the Methodological Approach

This investigation will make use of the Post-Positivism research paradigm. This paradigm is used by researchers who strive to test or verify a theory or law, which governs the way in which we understand the world (Clark, 1998; Creswell, 2014). As the researcher seeks to test and verify the applicability of the Agile-informed User Engagement guidelines, in the e-Government context, the Post-Positivist philosophical paradigm proved most suitable.

The quantitative and qualitative data collection characteristic of the Post-Positivism paradigm led the researcher to the selection of a Mixed-Methods approach. The research strategy and data collection techniques that will be used is the Multiple Case Study Methodology; comprising of semi-structured interviews, and an online questionnaire. The reason for this selection is because the case study approach will enable the researcher to observe different e-Government projects in South Africa; and investigate whether the systems development team members (from these different projects) believe that the implementation of the proposed Agile User Engagement guidelines can enhance e-Government user-adoption.

Figure 1.1 (below) summarises the methodological approach this research will follow, through illustration of an adapted version of the Saunders *et al*., (2012) research *onion*.

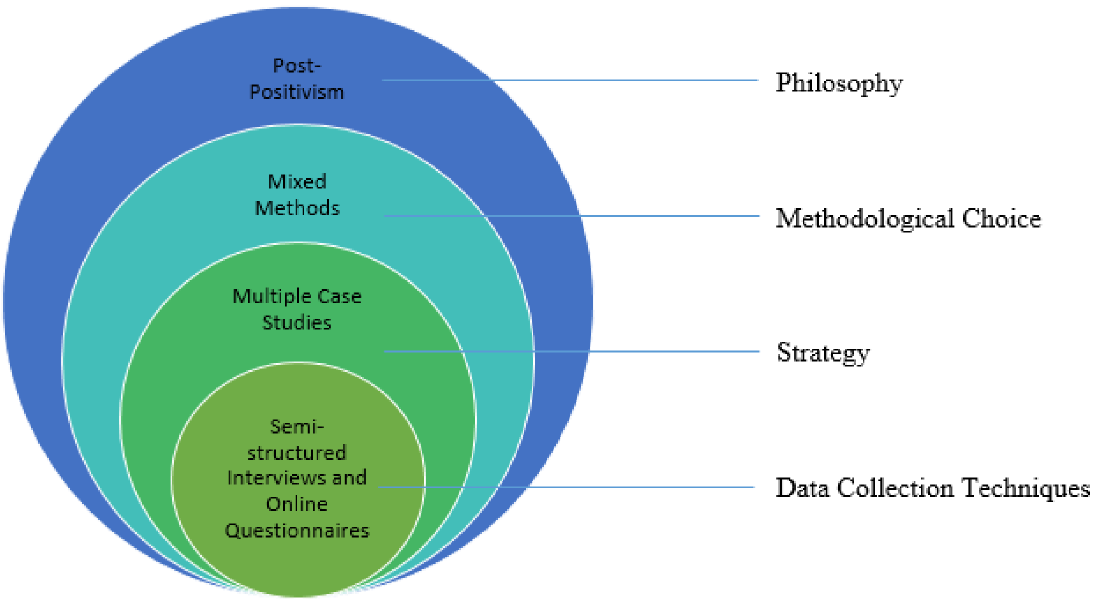

Figure 1.1: Adapted Research Onion of the Current Study's Methodological Approach

1.7. Research Contribution

The significance of this research is that it aims to propose recommendations to the low e-Government user-adoption challenge. The recommendations will be based on the best practices of the Agile Systems Development methodology.

This research seeks to challenge the status quo by confronting the current approach used in developing e-Government systems (Traditional Waterfall methodology): stating that this approach does not encourage consistent user engagement during the development process.

The greater impact of this research is through the recommendation of a set of practical User Engagement guidelines (extracted from the contemporary Agile Systems Development approach and / or best practices) to aid in improving e-Government adoption; and thus, the success of e-Government projects in South Africa. In the grander scheme, this research will have a positive influence on the delivery of efficient public services – using best IT practices in South Africa. The purpose of this is to contribute towards the sustainability of e-Government projects in South Africa.

1.8. Ethical Considerations

This research has been approved by the Rhodes University Ethics Committee.

The identity of the participants and organizations will be kept anonymous when presenting the research findings to ensure privacy and confidentiality.

All data collected from the study will be stored in a protected electronic format, only accessible to the researcher and supervisor.

Appendix H, at the end of this thesis, provides more information regarding the ethical clearance received to conduct this study.

1.9. Terms and Definitions

Table 1.1: Terms and Definitions

TERMS	DEFINITIONS
Project Management	The application of skills, tools, techniques and practices to ensure the successful delivery of project objectives, within the pre-defined scope, time, and cost constraints (Project Management Institute, 2013).
e-Government (Electronic Government)	The effective and efficient dissemination of information and delivery of public services, to empower the citizens through the provision of access to information, public participation and policy decision-making platforms (Ntulo and Otike, 2013).
Traditional Systems (Software) Development Methodology	Traditional methodologies are characterized by "structured processes, extensive documentation and detailed planning and management" (Estler *et al.*, 2013, p.1199).

Agile Systems (Software) Development Methodology	The core characteristics of Agile methodologies, as defined in the Agile Manifesto, distinguishing it from the Traditional System Development methodologies. "Individuals and interaction over processes and tools; working software over documentation; customer collaboration; and responding to change" (Venkatesh, 2012, p.14).
User-adoption	"The mental acceptance and use of new items" (Microsoft Dynamics, 2013, p.1).
User Engagement	Consulting with the user (or stakeholders) during the development of the e-Government system.

1.10. Thesis Structure

This thesis will consist of the following chapters, as illustrated in **figure 1.2** below:

Chapter 1: This chapter will introduce the research area and research problem which this thesis will investigate.

Chapter 2: This is the first chapter of the literature review, where the broad context of the research topic, Information Technology (IT) projects development, is reviewed.

Chapter 3: In this chapter the main research focus area, e-Government projects, is presented; where the various e-Government challenges are explored, with the focus on low adoption as a main factor hindering the success of e-Government projects.

Chapter 4: This chapter delves deeper into understanding the problem of low e-Government user-adoption, by exploring technology adoption theories. These theories are viewed in the context of e-Government systems, to identify the causes of low e-Government user-adoption. Research question 1 will be answered in this chapter.

Chapter 5: This final chapter of the literature review seeks to merge the previous chapters and address the research topic in its entirety. This chapter examines the Agile Systems Development Methodology in the context of e-Government user-adoption. The various Agile approaches are observed to determine whether the Agile practices and principles can be applied in an e-Government context, similar to the private sector. Research question 2 will be answered in this chapter.

Chapter 6: This chapter outlines the methodological approach which this research will follow to collect and analyse data.

Chapter 7: This chapter presents the quantitative and qualitative research findings collected from the semi-structured interviews, and online questionnaires. These results are presented in relation to the themes which will be explored in depth in the following chapter. Research question 3 will be answered in this chapter.

Chapter 8: In this chapter, the results from the previous chapter are analyzed, and interpreted, in order to answer the research questions presented in Chapter 1. The findings from each case study are compared and contrasted; the literature review, quantitative and qualitative data are triangulated to find commonalities in the data. Research question 4 will be answered in this chapter.

Chapter 9: This chapter provides recommendations according to the findings, to determine whether the Agile-informed User Engagement Guidelines can indeed be used by e-Government project teams in order to enhance the user-adoption of e-Government systems. This chapter also concludes the thesis, wrapping up the findings and presenting the research limitations and areas of future work.

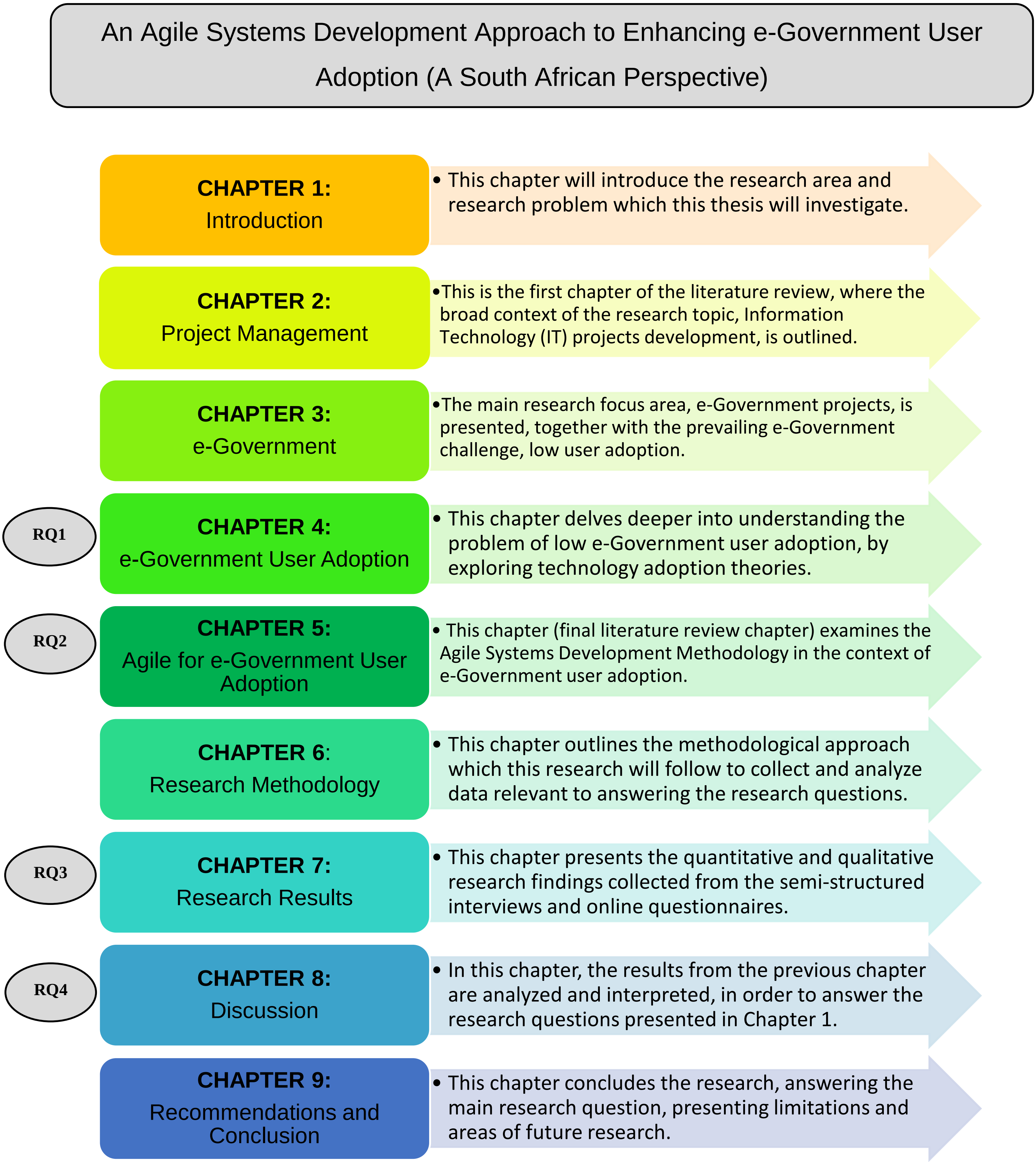

Figure 1.2: Chapter 1 Thesis Structure

CHAPTER 2: PROJECT MANAGEMENT

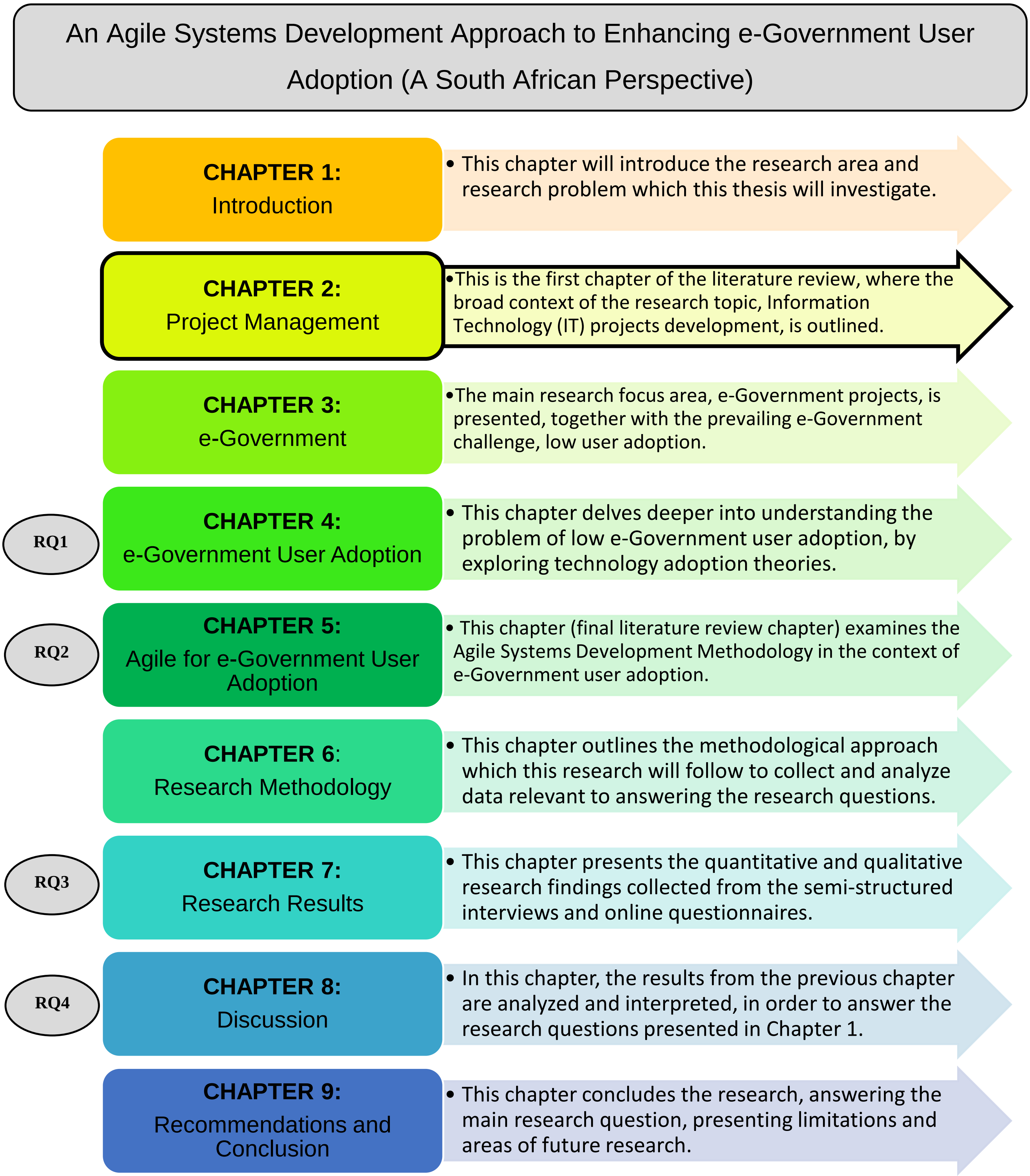

Figure 2.1: Chapter 2 Thesis Structure

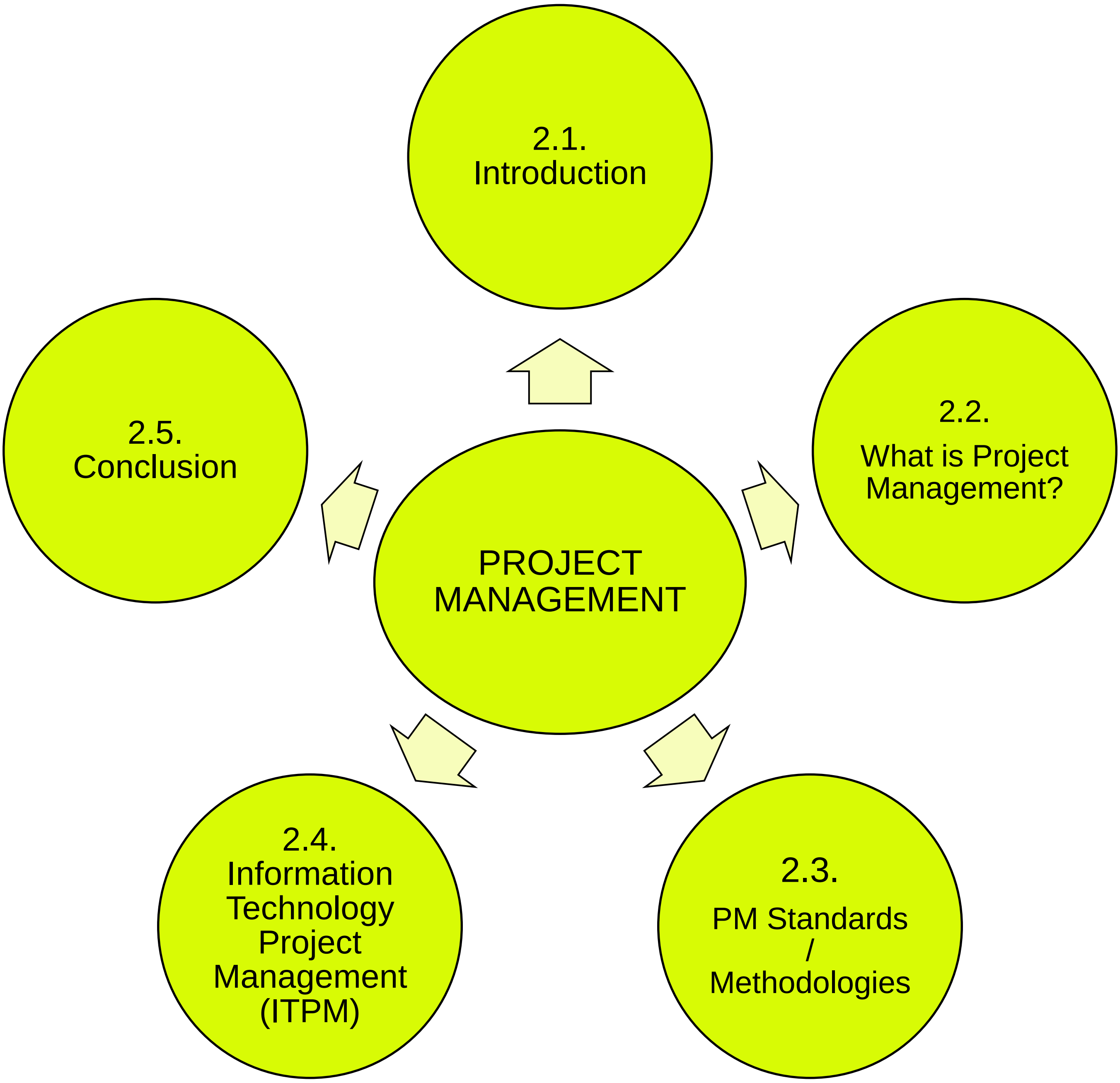

Figure 2.2: Chapter 2 Outline

***Abstract**: As the first chapter of the literature review, Chapter 2 seeks to lay the foundation and outline the context of the research area; by delving into Project Management, more specifically, Information Technology Project Management (ITPM).*

2.1. Introduction

The following set of chapters (**Chapters 2 to 5**) are the literature review chapters – which will lay the foundation and outline the overall context of this research: beginning with the first chapter, Project Management (hereinafter PM), and narrowing the focus of the research as we progress.

This chapter seeks to present the topic of Project Management by referring to project success factors (project management methodologies or techniques) and concluding with a focus on Project Management in the Information Technology environment (ITPM). This chapter highlights the importance of applying appropriate Project Management tools and techniques to ensure project success. The significance of using these techniques for project success will be explored further in the context of government IT projects in the following chapters.

The final section of this chapter, ITPM, will then pave the way for honing into one of the study areas: government IT projects (e-Government projects) in South Africa.

2.2. What is Project Management?

As a discipline, Project Management (PM) is a practice which entails the application of skills, tools, techniques and practices to ensure the successful delivery of project objectives – within the pre-defined scope, time, and cost constraints (Project Management Institute, 2013). In this context, a project is a temporary venture to create a unique result within a stipulated start and end time (Project Management Institute, 2013). This utilisation of organisational resources enables the realization of organisational strategic objectives (Shah *et al.*, 2011). According to Schwalbe (2014), it is common understanding in Project Management that possession of knowledge in this area – along with use of contemporary project management practices – is a key success factor for organisations.

As alluded to in the preceding paragraph, Project Management leads to the attainment of business or project objectives, thus leading to project success. However, a number of researchers (Patanakul, Iewwongcharoen, and Milosevic, 2010; Jugdev *et al*., 2013; Mir and Pinnington, 2014) have interrogated this notion, examining the extent to which the use of Project Management methodology results in project success. As the focus of this research is on Systems Development, an Information Technology Project Management phase, the Agile Systems Development (SD) approach will be assessed to determine whether its use has the potential to result in project success.

According to Jugdev *et al*., (2013), a project can be well managed, but still fail to deliver on the intended project outcomes. Alternatively, a government IT project (e-Government system) can be developed using an Agile approach yet still fail to satisfy users and ensure user-adoption. The next chapter (**Chapter 3**) will delve deeper into e-Government projects and the various factors that impede e-Government project success; while **Chapter 4 and 5** will expand on User-adoption, and Agile SD respectively.

Mir and Pinnington (2014) question project success which is supposedly derived from employing Project Management techniques. These authors do not dispute that PM is an effective technique for implementing organisational change and enabling the attainment of strategic objectives; however, they argue that not enough research has been conducted on the correlation between Project Management practices and project success (Mir and Pinnington, 2014). While one group of researchers define project success as meeting budget, time and quality constraints, and others believe that it is complex, containing many dimensions (Patanakul, Iewwongcharoen, and Milosevic, 2010); many studies have proclaimed that a number of projects fail to meet their objectives (Mir and Pinnington, 2014).

Mir and Pinnington (2014) suggest that the traditional Project Management success criteria of time, cost, quality, and technical requirements is no longer effective, and neglects key project assessment components such as stakeholder engagement (Joseph *et al*., 2014). The contemporary approach is to focus on the project stakeholder needs and expectations, also referred to as the stakeholder approach (Patanakul, Iewwongcharoen, and Milosevic, 2010; Mir and Pinnington, 2014).

Patanakul, Iewwongcharoen, and Milosevic (2010, p.45) also assert that the criteria for project success should consist of three main elements: "internal factors (time, cost and performance), customer-related factors (satisfaction, actual utilisation and benefits) and organisational related factors (financial, market, benefits)". The focus of this research will be on addressing customer-related factors, user-adoption of e-Government systems in particular. This will be expanded upon in the following literature review chapters: e-Government (**Chapter 3**); User-adoption (**Chapter 4**); and Agile Systems Development (**Chapter 5**).

Mir and Pinnington (2014) concur with the views of Patanakul, Iewwongcharoen, and Milosevic (2010), in affirming that project success can be improved by addressing all the PM performance areas contained in the Project Management Performance Assessment (PMPA) model, originally developed by Bryde (2003). These performance assessment categories are Leadership; Staff; Policy and Strategy; Partnerships and Resources; Project Lifecycle Management; and PM Key Performance Indictors (Bryde, 2003).

Project success can also be acquired from correctly utilising the appropriate PM standards and methodology (Schwalbe, 2014), such as the use of appropriate Systems / Software Development Methodology. The following section will present a couple of widely-used PM methodologies, one of which is the Agile methodology, which will be examined in greater detail in **Chapter 5**, in a Systems Development context.

2.3. PM Standards / Methodologies

There are a number of Project Management methodologies which can be utilised for successfully managing a project, and these approaches are referred to as Project Management Standards, or Methodologies (hereinafter methodologies). Each one of these methodologies provides its own set of adaptable principles and guidelines for managing a project (Karaman and Kurt, 2015).

According to the 2013 CHAOS Report (an authority on IT project success rates), cited in Karaman and Kurt (2015, p.572), "only 39% of IT projects [were] delivered on time, on budget and within required features and functions in 2012". Therefore, it is imperative that organisations make use of appropriate project management methodologies to improve the prospects of project success (Karaman and Kurt, 2015).

Jugdev *et al*., (2013, p.537) identify common PM methodologies as: the Project Management Body of Knowledge (PMBOK) guide, which consists of standards typically used in America; Projects In Controlled Environments (PRINCE 2), which was developed in the United Kingdom; "Structured System Analysis and Design Method (SSADM), and Agile PM". In addition to these methodologies are, the Critical Chain, Six Sigma, and Controlled Objectives for Information and Related Technologies (COBIT) methodologies, as illustrated in **figure 2.3** below (Newton, 2015). However, the most widely used PM methodologies are the PMBOK, PRINCE 2, Critical Chain, and Agile, therefore, those are the standards that will be explored further (Newton, 2015). Karaman and Kurt (2015) group these methodologies into two categories; (i) Project Management methodologies (for generic projects) and (ii) Systems / Software Development Methodologies (specifically for IT projects) – whereby Agile is classified as a Systems / Software Development methodology. As Agile is the focus of this research, this Systems Development Methodology will be examined in greater detail in **Chapter 5**, with reference to how it can be used to enhance e-Government user-adoption.

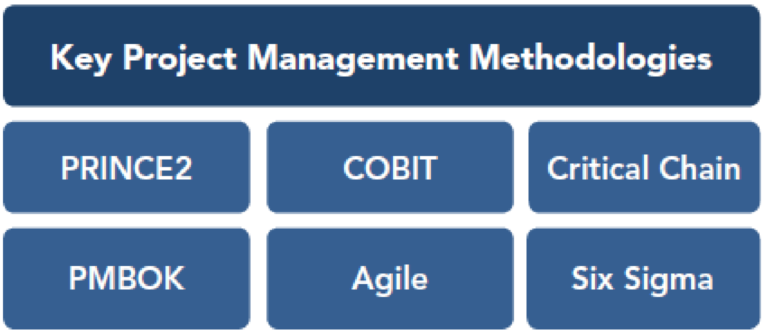

Figure 2.3: Key Project Management Methodologies (Newton, 2015, p.5)

2.3.1. Project Management Body of Knowledge (PMBOK)

The Project Management Body of Knowledge (PMBOK) is known as a standard, rather than a methodology, which originated from North America and was published by the Project Management Institute (PMI) in 1969 (Project Management Institute, 2013; Newton, 2015). It is a globally recognised standard for Project Management, which contains a set of PM process groups and knowledge areas, explained in the subsequent paragraphs (Project Management Institute, 2013, p.1).

Process Groups

Successful Project Management requires the correct use and integration of the 47 PM processes (Karaman and Kurt, 2015). Processes are a set of activities performed to produce a desired output (Project Management Institute, 2013). These processes are strategically assigned into five (5) process groups: (i) Initiating; (ii) Planning; (iii) Executing; (iv) Monitoring and Controlling; and (v) Closing, as illustrated in **figure 2.4** below (Project Management Institute, 2013).

Knowledge Areas

One of the main characteristics that distinguish PMBOK from other PM methodologies are the knowledge areas, which are unique to the PMBOK standard (Karaman and Kurt, 2015). The PM processes mentioned in the preceding paragraph are categorised into the 10 knowledge areas, specifying the inputs, outputs and required tools of each knowledge area (Project Management Institute, 2013). The 10 knowledge areas are: "Project Integration Management; Project Scope Management; Project Time Management; Project Cost Management; Project Quality Management; Project Human Resource Management; Project Communications Management; Project Risk Management; Project Procurement Management; and Project Stakeholder Management," (Project Management Institute, 2013, p.59).

Lifecycles

According to the PMBOK standard, each project goes through a life cycle, which consists of various phases that a project is required to pass through: from initiation, through to the project closing (Project Management Institute, 2013). A project phase consists of project activities or processes and ends with a work product or project deliverable produced (Project Management Institute, 2013). Each project phase comprises of process groups, as illustrated in **figure 2.5** below.

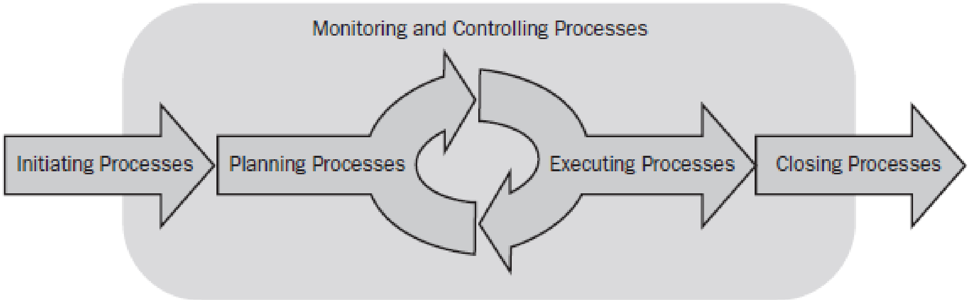

Figure 2.5: Example of one project phase (Project Management Institute, 2013, p.42)

The lifecycle is a basic guide to managing projects, with each phase being time bound (Project Management Institute, 2013). Along the lifecycle spectrum are “plan-driven” or predictive projects on one end, and adaptive – or “change-driven” – projects on the other end (Project Management Institute, 2013, p.38). Predictive life cycles are used in projects with predefined deliverables; while adaptive life cycles cater for changing requirements through iterative development, and greater stakeholder engagement (Project Management Institute, 2013). Predictive life cycles are best suited for projects where the end product is well understood (Project Management Institute, 2013). Iterative, or Incremental, life cycles, are located somewhere in the middle of the above-mentioned spectrum: these are characterised by repeating activities in phases (iterations), as a way to improve the end-product (Project Management Institute, 2013). A deliverable is produced at the end of each iteration, and subsequent iterations may focus on refining the deliverable (Project Management Institute, 2013). This type of lifecycle is most suitable for large, complex organizational projects where feedback and lessons learned can be used to further enhance the project (Project Management Institute, 2013).

Adaptive lifecycles (change-driven or Agile) are very similar to iterative lifecycles, with the difference being that iterations are shorter: they are designed to respond to change, and there is high stakeholder involvement (Project Management Institute, 2013). This type of approach is most common with Agile systems development methodologies, which will be expanded upon later (**Chapter 5**) in the context of e-Government projects.

2.3.2. Projects In Controlled Environments (PRINCE 2)

While most organisations may use PMBOK as a high-level framework for PM, many IT organisations use other methodologies, such as PRINCE2, which was initially developed for IT projects in government (Schwalbe, 2014). The Office of Government Commerce (OGC) in the United Kingdom established PRINCE2, as a "structured project management method based on experience from thousands of projects" (Office of Government Commerce, 2013, cited in Karaman and Kurt, 2015, p.574). PRINCE2 project management comprises of principles; processes and themes (Saad *et al.*, 2013), which will be explained below. PRINCE2 is not an all-encompassing methodology, but should be tailored to the project size and scope (Saad *et al.*, 2013).

Principles

There are seven (7) principles within the PRINCE2 methodology, which are regarded as best practices that must be adhered to when applying the PRINCE2 methodology. Only once all these principles are applied can the PM methodology be classified as PRINCE2 (Saad *et al.*, 2013). These principles are: "Business justification; Learning lessons; Roles and responsibilities; Managing by stages; Managing by exception; Product focused; and Tailored" (Saad *et al.*, 2013, p.109).

Processes

PRINCE2 is a process-based methodology which contains seven (7) process groups (Saad *et al.*, 2013) similar to those found in the PMBOK standards (Karaman and Kurt, 2015). These processes are actions or activities required to ensure that the project objective is obtained (Karaman and Kurt, 2015). The process groups are: "Starting up a project; Initiating a project;

Directing a project; Controlling a stage; Managing product delivery; Managing stage boundaries; and Closing a project" (Saad *et al.*, 2013, p.112-113).

Themes

The PRINCE2 themes are the project management aspects which need to be constantly addressed throughout the project (Saad *et al.*, 2013). These seven (7) themes are: "Business case; Organisation; Quality; Plans; Risks; Changes; and Progress (Saad *et al.*, 2013, p.109). Karaman and Kurt (2015) draw comparisons between the PMBOK knowledge areas and the PRINCE2 themes, stating that the Plans PRINCE2 theme can be likened to the Scope, Time, and Cost Management knowledge areas of the PMBOK and similarly, the PRINCE2 Organisation theme can be likened to the PMBOK Stakeholder Management and Human Resource Management knowledge areas. These comparisons by Karaman and Kurt (2015) imply that these seven (7) themes are to the PRINCE2 methodology what the ten (10) knowledge areas are to the PMBOK methodology.

2.3.3. Critical Chain

Eliyahu Goldratt established the Critical Chain Project Management (CCPM) methodology in 1997, from the Theory of Constraint (TOC) principles (Ghaffari and Emsley, 2015). This methodology places emphasis on optimising a project's resources, through the 5-steps of ongoing improvement (Ghaffari and Emsley, 2015). This stems from the TOC principle which stipulates that all projects have constraints which hinder them from reaching their ultimate potential (Ghaffari and Emsley, 2015). Consequently, the five steps of ongoing improvement are "Identify the constraint; Exploit the constraint; Subordinate other non-constrained entities to the constraint; Elevate the constraint; Return to step one if the constraint is changed" (Ghaffari and Emsley, 2015, p.2).

CCPM delivers on improved scope, time and cost performance (Leach, 1999). Nevertheless, Ghaffari and Emsley (2015) criticize CCPM as a PM methodology, and assert that it is more of a project management scheduling methodology – as it places emphasis on the scheduling aspect of a project rather than a holistic approach.

2.3.4. Agile

The Agile PM methodology was initially regarded as a PM methodology primarily for IT projects, but it has since developed into a more widespread and generic methodology: similar to the abovementioned PM methodologies (Serrador and Pinto, 2015). The objective of Agile PM is to minimise initial planning, and for the project to unfold as it evolves (Serrador and Pinto, 2015). This methodology is unique in that it promotes continuous design, as well as emphasizes flexibility and customer interaction (Serrador and Pinto, 2015). Its versatility makes it easier to manage change arising in the project, as it is incremental and iterative in nature (Serrador and Pinto, 2015). As mentioned in **section 2.3** above, Agile PM can be applied as a PM Lifecycle; PM methodology, or as a Systems / Software Development Methodology.

Thus, this research will focus on the use of an Agile Systems Development Methodology for developing e-Government systems (government IT projects). While the preceding sections reveal the topic of general PM, the following section will hone into Project Management in the Information Technology environment, and introduce government IT projects (e-Government projects) to make way for the transition into the following chapter on e-Government (**Chapter 3**).

2.4. Information Technology Project Management (ITPM)

Information Technology (IT), or Information Communication Technology (ICT) projects – both locally and internationally – encounter challenges or failure at an ever-increasing rate (Joseph *et al*., 2014). These projects are often classified as “wasteful, inefficient, mismanaged, expensive and behind schedule” (Rosacker and Rosacker, 2010, p.587; Winley, 2015).

As mentioned earlier, only 39% of IT projects in 2012 were considered complete successes (Karaman and Kurt, 2015). Success in this context is referred to as “on time, on budget, and with satisfied customers” (Johnson and Mulder, 2016). In South Africa, approximately R64.6 billion was misused in 2014 from challenged or failed ICT projects (Joseph *et al*., 2014). Joseph *et al*. (2014) add that although ICT Project Management is a widely researched field, not enough research is being conducted in South Africa, and Africa at large.

According to Johnson and Mulder (2016) from the Standish Group, there are five (5) Project Management factors to consider when ensuring an IT project succeeds, which are: (i) project team size; (ii) PM (or Systems Development) methodology; (iii) project team expertise; (iv) product owner expertise; and (v) the organisation's emotional maturity. According to Johnson and Mulder (2016), for IT projects to succeed they must consist of (i) small project teams (approximately 6 members) with short project durations; (ii) make use of Agile methodologies; (iii) project team members who are knowledgeable on Agile techniques and technologies; (iv) skilled product owner; and (v) an emotionally mature organisation. This concept is known as the "winning hand" (Johnson and Mulder, 2016). On the contrary, IT projects that experience challenges or fail are those which consist of large project teams; make use of the Waterfall development methodology; have inexperienced project team members and product owner; and exist in an emotionally immature organisation (Johnson and Mulder, 2016). These are "losing hand" projects, which are typically late, over budget and yield low customer satisfaction (Johnson and Mulder, 2016).

However, IT projects by their nature are usually large organisational projects, with long project timelines and large teams. In this instance, Johnson and Mulder (2016) suggest that these large organisational IT projects be broken down into smaller sub-projects; yielding quicker product deliveries and increased user satisfaction, as suggested by the "winning hand" approach.

One of the main distinguishing factors of IT projects, versus general projects, is that IT projects follow IT-specific project management methodology for software or system development projects, which are referred to as Systems (or Software) Development Methodology (SDM). These Systems Development Methodologies will be explored later in **Chapter 5**, where the Agile Systems Development methodologies (the focus of this research) will be expounded. Abiding to a set of ITPM techniques or methodologies can help to ensure the attainment of client expectations (Lacerda *et al*., 2011). They further allude that due to the rapidly changing market conditions, there is a prevalent need for Agile or flexible ways of innovating (Lacerda *et al*., 2011). The ITPM methodology (SDM) will be elaborated later in the Agile chapter, **Chapter 5**, where the various SDM's will be compared to determine which SDM is most appropriate for developing public sector IT projects (e-Government projects).

2.4.1. Characteristics of IT projects

Information Technology (IT) project types range from, "researching, analysing, purchasing and installing new hardware and software, to software development" (Schwalbe, 2014, p.59). As a type of IT project, software development projects are knowledge-driven, relying on the expertise of the project team to produce a finished product (Ryan and O'Connor, 2013). This means that IT project teams need to share knowledge and expertise within the project team in order to effectively develop the end product (Ryan and O'Connor, 2013).

According to Ryan and O'Connor (2013), one of the main factors which influence software development projects (IT projects) is the development methodology adopted (as alluded to in the preceding paragraphs); with the major methodologies being the Waterfall and Agile methodologies. The nature of an IT project team is that "it is unlikely that all members of a development team [will] possess all the knowledge required for the activities of software development" (Ryan and O'Connor, 2013, p.1617). It is for this and other reasons that an Agile methodology shows merit over the traditional Systems Development approach – as the Agile methodology fosters communication and social interaction of team members, unlike the traditional methodologies (Ryan and O'Connor, 2013).

2.4.2. IT Project Teams

Once the Software Development Methodology (SDM) is selected, the IT project teams are responsible for producing a software product, and ensuring that the project outcomes are accomplished – through addressing the client requirements and the project objectives (Colomo-Palcios *et al*., 2013). However, in some cases these project teams are globally dispersed from each other (or from the client); thus introducing the concept of virtual teams.

Virtual teams

Colomo-Palacios *et al*. (2013) state that the disruption of globalization has had an impact on the Information Technology (IT) industry in that it has fostered a new culture of globally distributed software teams; Global Software Development (GSD), or more commonly referred to as *virtual teams*. Software development has shifted from being traditionally *in-house* to the globalization trend of virtual teams. This means that more and more organizations are soliciting the services of IT projects team members from around the world to develop software from their dispersed locations, rather than employing an IT team to physically build the software on premises (Purvanova, 2014). "IBM reported a 15% to 40% increase in productivity from its virtual team members. Hewlett-Packard has seen doubled revenues per salesperson from its virtual sales teams, and Anderson Consulting has realized a 25% improvement in customer satisfaction since it started using virtual consulting teams" (Purvanova, 2014, p.2).

Virtual teams are teams that consist of globally distributed individuals or groups, working on interdependent tasks and relying on technology for communication, rather than face-to-face meetings (De Guinea, Webster and Staples, 2012; Martinic, Fertalj and Kalpic, 2012; Purvanova, 2014). Organizations make use of virtual teams because relative to their counterparts (in-house teams), virtual teams are inexpensive (saving organizations logistical expenditure); and more flexible to handle competition, business globalization, and changing customer requirements (Purvanova, 2014). Other benefits of adopting the virtual teams concept entail having more skilled workforce, and quicker completion of the end product (Colomo-Palacios *et al*., 2013). On the other hand, these types of teams are known to experience problems with “communication, coordination, control, and sociocultural distance” (Martinic, Fertalj and Kalpic, 201; Colomo-Palacios *et al*., 2013, p.5): and, thus, require the expertise of a project manager who is knowledgeable on virtual software development teams.

Studies on the performance and productivity of virtual teams have been inconclusive, with some authors stipulating that virtual teams yield quicker product delivery; while other authors state that virtual teams underperform (De Guinea, Webster and Staples, 2012; Colomo-Palacios *et al*., 2013, Purvanova, 2014). Martinic, Fertalj and Kalpic (2012) assert that to manage a project consisting of virtual team environments requires project managers to possess additional techniques and technologies above those addressed in the various project management methodologies.

It is also possible to have virtual teams working on developing an e-Government system: where the government agency would outsource the project to an IT organization – which is geographically dispersed from the government agency site. In an Agile methodology scenario, the IT organization would be required to develop the e-Government solution, while constantly engaging with stakeholders – providing prototypes of the system and obtaining user feedback, even with distributed locations.

2.4.3. ITPM within the public sector

As mentioned several times in the preceding paragraphs, Information Technology (IT) also plays a dominant role in the public sector. The public sector IT projects are most commonly referred to and hereinafter as *e-Government projects*, which will be elaborated upon in the following chapter, **Chapter 3**.

While e-Government projects are a type of IT project, they have certain peculiarities which distinguish them from general IT projects in the private sector. Afyonluoğlu *et al*. (2014) presents common problems experienced in e-Government projects, based on their field experience. Software development teams working on these projects experience problems with the project (i) feasibility, (ii) project plan, (iii) project monitoring and evaluation, (iv) requirement analysis, design and implementation, (v) test and acceptance processes, (vi) maintenance (Afyonluoğlu *et al*., 2014). These are ITPM problems which can be associated to the PMBOK processes groups mentioned in section 3.1.1 above, and are expanded below.

i. **Feasibility (Initiating Process Group):** While the practice of conducting a feasibility study is usually the first point of departure when seeking to undertake a project, many e-Government projects neglect to run a concise feasibility study due to time constraints and insufficient domain knowledge (Afyonluoğlu *et al*., 2014).

ii. **Project Plan (Planning Process Group):** The absence of a project plan is another challenge, whereby the project fails due to the project team's lack of planning of what needs to be done (Afyonluoğlu *et al*., 2014).

iii. **Project Monitoring and Evaluation (Monitoring and Controlling Process Group):** According to the Project Management Institute (2013), monitoring and controlling are necessary for tracking the progress and performance of the project regularly against the project plan. While it is crucial for all IT projects to encompass a monitoring and evaluation phase, to ensure the end-product serves its intended purpose, it is uncommon that e-Government projects will possess a monitoring and evaluation framework (Afyonluoğlu *et al*., 2014). Lack of project monitoring and controlling may lead to schedule and budget overruns (Project Management Institute, 2013).

iv. **Requirement Analysis, Design and Implementation:** The project requirements are seldom clearly outlined at the start of the project because the project owner is not adequately consulted during the requirements analysis. This results in the project requirements being constantly reworked throughout the project, instead of defining these requirements at the beginning of the project (Afyonluoğlu *et al*., 2014). Afyonluoğlu *et al*. (2014) advise against the constant reworking of project requirements, and suggest that all project requirements be determined in the beginning. The Agile approach, which will be presented in detail in chapter 5, embraces changing requirements as they help to refine the end product.

v. **Test and Acceptance Processes:** Unclear project requirements or specifications make it difficult to test whether the end-product meets the intended purpose. Similarly, the project owner's lack of software knowledge inhibits a thorough assessment of the product, thus increasing the risk of failure (Afyonluoğlu *et al*., 2014). The use of an Agile SD approach can help to enable testing and user acceptance processes throughout the development of the e-Government system. The Agile SD methodologies in chapter 5 will elaborate on this.

vi. **Maintenance:** Many projects fail to make provision for product maintenance in the planning and budgeting. Consequently, the product does not have a support structure in place for maintenance, should the product need to be repaired in future (Afyonluoğlu *et al*., 2014).

The problems listed above address one or other PM or ITPM process groups, thus questioning the extent to which e-Government project teams make use of appropriate ITPM methodology when developing e-Government systems.

This research aims to provide guidelines into the application of an Agile SD approach to foster or improve the user adoption of e-Government systems.

2.5. Conclusion

This chapter sought to introduce the overarching focus of this research; Project Management (IT Project Management in particular). This chapter has paved the way for the rest of this thesis, which seeks to present Agile SD as a potential solution for improving e-Government user-adoption.

With IT projects around the world, in 2012, experiencing a low success rate, of 39%, researchers have recognized that the effective selection and application of Project Management Methodology (or Systems Development Methodology) can ensure the overall success of a project. Therefore, while a number of Project Management Methodology and standards exist, the most widely used PM methodologies and standards are the PMBOK, PRINCE2, Critical Chain; and Agile (typically known as a Systems Development Methodology). The various Systems Development Methodology (SDM), together with Agile Methodologies, will be elaborated further in **Chapter 5**, to assess their appropriateness for the e-Government context.

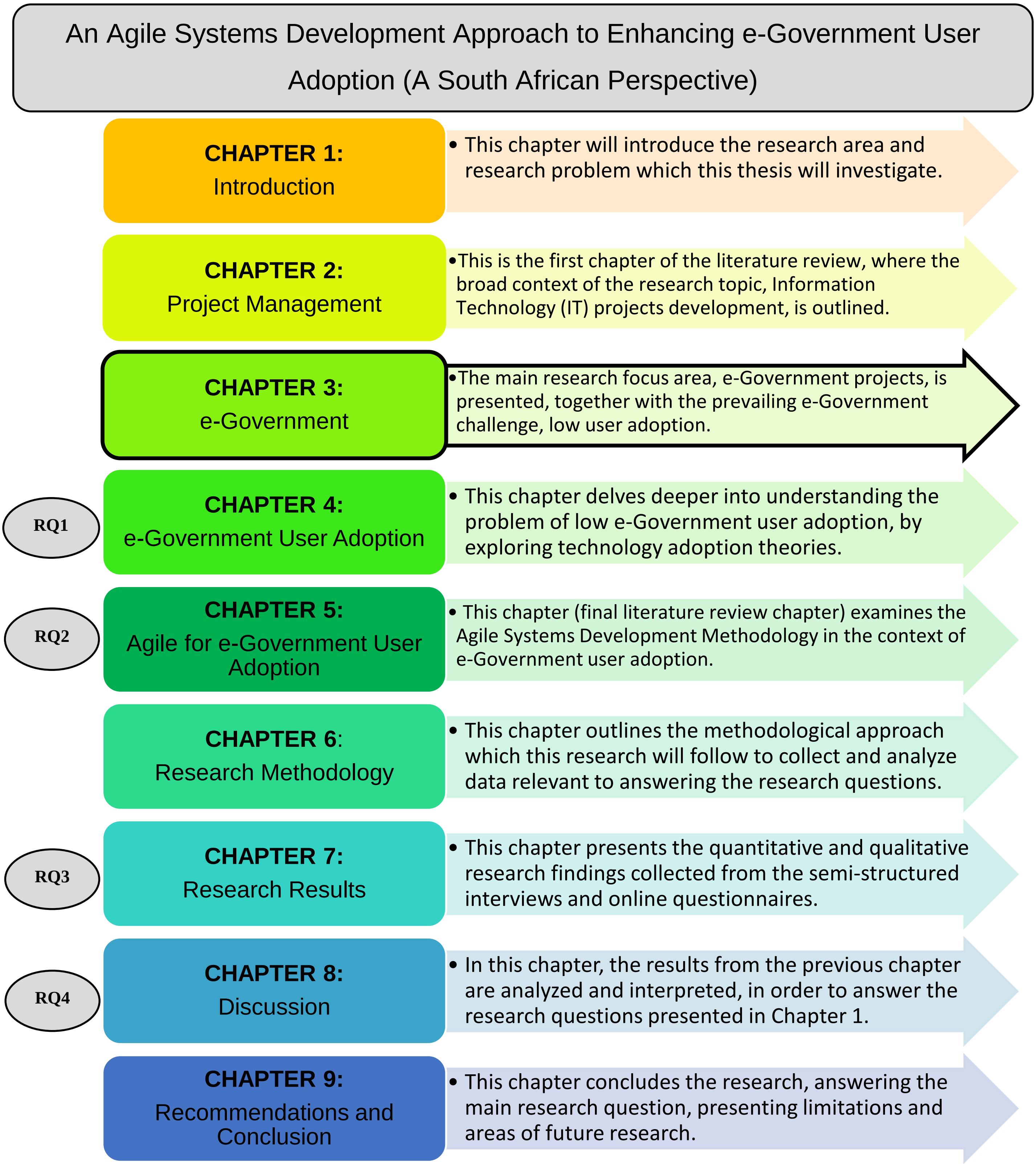

Figure 3.1: Chapter 3 Thesis Structure

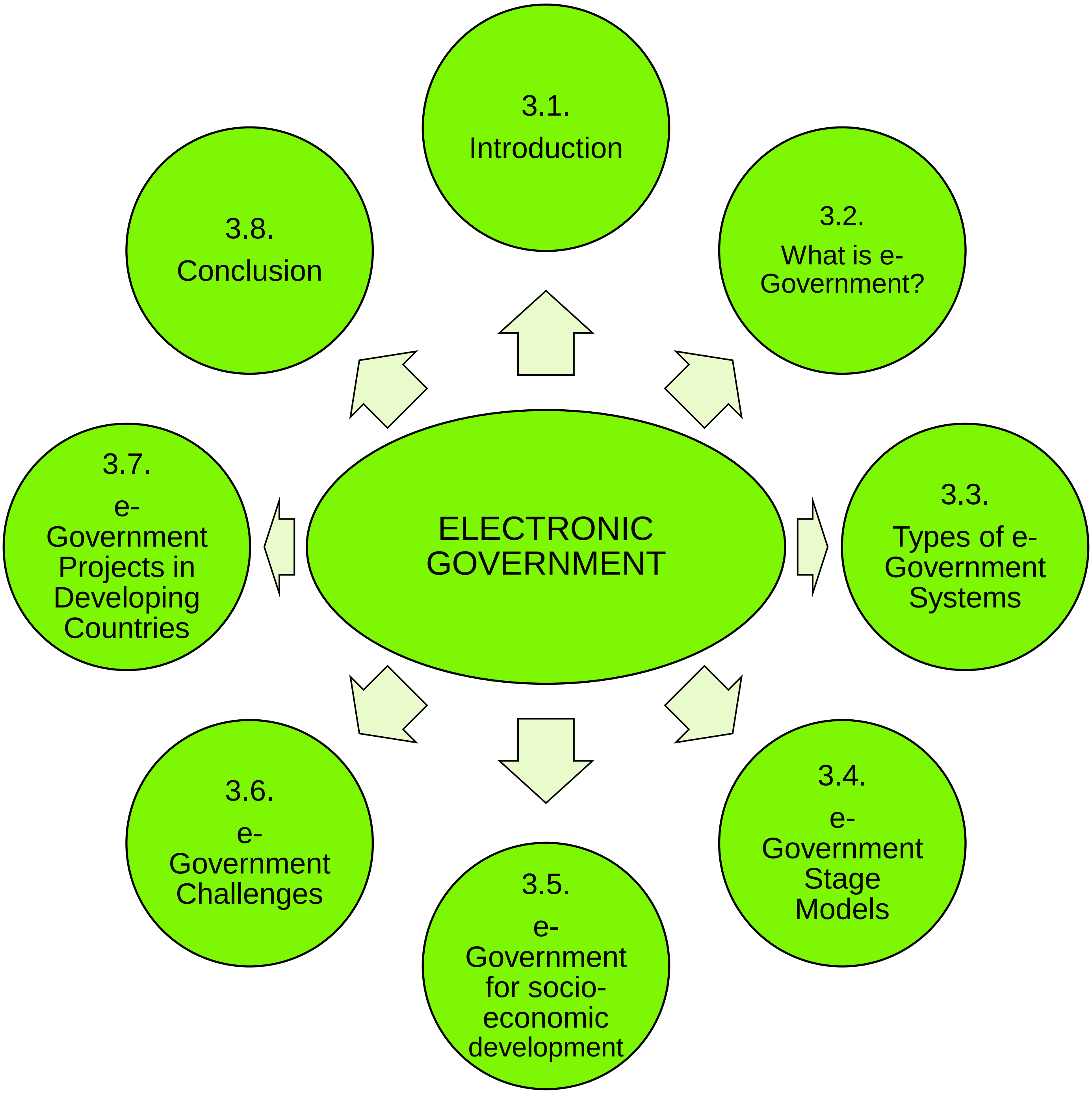

Figure 3.2: Chapter 3 Outline

***Abstract**: This chapter presents the main context of this research: electronic government projects (e-Government systems). In this chapter, the research phenomenon under study (low e-Government user-adoption) is reviewed in preparation for the following chapter.*

3.1. Introduction

The previous chapter sought to present the research field, Information Technology Project Management (ITPM), with specific focus on the systems development of government IT projects (also known as e-Government projects). This chapter will go further in establishing the context of this study, which is e-Government projects in South Africa. The phenomenon of e-Government projects will be explored in depth in this chapter, beginning with themes such as: the different e-Government development stages; the impact of e-Government systems on socio-economic development; and challenges of e-Government projects. This chapter will conclude by reviewing e-Government projects in developing countries; as well as briefly examining a practical example of a South African e-Government project, e-Toll.

This chapter also seeks to pave the way for the precise phenomenon under study, e-Government user-adoption, which will be explored in detail in the following chapter, **Chapter 4**.

3.2. What is e-Government?

The ever-expanding Information and Communication Technologies (ICTs) sector, has had an impact on the functioning of various other sectors in the economy, such as the public and private sectors, and how these interact (Alhomod and Shafi, 2012). The evolution from the industrial age to the information age has altered the way in which citizens engage with their environment, and how they wish to engage with their government (Alshehri and Drew, 2010). This technology era has seen the emergence of the following: e-commerce, e-business, and e-money in the economics field; e-mail in the communications field; and e-Government in the public sector (Almarabeh and AbuAli, 2010). As a result of this technology infiltration, governments across the world are incorporating ICTs in their business, transforming into e-Governments (Rana *et al*., 2015), as a way to better serve the people. According to the United Nations (2016), e-Government is one of the main priorities of governments around the world, with 148 UN member countries making use of e-Government services.

Governments have introduced ICTs as a way to enhance service delivery and public administration, thus making public services easily accessible to the public (Alhomod and Shafi, 2012). There are various names used to describe this manifestation: electronic government (e-Government); electronic governance; online government; and digital government, to list a few (Alshehri and Drew, 2010). This thesis will make use of the term e-Government when referring to this topic.

In the same way, most literature is well-equipped with a myriad of definitions to explain e-Government. The various definitions are similar, and can thus be grouped into two prevailing schools of thought: (i) public and private agencies; and (ii) academia (Goel *et al*., 2012).

Public and private sectors alike define e-Government as "the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability *to transform relations with citizens*, businesses, and other arms of government" (World Bank, 2011, p.1). The academic scholars, on the other hand, define e-Government as "a government's use of Information and Communication Technology (ICT) *to render services to its citizens*" (Visser and Twinomurinzi, 2009, p.1). Both of these definitions point to the importance of e-Government as a technology-based tool for improving public service delivery. Although both these schools of thought have a similar understanding of e-Government and the purpose of e-Government; there is some value in presenting the minor nuances in the various definitions.

Table 3.1 below provides a list of the various definitions of e-Government as defined by academic scholars and private / public sector agencies.

Table 3.1: e-Government Definitions

e-Government Definitions	Reference
"A way for governments to use the most innovative information and communication technologies, particularly web-based Internet applications, to provide citizens and businesses with more convenient access to government information and services".	Fang (2002, p.1).
"A government's use of Information and Communication Technology (ICT) to render services to its citizens".	Visser and Twinomurinzi, (2009, p.1).
"e-Government promises to deliver more transparent, efficient, and effective public services to citizens".	Carter and Weerakkody (2016, p.124).
"The use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government".	World Bank (2011, p.1).
"The sustainable use of ICT to enable improved information and service delivery as well as encourage citizen participation in decision making".	Western Cape Government (2010, p.9).
"The use of ICTs to more effectively and efficiently deliver government services to citizens and businesses. It is the application of ICT in government operations, achieving public ends by digital means".	United Nations (2016, p.1).

It can be deduced (from the e-Government definitions provided in the table above) that the definitions present a focus on: e-Government as a tool for enabling citizen's to access public services; and e-Government as a tool for improving citizen-government relations.

In addition, Alshehri and Drew (2010) assert that e-Government should not simply be considered as a government's use of technology for improving administration; but should instead be viewed as a mechanism for transforming the structures, processes and culture of government agencies. e-Government should also be regarded as a means to reform government public management, and promote good governance (Alshehri and Drew, 2010). The World Bank's definition of e-Government takes into account the notion of transformation of structures, processes and culture, as well as improved governance, as highlighted by Alshehri and Drew (2010).

Therefore, it can be concluded that the main objective of e-Government is to provide effective and efficient dissemination of information, and delivery of public services; and to empower the citizens through the provision of access to information, public participation and policy decision-making platforms (Ntulo and Otike, 2013).

3.3. Types of e-Government Systems

In order for the government to effectively and efficiently disseminate information, deliver services, and empower citizens through public participation and policy decision-making, as Ntulo and Otike (2013) indicated above, the government needs to decide which type of e-Government system to implement, and for which audience. This section will list and explain the different types of e-Government systems in conjunction with the various types of users of these e-Government systems, and explain what the term *user* means for this study.

There are several types of e-Government users, and when mentioning e-Government adoption it is important to distinguish the types of users whose adoption is the focus of the study. According to the Oxford Dictionary (2017, p.1), a user is “a person who uses or operates something”. e-Government systems, similar to general technology systems, typically have a number of users, from the internal team or employees who interact with the system on an administrative basis, or on behalf of the organization (Ndou, 2004; Alshehri, 2012); to the external end-user. However, in most cases with e-Government systems, the system is created for use by the general public – who seek to receive one or other government service (Ndou, 2004; Alshehri, 2012). These types of users are known as end-users or citizen users, whom from here on the term *user* will refer, unless otherwise stated.

A number of authors (Ndou, 2004; Alshehri and Drew, 2010; Khan *et al*., 2010; Alshehri, 2012) have classified e-Government systems into four main types, which each serve different target users. Alshehri (2012) and Ditibane (2014) support this statement by asserting that, governments provide electronic public services (e-Government services) to various groups of users, such as: employees of government agencies; government agencies; citizens; as well as private sector entities.

e-Government services are tailored to the needs of the targeted users, and this has necessitated for e-Government service offerings be separated into four categories (Alshehri, 2012). These e-Government categories can be seen as e-Government user groups. The first type of e-Government service, Government-to-Citizen (G2C), involves citizens receiving public services or information from the government using technology (Khan *et al*., 2010). An example of this service would be applying for birth certificates, or paying government fees (Alshehri, 2012). The Government-to-Business (G2B) service consists of government and private sector organizations interacting electronically, to process transactions such as: procurement applications, license renewals, online tax payments, obtaining permits or any other legal documentation (Khan *et al*., 2010; Alshehri, 2012). The Government-to-Employee (G2E) category consists of providing knowledge as well as sharing opportunities with government employees through the intranet (Khan *et al*., 2010); while the Government-to-Government (G2G) category involves communication between government agencies to share information that facilitates the efficient and effective delivery of services (Ndou, 2004). Examples of the various types of e-Government services in South Africa are: The South African Revenue Service (SARS) e-Filing; Home Affairs smart card identification system (as G2C systems). Municipality websites are regarded as G2B and G2C systems (South African Department of Communications, n.d, p.2). The electronic tolling (e-Toll) system can also be regarded as a G2C system as it is aimed at providing citizens with a transactional public service, similar to the SARS e-Filing system. Hence, from this information it can be accepted that there are four types of e-Government users: citizens; businesses (private sector); government agencies; and government employees.

Therefore, as the focus of this research is on investigating the use of an Agile approach for improving the user-adoption of e-Government systems (by the general public), the term *user* hereinafter will be used to refer to the citizens (or end-user), as defined in the G2C category in the preceding paragraphs.

3.4. e-Government Stage Models

The adoption of e-Government systems is of strategic significance for governments, and as a result these governments have opted to make use of e-Government stage models – which guide them in selecting and implementing e-Government projects in their respective countries (Alomari *et al*., 2012). In order to have a holistic understanding of e-Government projects, a brief overview of e-Government stage models will be conducted.

Stage, implementation or development models are often cited when measuring a country's level of e-Government progress in relation to the various stages of the model. Therefore, these models indicate how progressive a government is in integrating technology in their administration and service delivery, in comparison to other countries (Abdullaha *et al*., 2011).

e-Government implementation is a multifaceted procedure, and thus cannot be condensed into a one step process; but requires multiple steps of development (Abdullaha *et al*., 2011). The following paragraphs will identify the various development models which assist in classifying e-Government projects. These models are also used to assist governments to position their e-Government project on the e-Government evolution chart.

3.4.1. Four Stage Model

The Four Stage Model was introduced to assist governments in their use of e-Government systems to deliver services (Alomari *et al*., 2012). The Four Stage Model consists of the following e-Government stages (i) *Catalogue*: the basic presentation of information through websites and downloadable documents. (ii) *Transaction:* the ability to conduct online transactions. (iii) *Vertical Integration:* the integration of government tasks at local, provincial and state level. (iv) *Horizontal Integration:* the integration of tasks and systems of different levels of government to provide users with an amalgamated and seamless service (Abdullaha *et al*., 2011). Layne and Lee created this model in 2001 with its focus on ensuring the "citizen as the main user[s] of e-Government" systems (Alomari *et al*., 2012, p.210).

3.4.2. United Nations' (UN) Five-Stage Model

The United Nations (UN) developed the United Nations' (UN) Five-Stage Model, which is similar to Layne and Lee's Four-Stage Model above (Abdullaha *et al*., 201). This model was created on the basis of establishing a platform (e-Government system) which enables the provision of web-based public services (Siau and Long, 2005). The focus of this model is on government's use of the web to deliver public services. The stages are as follows: (i) *Emerging Web Presence*: the display of static information. (ii) *Enhanced Web Presence*: government websites which are frequently updated with new information. (iii) *Interactive Web Presence*: advanced interaction. (iv) *Transactional Web Presence*: citizen-government interaction which also includes online financial transactions. (v) *Seamless Web Presence*: improved e-Government service delivery through integrated government department functions (Abdullaha *et al*., 2011). The UN Five Stage Model can be likened to Layne and Lee's Four-Stage Model; with similar stages such as the UN's stage (i) Emerging web presence and Layne and Lee's stage (i) Catalogue. Both of these stages identify the ability of the e-Government system to present static information. In the same way, the UN's stage (iv) Transactional web presence is similar to Layne and Lee's stage (ii) Transaction. These stages focus on the e-Government system's ability to perform online transactions between the citizen and the government.

3.4.3. Two-Stage Model

Other groups of researchers and governments prefer to use the Two Stage Model approach of e-Government introduced by Reddick in 2004. This model consists of (i) *Cataloging* and (ii) *Transactions* (Alomari *et al*., 2012). The focus of this model is on the ability of e-Government systems to perform transactions (Fath-Allah *et al*., 2014).

3.4.4. Gartner's Four-Stage Model

Gartner's Four-Stage Model emphasizes the ever-changing nature of e-Government systems, and thus focuses on citizen-centricity (Abdullaha *et al*., 2011). The first three (3) stages of this model, while rearranged, are similar to the first three (3) stages of the Layne and Lee model. The stages of the Gartner four-stage model are: (i) *Web Presence*; (ii) *Interaction*; (iii) *Transaction*; and (iv) *Transformation*: transforming current systems to ensure that they are more efficient, integrated and offer a personalized service (Abdullaha *et al*., 2011).

3.4.5. Hiller and Belanger Five-Stage Model

The Hiller and Belanger Five-Stage Model makes reference to the use of e-Government systems to enable citizen participation during government decision making. The five stages of this model are: (i) *Simple Information Dissemination*; (ii) *Two-Way Communication*; (iii)

Service and Financial Transaction; (iv) *Vertical and Horizontal Integration*; and (v) *Political Participation*: using online voting (Jayashree and Marthandan, 2010).

Governments may utilize any of these models in implementing their e-Government practices; and, in doing this, should be conscious of the benefits and shortfalls of their chosen model. However most of these models are designed for the developed country context, and should thus be used with caution, or modified when applied in developing countries (Abdullaha *et al*., 2011). **Table 3.2** below has summarized all the above mentioned e-Government stage models for convenience.

The Four Stage Model by Layne and Lee indicates that complete e-Government integration is accomplished at stage four of the model (Alomari *et al*., 2012). It can then be argued that in its simplicity, the Two Stage Model by Reddick cannot adequately realize the benefits of complete e-Government integration in a mere two stages. Siau and Long (2005) recognizes that conflict, omission and overlap are inevitable between the models – which is an indication to a lack of consensus on the stages an e-Government system should go through.

Consequently, various researchers have recommended a standardized e-Government stage model which can be utilized by all countries who wish to improve public service delivery through e-Government systems. Siau and Long (2005) acknowledged that most stage models have the first four stages (*Web Presence, Interaction, Transaction* and *Transformation*) here end there, as seen in **Table 3.2** below. Therefore, Siau and Long (2005) and Jayashree and Marthandan (2010) are some of the authors who have extended the stage model to a fifth stage: *Political Participation*.

Table 3.2: E-Government Stage Models (Summarized)

Models	Year	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Layne and Lee's 4 Stage Model	2001	Catalogue	Transaction	Vertical Integration	Horizontal Integration	
United Nation's 5 Stage Model	2001	Emerging Web Presence	Enhance Web Presence	Interactive Web Presence	Transactional Web Presence	Seamless Web Presence
Reddick's 2 Stage Model	2004	Cataloguing	Transactions			
Gartner's 4 Stage Model	2000	Web Presence	Interaction	Transaction	Transformation	
Moon's 5 Stage Model	2002	Simple Information Dissemination	Two-Way Communication	Service and Financial Transaction	Vertical and Horizontal Integration	Political participation

Siau and Long (2005) developed a blended five stage model which reflected the increasing benefits, costs and complexity of e-Government systems as they develop from one stage to the next. ***Figure 3.3*** below is Siau and Long's (2005) standardized e-Government stage model.

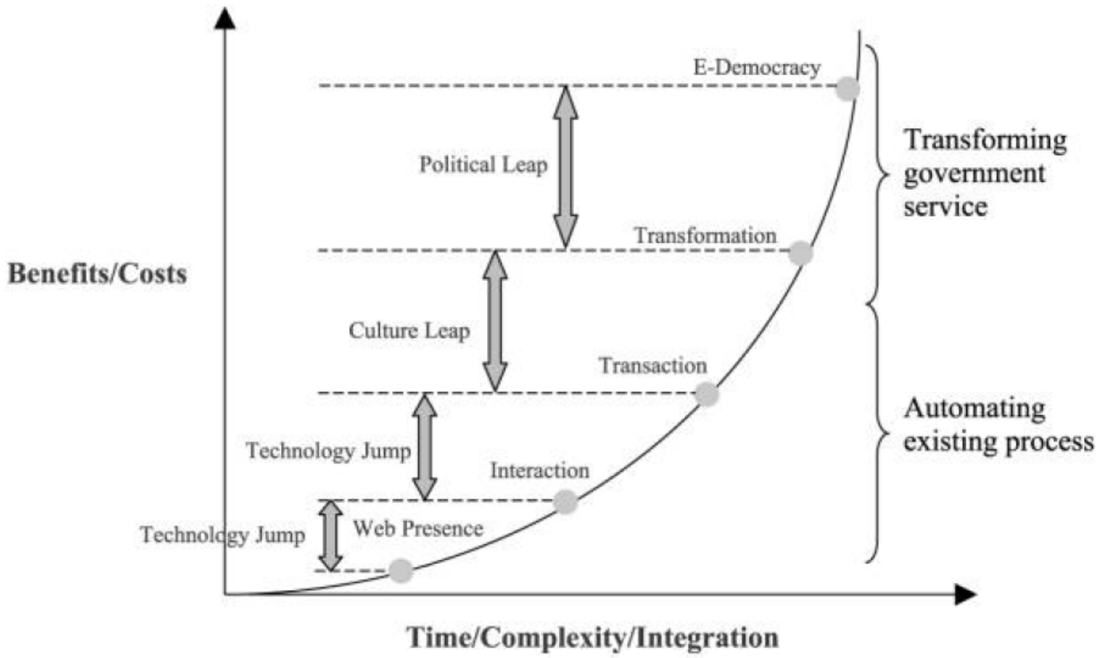

Figure 3.3: Five-Stage Model of e-Government (Siau and Long, 2005)

In a similar manner, Jayashree and Marthandan (2010) also produced a standardized e-Government stage model, which is illustrated in ***Figure 3.4*** below.

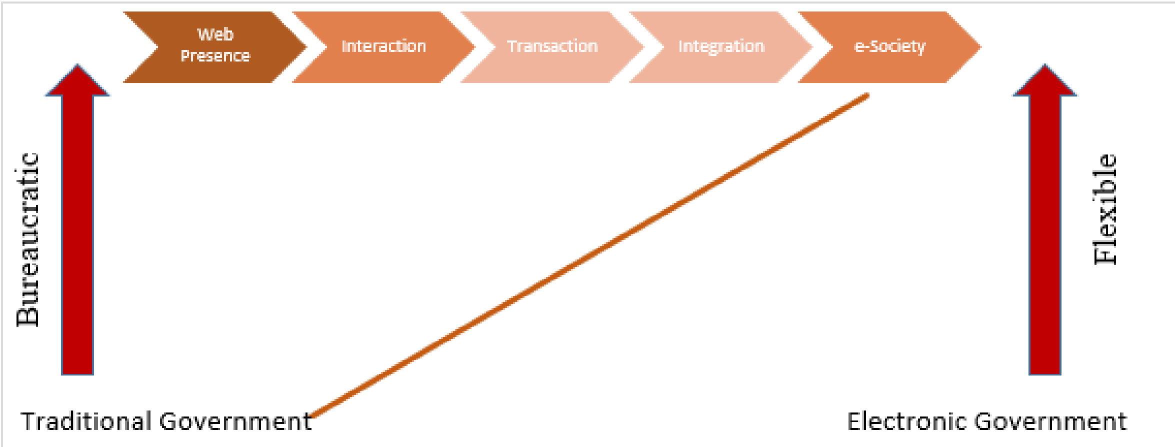

Figure 3.4: Simple Integrated Model for e-Government (Jayashree and Marthandan, 2010)

This model is similar to that of Siau and Long (2005). In both models, one can see that the end-goal of e-Government is for countries to become e-societies or e-democracies. Siau and Long (2005) define an e-society as one which uses digital media for communication, transaction and integration between all facets of society (businesses, government, and the public). E-democracy, on the other hand, is a state where e-Government enables "online voting, polling and surveys"; and improves "political participation and citizen involvement" (Jayashree and Marthandan, 2010, p.455).

3.5. e-Government for Socio-Economic Development

What has allowed for the expansion of e-Government systems in developed and developing countries are the various benefits which arise from the implementation of an e-Government system, among other things. Kaaya (2012) identifies common e-Government benefits as: improved public service delivery; cost and time savings; increased government accountability and transparency; and "one-stop shopping" for fully developed e-Government systems (Alshehri and Drew, 2010). The use of e-Government, in comparison to the traditional paper-based method, has also demonstrated reductions in administration costs of processing customer transactions (Alshehri and Drew, 2010; Kaaya, 2012). In addition, Alshehri and Drew (2010) identify benefits of implementing e-Government systems as an integrated online government service, accessible from a single portal; the ability to involve citizens in policy decision-making, through information and idea sharing. This will allow for better governance, government accountability and transparency.

One of the biggest gains of successfully implementing e-Government is the improvement in the manner in which government agencies provide services to their customers, the citizens. With e-Government, the focus shifts away from being systems-oriented, to being user-oriented, with the users being the citizens (Kaaya, 2012). This shift sees government agencies prioritizing the needs of the citizens through service delivery (Alshehri and Drew, 2010).

In order to measure whether an e-Government system has truly been advantageous in an economy, Alshehri and Drew (2010) indicate that at least one of the *five key benefits* should be realized. These benefits are: *Financial* - the reduction of operating costs in comparison to using the traditional system; *Economic Development* - the economic and social wellness of the country or region; *Efficient Systems* - to enable an integrated government system; *Democratic Principles* - to allow citizens to partake in policy making and idea sharing; and *Improved Service Delivery to Citizens*.

It is important to note, however, that e-Government is a mechanism that facilitates the efficient delivery of government services – and not a replacement of government service delivery (Makene, 2009). The impact of e-Government in society is identifiable through the four (4) categories, similar to those listed in the previous paragraph: *Social; Economic; Political;* and *Cultural* (Makene, 2009).

The *Social* impact of e-Government is the effective delivery of government services to healthcare, education and the public.

The *Economic* impact of e-Government is administrative cost reductions from operating more efficiently. For instance, the payment of bills or taxes online is more cost effective than a traditional paper-based method.

The *Political* impact of e-Government is the ability to apply for identification documents online, or even vote online, through the e-Voting system. Improved government-citizen relations and public participation are also a political outcome of e-Government systems (Makene, 2009).

Finally, e-Government systems can also have a *Cultural* impact, as it can stimulate growth in ICT for development initiatives, especially in developing countries, that directly address factors such as access and ability to use technology (digital divide issues) (Makene, 2009).

3.6. E-Government Challenges

While the successful implementation of e-Government systems yields numerous socio-economic benefits, there exist various challenges that hinder the realization of these benefits (Ntulo and Otike, 2013).

Governments continue to allocate resources to projects, strategies and programs that aim to eradicate e-Government challenges and barriers (Anthopoulos *et al*., 2016). Despite this attempt, e-Government challenges persist and can be classified into two main categories (Rana, Dwivedi and Williams, 2013): (i) *Supply-Side Driven* (implementation issues) or (ii) *Demand-Side Driven* (adoption / post-implementation problems).

On the contrary, Nkonhkwo and Islam (2013) believe that e-Government challenges can be attributed to six (6) main problem groups. These groups are *Infrastructural; Financial; Political; Organizational; Socio-Economic;* and *Human* (Nkonhkwo and Islam, 2013). The *Infrastructural* category, technological resources and connectivity-related issues, is the most common challenge impeding the success of e-Government projects in Sub-Saharan Africa (Nkonhkwo and Islam, 2013, p.256).

The following sections will dissect the Implementation, and Post-Implementation e-Government challenge categories, mentioned in the preceding paragraphs, identifying the individual factors that contribute to the emergence of these challenges.

3.6.1. Implementation Challenges

This sub-section will look at the e-Government implementation challenges, and the succeeding sub-section will focus on the post-implementation challenges.

Design-Reality Gap

The design-reality gap has been identified by several e-Government authors (Heeks, 2003; Ahmed, 2004; Almarabeh and AbuAli, 2010; Hasan, 2015) as being one of the main failure factors of e-Government implementation. A design-reality gap is a state where a disparity exists between the current reality of the government agency (agency without e-Government technologies), and the designed or proposed e-Government system (Ahmed, 2004). It is apparent that the larger the gap between the two states, the higher the risk of a project failure (Heeks, 2003). The dimensions used to compare these two states are: "Information; Technology; Processes; Objectives and Values; Staffing and skills; Management systems and structures; Other resources (i.e. time and money)" (Hasan, 2015).

A gap may occur when the design is very different to the reality, which could mean that too many variables are being changed. Ahmed (2004) recommends that standardized, over-the-counter technologies may lead to low project risk and higher chances of success. Conversely, Almarabeh and AbuAli (2010, p.34) indicate that a design-reality gap in e-Government projects is due to the use of "off-the shelf solutions from industrialized countries for a developing country".

ICT Infrastructure

In order to successfully implement e-Government services, the appropriate ICT infrastructure needs to be in place. This consists of computer hardware, software and telecommunications connectivity – which need to be shared, standard and compatible, to allow for an e-Government system which is integrated across government departments (Alshehri and Drew, 2010; Kaaya, 2012). Such internetworking enables information sharing across government agencies and enhanced service delivery through a convenient, seamless government portal (one-stop shop) (Alshehri and Drew, 2010). Government ICT infrastructure is one of the most significant aspects of successful e-Government implementation; and, ironically, one of the main challenges of implementing e-Government (Alshehri and Drew, 2010).

Project Management / Systems Development

According to Anthopoulos *et al*. (2016), poor project management is the top reason for e-Government project failure; it can cause: mission failure; objective failure; satisfaction failure; adoption failure; sustainability failure; replication failure; or total failure. The authors cite effective project management as fundamental for preventing the abovementioned types of e-Government project failures (Anthopoulos *et al*., 2016). As Systems Development is a type of IT project, as mentioned in the previous chapter on Project Management, it can be deduced that poor e-Government Systems Development can also lead to e-Government project failures such as satisfaction and adoption failure. This study will focus, partly, on this e-Government challenge in trying to understand the user-adoption challenges, expanded below.

3.6.2. Adoption / Post-Implementation Challenges

This sub-section will briefly outline the e-Government adoption, or post-implementation challenges. e-Government adoption influences will be explained in the following chapter, **Chapter 4**.

Low e-Government user-adoption is most prevalent in developing countries and contributes to the overall failure of e-Government projects (Alghamdi and Beloff, 2014). Some of the main adoption or post-implementation challenges are identified below.

Digital Divide

The challenge of the digital divide refers to the unequal access to e-Government services either because of illiteracy or because of the user’s inability to access e-Government facilities (Alsufayri, 2014). E-Government access is critical to the success of e-Government projects (Ozkan and Kanat, 2011; Sharma *et al*., 2012; Alghamdi and Beloff, 2014), as the inability to access these e-Government systems also implies that citizens are deprived of accessing government services.

The digital divide issue also exists in South Africa and arises from an increase in the development of e-Government initiatives without adequately addressing the low literacy rates (Western Cape Government, 2012). Therefore, this widens the digital divide and hinders disadvantaged citizens from exploiting the benefits brought about by e-Government, and, thus, prevents citizens from accessing public services (Western Cape Government, 2012).

IT Skills

Lin *et al.*, (2011) state that the inability to effectively use ICTs discourages some people from adopting e-Government systems. They further add that in Africa, “40% of the adult population is illiterate and computer penetration is the lowest in the world with 2.2 computers per 100 inhabitants” (Lin *et al.*, 2011, p.). A number of other authors concur that the usability or, rather, lack of usability of e-Government systems is a hindrance to e-Government user-adoption (Ozkan and Kanat, 2011; Shareef *et al*., 2011; Sharma *et al*., 2012; Alghamdi and Beloff, 2014).

Resistance to Change

Resistance to change arises from staff or end-users who prefer to use the original system instead of a new e-Government system. This may be a result of intimidation caused by inability to use the new system, or fear of job loss (Goel *et al*., 2013). Change Management techniques – such as extensive training and stakeholder buy-in – are aspects that need to be addressed to prevent resistance and ensure e-Government success (Goel *et al.*, 2013).

Figure 3.5 below illustrates the most prevalent e-Government challenges in Sub-Saharan African countries as identified by Nkonhkwo and Islam (2013).

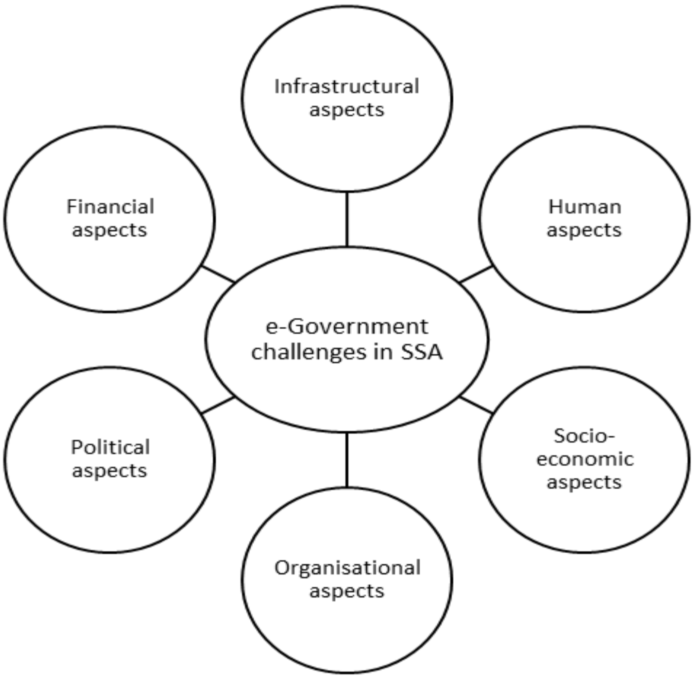

Figure 3.5: Sub-Saharan Africa e-Government Challenges (Nkonhkwo and Islam, 2013)

Alsufayri (2014) concurs that low adoption is one of the main challenges to the realization of effective e-Government systems. While a vast number of e-Government challenges plague developing countries, this research will only focus on two e-Government challenges: the application of appropriate Systems Development methodology, and low user-adoption. The following chapter, **Chapter 4**, will delve into trying to better understand e-Government user-adoption, while **Chapter 5** will explore the topic of Systems Development Methodologies

(Agile in particular) and how it can be used to address the phenomenon of low e-Government user-adoption.

3.7. e-Government Projects in Developing Countries

As mentioned earlier, the surge in technological developments have compelled governments to explore ways to make use of ICTs to enhance government-citizen relations; improve government service delivery to citizens; and uplift socio-economic standards in the country (Mutula and Mostert, 2010).

According to the 2016 e-Government Development Index created by the United Nations (2017), the top three (3) ranked e-Government counties in Africa are Mauritius, Tunisia, and South Africa, respectively. For that reason, this section will present practical examples of e-Government projects in Africa, from those three countries.

3.7.1. Mauritius

Contrary to other African countries, Mauritius does not suffer from digital divide related issues such as literacy and access. Mauritius has almost a 100% electricity penetration, 89% adult literacy levels, as well as over 50% of the population with access to a personal computer (Lallmahomed, Lallmahomed and Lallmahomed, 2017).

The Mauritius government provides an online portal with over 130 government services to choose from, grouped into government ministries and departments (Lallmahomed, Lallmahomed and Lallmahomed, 2017). These services have limited interaction as they are largely form-based.

However, the main challenge faced by the Mauritius e-Government system is low user-adoption of these services, despite the high literacy rates and impressive ICT infrastructure (Lallmahomed, Lallmahomed and Lallmahomed, 2017). Resistance to change and trust in the government are some of the factors that have contributed to the lack of e-Government usage in Mauritius (Lallmahomed, Lallmahomed and Lallmahomed, 2017).

3.7.2. Tunisia

Tunisia was once ranked top in Africa (United Nations, 2017). Mellouli (2014) presents some of the factors which contributed to the success of the Tunisian Government. In 2014, Tunisia had 202 e-Government systems, the majority of which were Government-To-Citizen (G2C) services, and planned to develop a further 200 systems in 5 years (Mellouli, 2014). **Table 3.3** below reflects the types of e-Government systems in Tunisia divided into the e-Government stages. This indicates that most of their e-Government systems are interactive.

Table 3.3: Distribution of e-Government Services in Tunisia (Mellouli, 2014)

Marurity Level	Description	Number of Services	Percentage
1	Online Application (informational)	50	25%
2	Following the online application (Interactional)	66	33%
3	Transactional	66	33%
4	Intra-organisational Integration	3	1%
5	Intra-organisational Integration	17	8%
TOTAL		202	100%

3.7.3. South Africa

Ranking 76th in the e-government development index in the world in 2016, South Africa has made visible progress with regards to e-Government development compared to its 93rd position in 2014 (United Nations, 2017).

Some of the e-Government initiatives that have emerged from South Africa are municipality websites such as the Western Cape, and Gauteng e-Government systems. In addition to these are, the SARS tax e-filing system; eHome Affairs (online application of identification documents and passports); e-Natis (online registration or renewal of vehicle licenses); e-Toll; and SASSA for social grant distribution (Pillay, 2012; Western Cape Government, 2013; Ntsham, 2014; South African Government, 2015).

While South Africa has made great progress in the implementation of e-Government systems, it does not appear to be taking full advantage of the opportunities presented by these government structures (Mutula and Mostert, 2010). South Africa is no exception to large e-Government project failures, with only a handful of projects categorized as complete successes, such as the SARS e-filing system (Ntsham, 2014).

An e-Government project that has recently experienced user-adoption challenges in South Africa is the SANRAL e-Toll system, in the Gauteng Province. The following section will briefly expand on this project, identifying the factors that have contributed to the user-adoption issues, according to the literature available.

3.7.4. A South African e-Government project: SANRAL e-Toll system

e-Toll is a tolling system created by the South African National Road Agency Ltd (SANRAL) (SANRAL, 2017). SANRAL is the function of the government which is responsible for managing the national road network which connects various parts of the country: from cities, villages and towns (SANRAL, 2017). This road network seeks to foster socio-economic development, "tourism and the creation of economic opportunities" (SANRAL, 2017, p.1).

SANRAL manages the toll road operations which entails motorists paying for the use of roads, following a user pay (pay-as-you-use) concept, rather than the conventional tax-based payment system (SANRAL, 2017). The debt incurred by SANRAL to implement the e-toll project is being settled by the proceeds obtained from the user-pay approach (Lin, 2015).

The e-Toll system entails the use of credit cards or e-tag devices at toll booms or overhead gantries, to pay for use of the road (SANRAL, 2017).

How the Tolling system works?

According to SANRAL (2017), to make use of the Tolling system, users (motorists) need to register their vehicles online (or at e-toll stations) under the e-Toll system, where the vehicle can be identified by use of license plates or e-tags. The e-tags can be loaded with money as a pre-paid account, or linked to the user's bank account. The overhead gantries scan the e-tag or license plates as the vehicle drives underneath and automatically charges the motorist (SANRAL, 2017).

Benefits of an e-Toll system

The benefits of an e-Toll or tolling system are:

1. A tolling system ensures road networks of a high quality
2. Safe and secure roads which consist of surveillance and emergency units, from the freeway management system
3. An equitable user-pay principle which only charges motorists based on road usage
4. Uninterrupted driving without slowing down or stopping at boom-gated tolls

(SANRAL, 2017).

e-Toll Resistance

The Gauteng e-toll system has faced a great deal of public resistance from the beginning of the project, to the present day, with the formation of multiple resistance groups, such as Toll Free GP; OUTA; and political parties, directly opposing the implementation of the e-toll system (Toll Free GP, 2011; OUTA, 2016).

As e-Government user adoption is the focus of this thesis, below is a list of the issues that hindered the successful user adoption of the e-toll system in the Gauteng Province.

1. **Access to information**: The lack of complete project information (in the beginning), about the nature and funding of the e-toll project (Lin, 2015).
2. **Freedom of movement**: e-Tolls are seen as obstructing motorists' freedom of movement (a constitutional right), by placing a fee for the use of main highways, which are in better condition than the non-tolled alternative routes (Lin, 2015; OUTA, 2016).
3. **Lack of public participation and consultation**: The lack of sufficient consultation (less than 100 members of the public consulted) (Lin, 2015). The public is dissatisfied with the extent of public participation and consultation that took place during the e-toll project (Toll Free GP, 2011; OUTA, 2016, p.1).
4. **High cost and impact on the poor (additional taxing)**: e-Toll opposition groups have expressed that the e-toll system will place a socio-economic burden on the public, as it is another form of tax in addition to the existing taxes and levies imposed on motorists (Lin, 2015; Toll Free GP, 2011; OUTA, 2016).

5. **Flawed user-pay principle**: The principle requiring payment upon use of the road, as a way to fund the e-toll project, is problematic as road improvements will have a ripple effect on the development of the country and thus the funding of the e-toll should arise from the national fiscus (OUTA, 2016).

It is important to note that the panel which was put in place to consult with aggrieved public groups and review the e-toll project concluded that the e-toll project would not be disbanded but that the system would be revised "to make it governable" (Lin, 2015, p.70).

With that said, this research does not seek to change nor challenge the current e-toll system, or any other South African e-Government system; but rather seeks to provide recommendations, to e-Government projects in South Africa, on how to best ensure user adoption.

3.8. Conclusion

This chapter introduced the broad topic of electronic government (e-Government), a type of IT project, as the focus area of this thesis. A background into the e-Government models, as well as an explanation of the socio-economic impact of e-Government systems in developing countries, was also presented. The scope of the chapter was narrowed down to the typical challenges that inhibit the success of e-Government projects, and then further honed into as to identify e-Government challenges in developing countries. In order to conceptualize the issue of e-Government user-adoption, an example of a South African e-Government project was presented – detailing some of the user-adoption challenges faced.

The following chapter will expand on the phenomenon of e-Government user-adoption by identifying some of the factors that influence the adoption of e-Government systems; in order to propose informed recommendations for improving e-Government user-adoption. The following chapter will also present various user adoption frameworks and theories that can assist in understanding e-Government user-adoption.

CHAPTER 4: E-GOVERNMENT USER ADOPTION

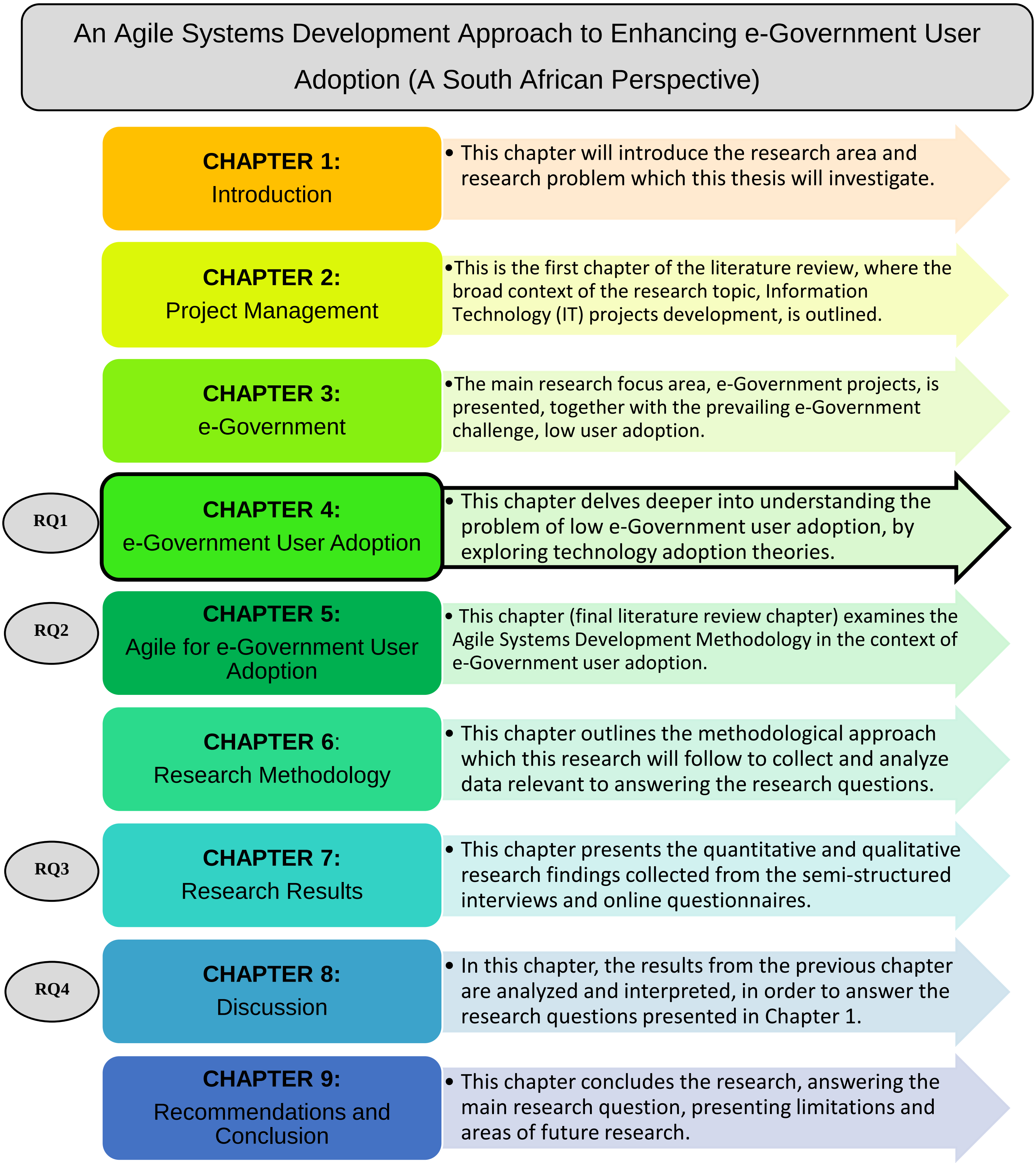

Figure 4.1: Chapter 4 Thesis Structure

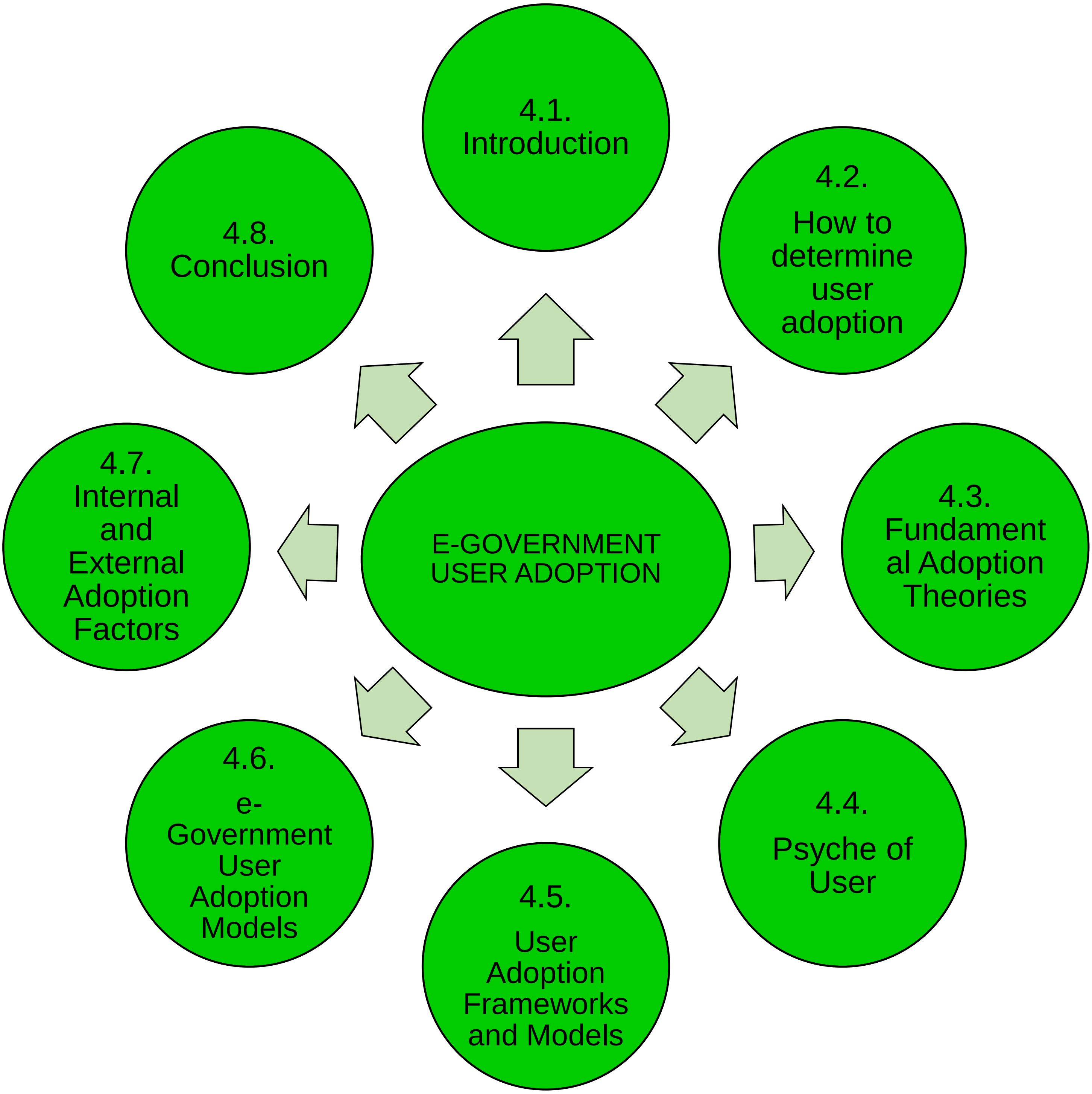

Figure 4.2: Chapter 4 Outline

***Abstract**: This chapter delves deeper into understanding the problem of low e-Government user adoption, by exploring technology adoption theories and models.*

4.1. Introduction

The two preceding chapters, on Project Management and e-Government, sought to outline and place this thesis into the context of Information Technology Systems Development projects in the public sector (e-Government projects). This chapter will refine and hone into e-Government user adoption. As indicated in the previous chapter, e-Government adoption is one of the core issues hindering e-Government success.

The aim of this research is to provide recommendations on how an Agile approach can improve e-Government user adoption in South African e-Government projects. Therefore, this chapter will explore underlying user adoption theories – as well as e-Government user adoption models to better understand the factors that influence e-Government user adoption.

The following chapter, **Chapter 5**, will explore the pre-(system)implementation factors that influence e-Government user adoption.

It is important to mention at this point that although this study is not directly focused on identifying e-Government adoption factors – it is fundamental to have an understanding of user adoption and technology adoption theories in order to answer research question 1 and unveil the context of this study.

4.2. How to Determine User Adoption?

Before we can dig into the different adoption theories (and the technology, and e-Government adoption models that arise from these theories) it is essential to have an understanding of the term *user adoption*, as it will be used exhaustively from hereon. Technology adoption is defined as “the extent by which a given technology becomes accepted and incorporated into approved social practices” (IGI Global, 2017, p.1).

Some authors (Ovwigho, 2015 for instance) have measured user adoption according to the number of users; whereby the user adoption of a new technology for soil management in farming was measured on the basis of the number of users in proportion to the total sample size.

User adoption can also be measured against a set of predetermined Key Performance Indicators (KPIs) (Hulgan, 2015). For example, in the e-Toll project, adoption could be determined on whether the targeted monthly transactions are met. When measuring adoption based on number of users, it is important to differentiate between those users who made use of the entire system, and those who only used some of the system functionality (Hulgan, 2015).

In an older study by Williams *et al.* (1984), user adoption is seen to consist of five (5) stages as illustrated in **figure 4.3** below; starting with awareness, and progressing through to the final stage of actual use. Therefore, based on this, it can be inferred that one needs to be able to measure adoption at various stages, rather than assume that adoption is one-dimensional.

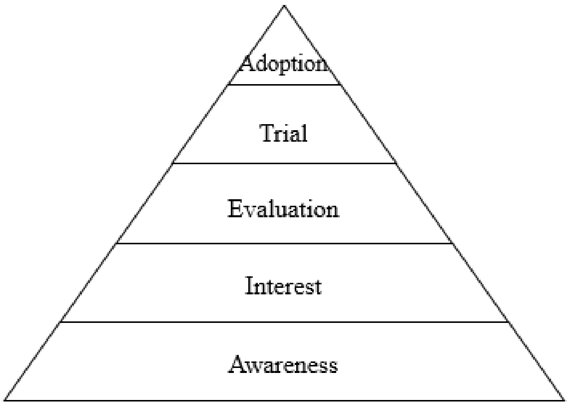

Figure 4.3: Stages of Adoption (Williams *et al*., 1984; cited in Ovwigho, 2013)

The second definition, as noted in the preceding paragraphs, supports this assertion by making use of the word 'extent' – which implies that user adoption ranges (has different levels): from minimal adoption, to adoption of the entire system (using the system / technology to its full potential), for instance.

In addition to stating that user adoption is a function of mental acceptance and usage. For such adoption to take place, the following steps ought to be considered:

1. Top-down support from the managerial level
2. User involvement to prevent resistance

3. Explaining to users what they stand to gain from the new technology
4. A reward system for adopters
5. Managing non-adopters
6. Providing training, education and support for the new technology.

Failure to address the points above may lead to users rebelling against the new technology, and restoring to their own methods (Microsoft Dynamics, 2013). Themes made in these steps will emerge later in the Agile approach, and in the South African e-Government projects investigated, in **Chapter 5** and **Chapter 7** of this thesis.

Hulgan (2015) takes a business perspective in measuring user adoption, and states that adoption should not be solely measured against quantifiable metrics (such as number of users or time spent using the system), but should also be analyzed in relation to an organization's goals. The author goes on to state that user adoption needs to be measured in a way that reflects whether business goals have been reached through the project (Hulgan, 2015). An example of this is if the implementation of the e-Toll project was intended to reduce operating costs by 10%, and costs increased instead; then the business objective of the project has not been met. This would imply that the system is not used correctly, or that the system is not being used to its fullest potential (Hulgan, 2015).

Therefore, user adoption can be measured according to various dimensions, such as: calculating the number of people who interact with the system, the number of users who make use of specific system functionalities; against the predetermined KPIs of an organization, or based on organizational goals.

4.3. Fundamental Adoption Theories

There are several contending theories that provide an understanding into the elements that influence a user's acceptance or adoption of a new technology (Cheung and Vogel, 2013). Adoption theories are important for identifying and explaining the factors that influence technology adoption – and in particular, the use of e-Government systems (Athmay *et al*., 2016). In order to identify these technology adoption factors, various studies were consulted to identify the main factors that affect a citizen's "willingness to adopt e-Government services" (Athmay *et al*., 2016, p.61).

The theoretical underpinning of the adoption theory stems from the 1975 social psychology study by Fishbein and Ajzen on the Theory of Reasoned Action (TRA) (Adams *et al*., 2017), and Ajzen's (1985) work on the TRA and Theory of Planned Behavior (TPB). Cheung and Vogel (2013) identify the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), and the Technology Acceptance Model (TAM) as common theories employed for studying the users' behavior and acceptance factors for using a new technology.

There are two (2) schools of thought concerning these fundamental adoption theories: (i) Intention-based theories such as the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM); and the Unified Theory of Acceptance and Use of Technology (UTAUT). This school of thought seeks to predict whether potential users will adopt or reject a technology (Chiyangwa and Alexander, 2016). The second school of thought is based on Rogers' (1983) Diffusion of Innovation (DOI) theory, which investigates the factors that influence the spread of a technology in society (Chiyangwa and Alexander, 2016). These theories were not initially developed to analyse technology adoption, as they are theories developed in the social psychology domain, except for the DOI theory – which was specifically developed for the technology adoption domain (Chiyangwa and Alexander, 2016). The theories from the Intention-based school of thought, and adaptations of these theories, will be explored further; as these theories speak directly to the external (post-implementation) technology adoption factors.

There are extensive adaptations, integrations, and replications of the fundamental adoption theories; and these are beneficial in aiding the understanding of technology adoption theory in various contexts (Venkatesh, Thong and Xu, 2012). These other adoption models will be assessed after analysing the primary adoption theories below.

4.3.1. Theory of Reasoned Action (TRA)

Fishbein and Ajzen established the Theory of Reasoned Action (TRA) in 1975, to predict the volitional behaviours of individuals, and determine the psychological factors that influence such behaviours – based on the individual's behavioral intentions (Ajzen, 1985). The theory states that a user's behavioral intention can be determined by both attitudinal and normative factors (Adams *et al*., 2017). Attitudinal factors refer to the attitude of the user towards adopting a new technology, while normative or subjective factors refer to what other people think about adopting the new technology, i.e. social pressures (Gelbrich and Sattler, 2014). The TRA assumes that users assess the available information before making a decision, and thus consider the implications of the behaviour before making a decision (Ajzen, 1985). This theory states that the user's attitude towards a new technology, for instance, determines the user's intention to use that technology (Joo and Sang, 2013). **Figure 4.4** below illustrates the Theory of Reasoned Action by Fishbein and Ajzen (1975, cited in Gelbrich and Sattler, 2014).

Still, the limitation of this theory is that it places emphasis on the individual's intention and omits the next step – which is the actual behaviour of the individual. Ajzen (1985, p.29) states that while an individual may intend on performing a certain action, the "successful performance of the intended behaviour is contingent on the person's control over the various factors that may prevent it". Therefore, an individual's intention should be regarded as a desire to perform a task, and not the actual performance of the task (Ajzen, 1985).

The core constructs of this theory are *Attitude toward a behaviour* and *Subjective norm* (Venkatesh, Morris, Davis and Davis, 2003).

4.3.2. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior is an extension of the TRA by Ajzen – proposed in 1985 (Ajzen, 1991). The TRA was expanded by adding *perceived behavioral control* to develop the TPB (Ajzen, 1991). **Figure 4.5** below illustrates that behavior (actual adoption or rejection) is dependent upon the behavioral intention, and the perceived behavioral control. Perceived behavioral control is the perceived ease or difficulty in performing a certain behavior (Ajzen, 1991). The core constructs of this theory are *Attitude toward a behavior*; *Subjective norm* and *Perceived behavior control* (Venkatesh *et al*., 2003).

The TRA and TPB models are illustrated in **figure 4.4** and **figure 4.5** below. These models, along with the TAM, provide the visual representation of how the technology adoption theories have evolved over time.

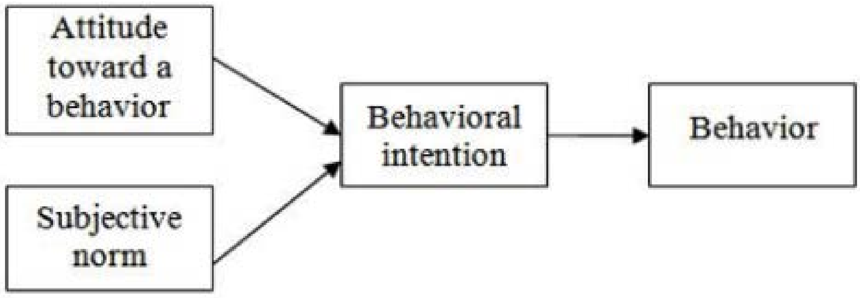

Figure 4.4: Theory of Reasoned Action (Lau, 2011)

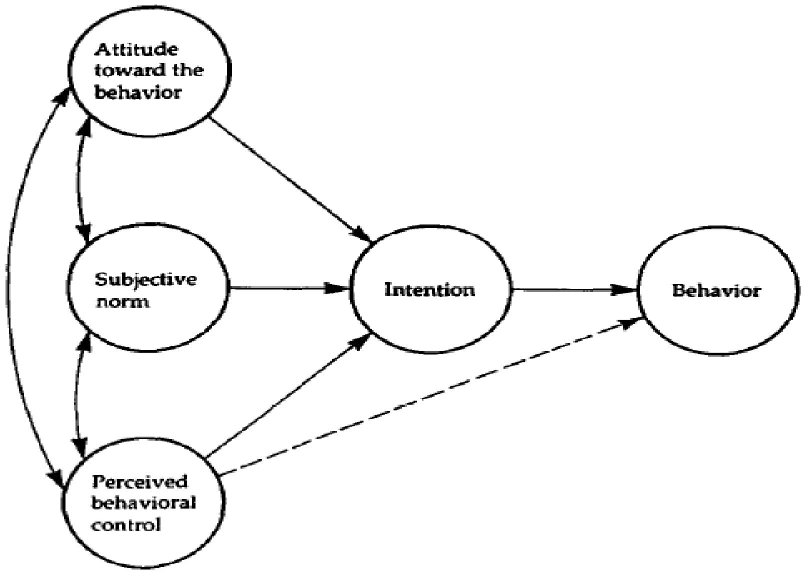

Figure 4.5: Theory of Planned Behavior (Ajzen, 1991)

4.3.3. Technology Acceptance Model (TAM)

The most commonly accepted technology adoption theory is the Technology Acceptance Model (TAM), which has been referred to as "the premier model in understanding consumers' adoption of new technologies" (Adams *et al*., 2017, p.3). The Technology Acceptance Model (TAM) was coined by Davis (1989, cited in Cheung and Vogel, 2013) and attributes its origins to the abovementioned Theory of Reasoned Action (TRA) (Joo and Sang, 2013) by Fishbein and Ajzen (1975, cited in Gelbrich and Sattler, 2014).

TAM has been recognised as one of the leading models to evaluate the users' intention to use a new system (Joo and Sang, 213). This model can be used to draw "comparisons between user groups of a particular technology" (Joo and Sang, 2013, p.2513). TAM consists of two (2) core constructs that affect the user's intention to use the technology, which are Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) (Venkatesh *et al*., 2003).

Perceived Ease of Use (PEOU)

Perceived Ease of Use (PEOU) is defined as "the degree to which a person believes that using a particular system [or technology] would be free from effort" (Davis, 1989, p.320, cited in Joo and Sang, 2013). This is the belief that a system, application or technology is easy to use (Adams *et al*., 2017). Therefore, the assumption is that there is a causal effect between the ease of use of a system and the user's intention to use that system.

Perceived Usefulness (PU)

Davis (1989, p.320) defines Perceived Usefulness as "the degree to which a person believes that using a particular system [or technology] would enhance his or her job performance" (cited in Joo and Sang, 2013).

Limitations

While TAM is widely recognised as the leading technology adoption model, the possibilities of this model are obstructed by its inherent limitations – which have led to various authors (Venkatesh and Davis, 2000; Joo and Sang, 2013; Gelbrich and Sattler, 2014; Adams *et al*., 2017) criticising its merit; and, thus, amending the original TAM.

One of the key limitations of the TAM is that it focuses on PEOU and PU as determinants of intention to use a new technology; yet omits the antecedent variables that influence PEOU and PU (Joo and Sang, 2013). Another limitation of the model is that it "cannot fully explain why people accept and use a particular technology" (Joo and Sang, 2013, p.2513). Some of these limitations have been addressed by Vankatesh and Davis (2000) through the extended TAM, known as TAM 2 (Adams *et al*., 2017) and later a TAM 3 by Venkatesh and Bala (2008) (**figure 4.6** below). TAM 2 expounds on the original TAM by including the antecedents of Perceived Usefulness (PU) (Adams *et al*., 2017); while TAM 3 expands on TAM 2 to include the determinants of Perceived Ease of Use (PEOU) (Venkatesh and Bala, 2008). TAM 3 asserts that a user's perceptions of a new technology's ease of use are determined by the user's general beliefs about that technology (Gelbrich and Sattler, 2014). For instance, the user's perceived enjoyment; usability; computer anxiety; and computer self-efficacy are some of the factors which influence how easy the user perceives the technology to be (Venkatesh and Bala, 2008).

Subsequent research employing TAM has indicated how researchers have derived their own TAM extensions to compensate for the limitations of the original TAM model and to appeal to a specific context. For instance, Joo and Sang (2013) propose the Uses and Gratifications (U&G) model to supplement the TAM in understanding smartphone usage in Korea.

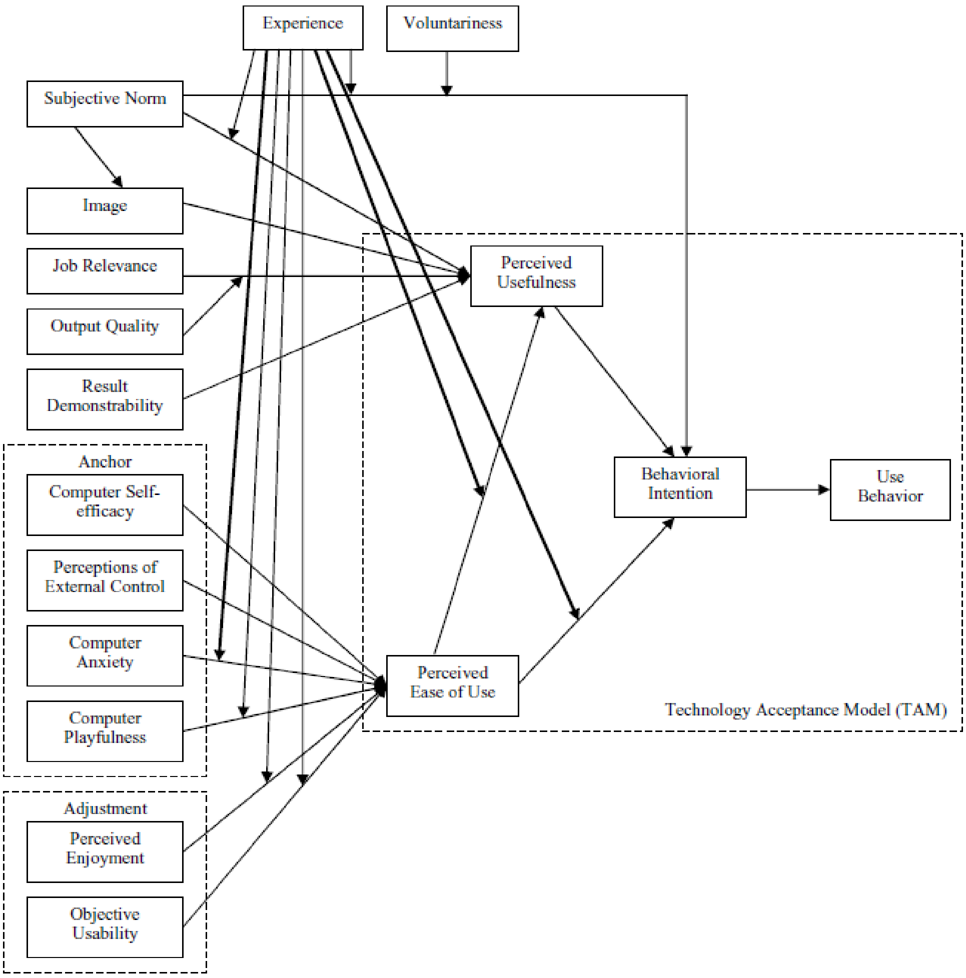

Figure 4.6: Technology Acceptance Model (TAM) 3 (Venkatesh and Bala, 2008, p.280)

4.3.4. Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is the most widely accepted improvement of the TAM (Oliveira *et al.*, 2014). Venkatesh *et al.* (2003) developed this model based on the similarities across previous adoption theories.

The UTAUT model consists of four main constructs – which Venkatesh, Thong and Xu (2012) posit as the determinants of behavioural intention to use a new technology. These constructs are: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh, Thong and Xu, 2012). The original UTAUT model has been amended to UTAUT 2 for the consumer technology adoption context – such as citizen use of e-Government services. As such. the original model was used in the context of technology adoption in an organization (Venkatesh, Thong and Xu, 2012). **Figure 4.7** is an illustration of UTAUT 2 by Venkatesh, Thong and Xu (2012). The original UTAUT model by Venkatesh *et al*., (2003) is the UTAUT 2 model in **figure 4.7** below – without the hedonic motivation, price value, and habit constructs, without the thicker (darker) arrows; and with voluntariness as an individual difference variable, which was part of the variables: age, gender, and experience (Venkatesh, Thong and Xu, 2012).

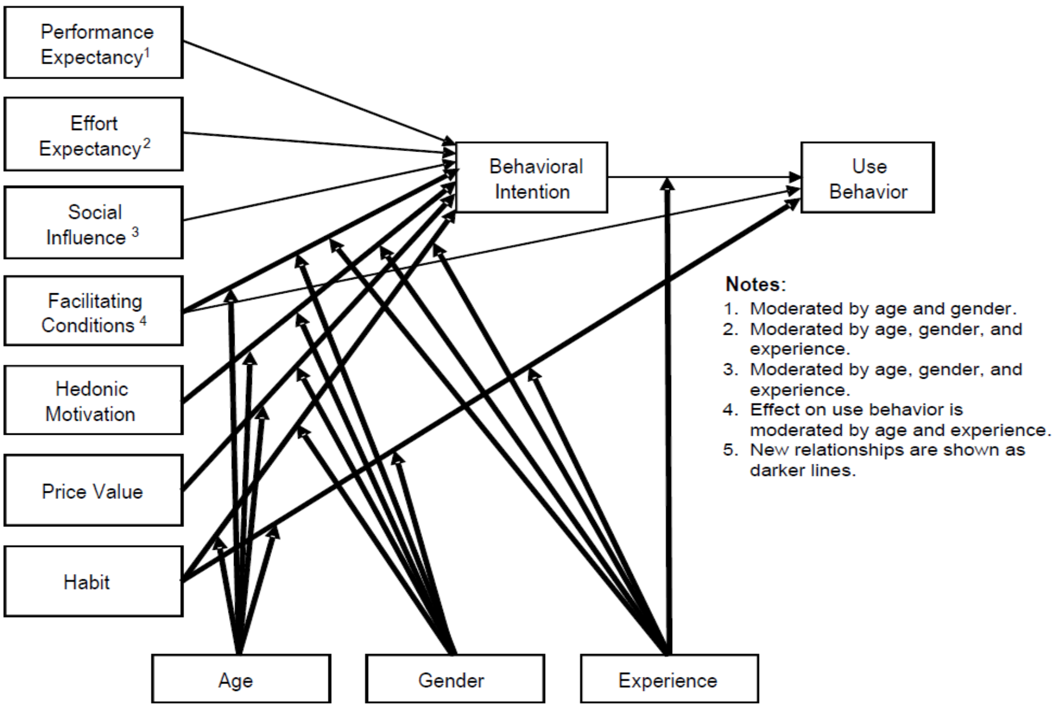

Figure 4.7: UTAUT 2 (Venkatesh, Thong and Xu, 2012)

The *Performance Expectancy* and *Effort Expectancy* elements can be likened to the TAM's *Perceived Usefulness* and *Perceived Ease of Use* elements, respectively (Venkatesh, Thong and Xu, 2012). Social Influence refers to the social pressure consumers receive from friends and family to use a particular technology; while Facilitating Conditions refer to the perceptions consumers have on the resources available to assist them with using a technology (training, information material, for example) (Venkatesh, Thong and Xu, 2012). Although the other constructs in **figure 4.7** influence the users' intention to adopt a technology, Facilitating

Conditions, and Habit are the only factors that influence actual use of a technology (Venkatesh, Thong and Xu, 2012).

The three (3) additions to UTAUT 2 are Hedonic Motivation, Price Value, and Habit. Price value has been included in this model as this model is applicable to the consumer technology use context, and implies that there is some cost bore by the consumer when adopting a technology (inverse relationship) – such as purchasing devices or services (Venkatesh, Thong and Xu, 2012). The cost of using the technology plays a significant role in the adoption of the technology. Short messaging services (SMS) gained popularity due to the low rates of sending text messages, relative to other messaging platforms (Venkatesh, Thong and Xu, 2012).

Hedonic motivation is "the perceived enjoyment" of using a technology, and has a direct relationship with a consumer's intention to adopt a technology (Venkatesh, Thong and Xu, 2012, p.161). Habit is often considered as similar, yet different to experience; and it is referred to as having prior knowledge on the technology, or the extent to which the technology is regarded as automatic (Venkatesh, Thong and Xu, 2012). Venkatesh, Thong and Xu (2012) assert that prior experience of the technology influence the future use of the technology. Lastly, Age, Gender and Experience are only used as support factors (Venkatesh, Thong and Xu, 2012).

4.3.5. Diffusion of Innovation (DOI)

The Diffusion of Innovation (DOI) theory was developed by Rogers, who defines innovation as "an idea, practice or object that is perceived as new by an individual or other unit of adoption" (cited in Aizstrauta *et al*., 2015, p.73). This theory has been applied by many researchers to explore the factors that affect the adoption of an innovation (technology) (Aizstrauta *et al*., 2015). The DOI theory explores the innovation-decision process by Rogers, which states that, initially, a user progresses from having knowledge of the innovation; to developing a perception about the innovation; then deciding whether or not to adopt the innovation; to actually using or rejecting; and lastly, confirming the decision (Aizstrauta *et al*., 2015).

The theory is based on five main constructs which are relative advantage; compatibility; complexity; trialability (users can experiment with the innovation on a trial basis at no loss to them); and *observability* (the benefits of the innovation can be seen and communicated with others) (Aizstrauta *et al*., 2015). Relative advantage implies that using a new technology will give one an advantage over using the previous system, enabling the user to perform tasks quicker, easier and at a higher quality (Moore and Benbasat, 1991). Complexity is the extent to which the technology is difficult to understand and use, and users perceive it to be more tedious to use the technology to complete a task (Venkatesh, Thong and Xu, 2012). Compatibility determines whether the technology will supplement existing systems seamlessly (Moore and Benbasat, 1991).

The fundamental difference between this theory and the aforementioned adoption theories is that this theory analyses the dissemination of a technology through society – by means of communication between users and the rest of society (Chiyangwa and Alexander, 2016). According to Rogers (1983, cited in Chiyangwa and Alexander, 2016), there are different types of adopters in society. These types of adopters range from the pioneers (few who are quick to adopt an innovation in its early phase); the majority who adopt the innovation at a later stage; and the laggards who subscribe to the traditional mode of operating and tend to be the last to adopt an innovation. **Figure 4.8** below illustrates Roger's classification of innovation adoption model.

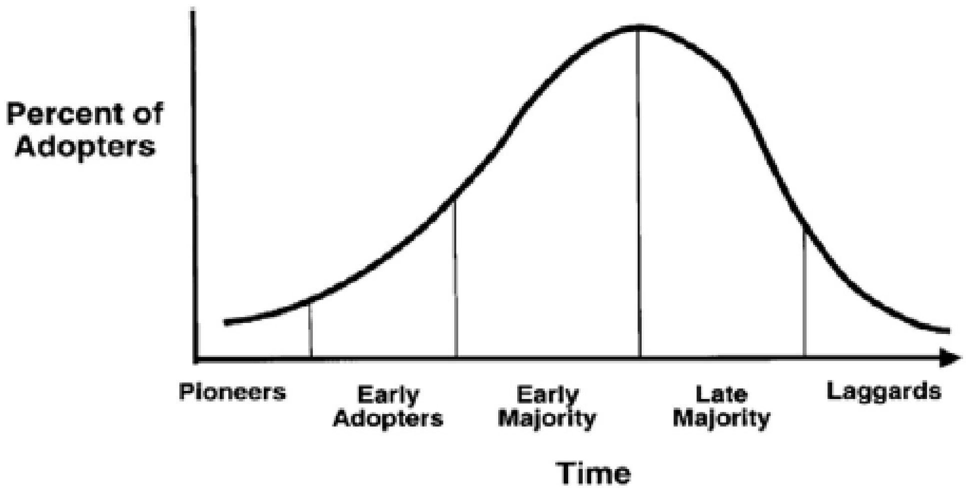

Figure 4.8: Types of innovation adopters (Rogers, 1983, cited in Chiyangwa and Alexander, 2016)

As this section sought to discover the fundamental adoption theories which provide the basis for understanding technology adoption factors; one needs to bear in mind that these adoption theories only represent the post-implementation (after the system is developed) or external adoption factors. This implies that there are other adoption factors, pre-implementation (during development) or internal factors, that influence the adoption of a technology. These factors will be reviewed later in the following chapter.

4.4. Psyche of a User

In order to obtain an understanding of user adoption, and the possible ways to improve e-Government user adoption; e-Government project teams need to know who their target users are, and what motivate these users to adopt e-Government systems. Being the focus user-group of this research, this section – together with the rest of the chapter – will identify the factors that motivate citizens to adopt e-Government systems. This can provide a guide that will assist in having a general understanding of the external factors which motivate South African citizens to make use of e-Government services.

A study by Pai and Arnott (2013) on the motives of users for adopting social networking sites, like Facebook, sought to gain a clear understanding of the drivers of user adoption. In their study, Pai and Arnott (2013) implemented the means-end approach, as well as the laddering interviews approach. The means-end perspective enabled them to predict that users adopt a specific social networking site over another because it is a means (medium of communication) to an end ("satisfying a psychological need") (Pai and Arnott, 2013, p.1040).

The study indicated that users do not base their decision to adopt a new technology solely on the attributes of that technology (Pai and Arnott, 2013). Instead, they also consider the needs fulfilment they will attain from using that technology, and the social factors, which are explained by the Uses and Gratification (U&G) theory (Pia and Arnott, 2013). The U&G theory is based on understanding "why and how people seek to use media to fulfil their needs and motives" (Joo and Sang, 2013, p.2513). This approach predicts that there is a specific psychological need that users try to satisfy in their use of media (Joo and Sang, 2013). Therefore, Pia and Arnott (2013) conclude that user adoption of an innovation, like a social networking site, is motivated by four (4) psychological values: (i) reciprocity (giving back); (ii) self-esteem (enhancing one's status); (iii) belonging (affiliation or friendship); and (iv) hedonism (the ability to create one's own page and share this for others to see).

Understanding the values users seek to satisfy from adopting a new technology can assist e-Government project teams to develop e-Government systems that meet the needs of the users, and encourage user adoption (Pai and Arnott, 2013). This can be achieved through engaging with users.

Joo and Sang (2013) also suggest that to increase user adoption, the developers of the technology need to understand the users' intrinsic values and extrinsic perceptions of the technology.

4.5. User Adoption Frameworks and Models

Research on the acceptance and use of technology is one of the most mature areas of research in the Information Technology (or Information Systems) domain (Venkatesh, Thong and Xu, 2012). As indicated in **section 4.3** of this chapter, adoption theory stems back to the late 1900s with Fishbein and Ajzen's Theory of Reasoned Action in 1975. However, as mentioned earlier, these theories were not initially technology adoption theories, as they were part of the social psychology domain (Adams *et al*., 2017). The following section will explore some technology adoption models that have been developed more recently. These models have been adapted, from the fundamental adoption theories presented in the first section of the chapter. Analysing and understanding technology user adoption models will assist to place this research into the context of e-Government (technology) user adoption.

4.5.1. Anxiety-based model of intention to use an SST in public

In their study of the use of Self-Service Technology (SST) in public, Gelbrich and Sattler (2014) developed a technology adoption model – which is an adaptation of the TAM 3 *computer anxiety* variable. It goes without saying that there is a myriad of factors that affect the adoption of a technology, as illustrated in the models above; but Gelbrich and Sattler's (2014) model focuses on technology anxiety as a determinant of user adoption, or intention to use a new technology (Gelbrich and Sattler, 2014).

Public SSTs are on-site technologies used to self-administer a service in a public setting (Gelbrich and Sattler, 2014). Examples of SST's are "ATMs, interactive kiosks, and self-checkouts" (Gelbrich and Sattler, 2014, p.83). A private SST on the other hand, is a technology used off-site, in personal environments such as the home or office (Gelbrich and Sattler, 2014). Examples of private SSTs are "telephone / internet banking applications, and internet applications like online shopping", to list a few. (Gelbrich and Sattler, 2014, p.83). Based on this definition, it can be deduced that the South African Revenue Services (SARS) tax e-filling services; South African Home Affairs Identity Documentation online applications; and the e-Toll system are examples of private SST e-Government services in South Africa, as they can be self-administered in the user's private setting.

Gelbrich and Sattler (2014) assert that the resistance to use public SSTs is due to the user's technology anxiety – which is influenced by two constructs: perceived crowding, and perceived time pressure (Gelbrich and Sattler, 2014). Explained further, perceived crowding arises when an individual is in a crowded public site (retail store or government department, for example) and tries to avoid, escape, or distance themselves from the crowd (Gelbrich and Sattler, 2014). In addition, users experience perceived time pressure when they believe they have a restricted amount of time to use the public SST (Gelbrich and Sattler, 2014). Both of these variables negatively influence the user's technology anxiety, which thus negatively influences a user's intention to use a new technology (Gelbrich and Sattler, 2014).

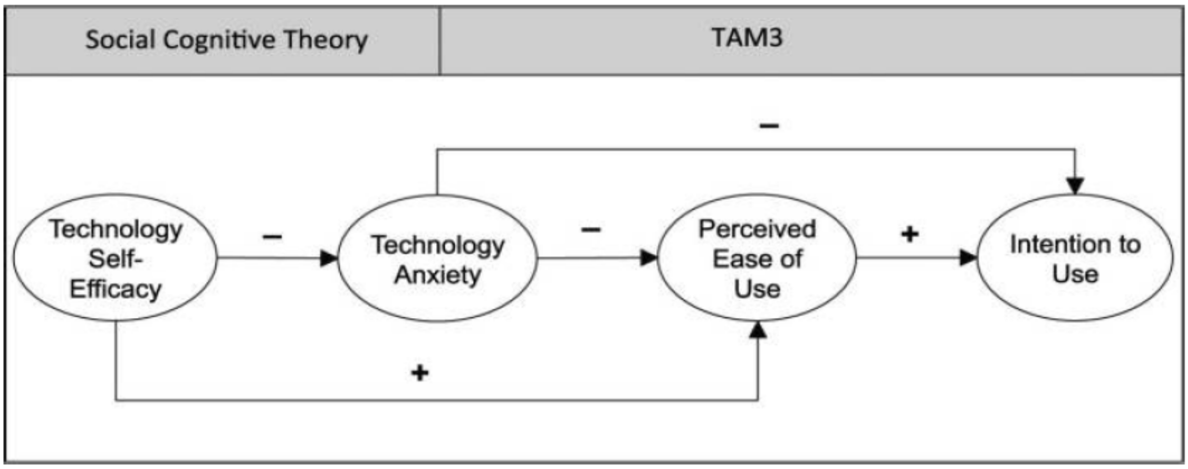

Figure 4.9: Anxiety-based model of intention to use an SST in public (Gelbrich and Sattler, 2014)

Figure 4.9 above illustrates the relationship between technology anxiety and intention to use, which states that increased technology anxiety decreases the user's intention to use a new technology (Gelbrich and Sattler, 2014). This model presents technology self-efficacy as an antecedent to TAM 3's technology anxiety construct (Gelbrich and Sattler, 2014). This means that if technology self-efficacy ("degree to which a person believes that she / he is able to use a technology to accomplish a particular task") increases, then a user's technology anxiety decreases, thus resulting in an increased intention to use (Gelbrich and Sattler, 2014, p.84).

Technology anxiety is a very prevalent issue in developing countries due to the digital divide, presented in the previous chapter, which discourages citizens from making use of e-Government services, especially public SSTs (Western Cape Government, 2012). Gelbrich and Sattler (2014, p.88) explain this logic by stating that "the more apprehensive consumers feel when faced with the possibility of using a new technology for the first time, the less they intend to use the technology in a public setting". The limitation of this model is that it only focuses on one variable (technology anxiety) as the antecedent to ease of use and disregards the other variables included in the TAM 3. This study is also limited in that it does not provide remedial measures to address challenges of technology anxiety, such as user engagement or lack of training, for instance.

4.5.2. Integrated Acceptance and Sustainability Assessment Model (IASAM)

According to Aizstrauta *et al*. (2015), technology adoption theories, such as the TAM and UTAUT, are flawed in that they provide predictions and modelling of what the likely behaviour of a user might be when making the decision to adopt or reject a new technology. These technology adoption models are primarily used during the implementation of a new technology. However, Aizstrauta *et al*. (2015, p.70) believe that it is essential to evaluate the likelihood of failure of a new technology, and subsequently ensure that "the possibility of [such] failure has been diminished in the development stage or during testing and maintenance".

Figure 4.10 below illustrates the IASAM, which is a multi-dimensional model that focuses on four determinants of technology acceptance and sustainability: *Management; Quality of Technology; Acceptance;* and *Domain Development* (Aizstrauta *et al.*, 2015). The purpose of this model is to evaluate whether a technology is designed in a manner that addresses the needs of the stakeholders (Aizstrauta *et al.*, 2015). The model can be used for both existing technologies, and those that are still in the development phase (i.e. pre- and post-implementation (Aizstrauta *et al*., 2015).

"Technology developers, investors, government officials and researchers", can use this model, to assess the potential success of the new technology (Aizstrauta *et al*., 2015, p.77). For instance, government officials and the project team can use this model to determine whether users will accept a new e-Government system, and if it will be worth the investment.

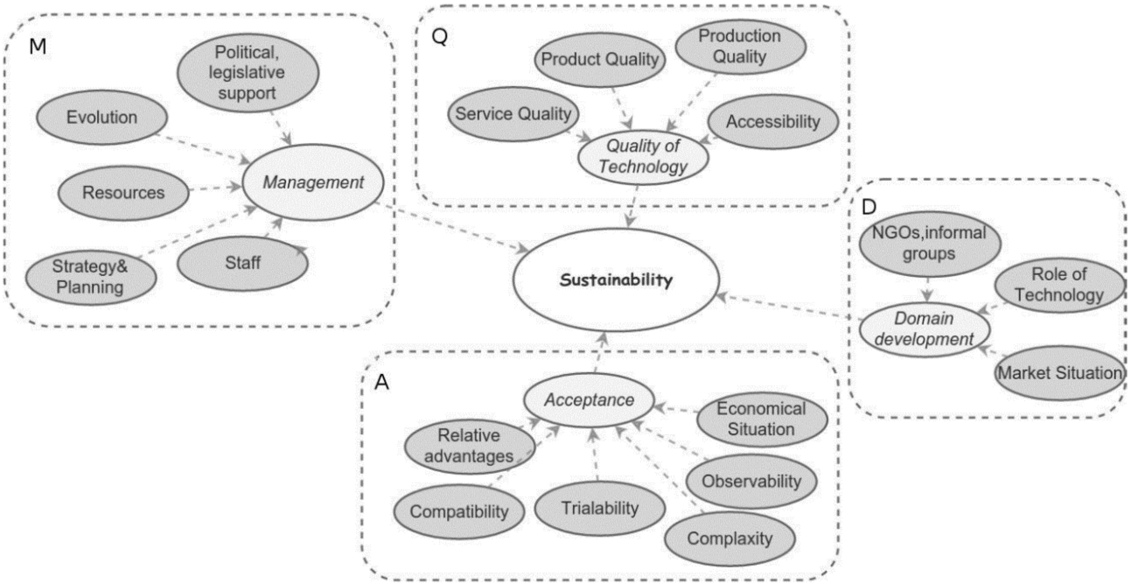

Figure 4.10: Integrated Acceptance and Sustainability Assessment Model (IASAM) (Aizstrauta *et al*., 2015)

4.5.3. Adoption of Mobile Health Applications at the Workplace

Melzner *et al.* (2014) developed a framework for explaining the factors that influence the adoption of mobile health applications in the workplace. This framework, as seen below in **figure 4.11**, is based on the traditional technology adoption theories such as the Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM) (Melzner *et al*., 2014).

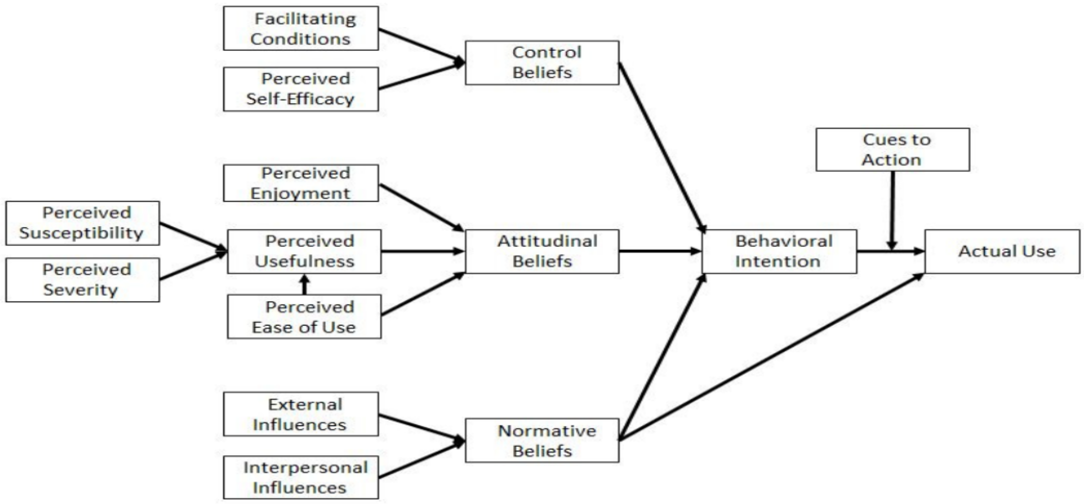

Figure 4.11: Adoption of Mobile Health Applications at the Workplace (Melzner *et al*., 2014)

As this framework is based on the fundamental adoption theories mentioned earlier, in **section 4.3** of this chapter, it holds the same belief that actual use (adoption) of a technology is a result of behavioral intention and perceived behavioral control (Melzner *et al*., 2014).

This framework supplements the traditional adoption models by identifying the antecedents of the control, attitudinal, and normative beliefs variables, as depicted in **figure 4.11** above. Senior management, or project teams, can use this framework to control the user's behavioral intention; and, thus, adoption of a technology (Melzner *et al*., 2014). For example, system developers, like an e-Government project team, can benefit from addressing factors such as "perceived usefulness, perceived ease of use, perceived enjoyment, and cues to action" when developing e-Government systems, in order to deliver a system that is readily accepted (Melzner *et al*., 2014).

The perceived susceptibility and perceived severity factors are specific to the health domain, and will thus not be explored further in this research.

Control beliefs, together with normative and attitudinal beliefs, are regarded as direct determinants of behavioral intention, and, thus, actual use (Melzner *et al*., 2014). Normative and attitudinal beliefs are the same as those presented in the Theory of Reasoned Action. Attitudinal factors refer to the attitude of the user towards adopting the new technology, and normative factors refer to what other people think about adopting the new technology; while control beliefs are those influenced by an individual's belief concerning the required resources and information to perform a particular behaviour (Gelbrich and Sattler, 2014; Melzner *et al*., 2014).

In addition to these factors, Melzner *et al*. (2014) included cues to action in their framework. The cues to action are defined as "external reminders that assist in retrieving a previously made behavioral intention" (Melzner *et al*., 2014, p.1380). In other words, an individual may initially intend on using a technology, but may forget to use it, thus requiring a reminder (a cue). For example, Melzner *et al*. (2014) suggest sending notifications at set intervals to remind users to use the health application to record their calorie intake. A similar concept can be applied in the e-Government context to encourage users to continue using e-Government services such as tax e-filing, for instance.

4.5.4. Innovation Management Application (IMA) Adoption Model

Plewa *et al*. (2012) developed an adoption model to address the high failure rate of Innovation Management Applications (IMAs), which is a result of low adoption. These authors set to explore the determinants of IMA adoption, and how those constructs can be incorporated into the design and development of IMAs in the future – to increase user adoptic (Plewa *et al*., 2012). They discovered that the factors which influence technology adoption vary depending on the technology; and, thus, a one-size fits all adoption model or framework would be inappropriate given the fundamental differences between technologies (Plewa *et al*., 2012). They therefore established an adoption model that is context-specific – integrating the Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) constructs from the widely referenced Technology Acceptance Model (TAM), with the Innovation Diffusion Theory (IDT), as illustrated in **figure 4.12** below (Plewa *et al*.,2012). The IDT presents technology adoption determinants such as *relative advantage; trialability; observability; complexity;* and *compatibility* (Plewa *et al*., 2012). Due to similarities between the TAM and IDT theory, the IDT's relative advantage element has been merged with the TAM's perceived usefulness element, and the complexity element has been merged with the perceived ease of use element (Plewa *et al*., 2012). Trialability and observability have been completely eliminated, as they are not considered as relevant determinants of technology adoption (Plewa *et al*., 2012).

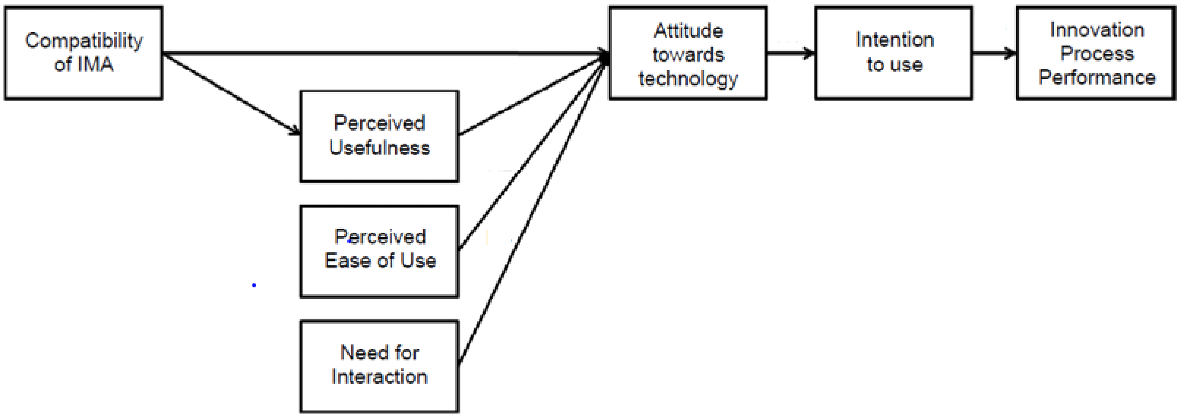

Figure 4.12: IMA Adoption Model (Plewa *et al*., 2012)

According to their study, Plewa *et al*. (2012) highlight Perceived Usefulness and Compatibility as key determinants for technology adoption. Compatibility is defined as “the degree to which the innovation is seen as consistent with potential users’ previous experiences and needs”: and it considers the extent to which a new technology will seamlessly fit into the individual’s “current way of working” (Plewa *et al*., 2012, p.751). Plewa *et al.* (2012), thus, assert that if a technology enables a user to fulfil their task (Perceived Usefulness), and compliments the user’s current way of working (Compatibility), then the user’s intention to use the technology increases. Arguably, the compatibility construct relies on engaging with users to obtain an understanding of the user’s background, environment and perceptions. This notion of user engagement, as the proposition of this research, will also be examined further (in the context of the Agile systems development approach), in the **Chapter 5**.

The IMA model can assist managers and ICT professionals to consider ways in which to enhance the user’s opinions of Perceived Usefulness and Compatibility, during the design and implementation phases of the technology (Plewa *et al*., 2012). An example of this would be how providing training to the potential users on the technology can be a technique used to educate the target user on the usefulness and compatibility of the technology (Plewa *et al*., 2012).

4.6. E-Government User Adoption Models

"The theory of reasoned action is concerned with attitudes toward behaviours and not with the more traditional attitudes toward objects, people, or institutions" (Ajzen, 1985). While the TRA focuses on the attitudes toward behaviour, it is important to note the difference with e-Government user adoption studies – which focus extensively on the traditional attitudes toward objects, people or institutions. This is evident in the e-Government literature that highlights factors such as lack of citizen trust in government, and social issues (access to e-Government services, and computer literacy), as some factors that inhibit e-Government adoption. A frequently cited study on e-Government adoption by Carter and Belanger (2005) emphasizes the significance of identifying and examining the factors that influence citizens' adoption of e-Government services.

Rorissa and Demissie (2010) state that African countries are among the last to adopt technologies that enable the implementation of e-Government services. This low adoption of enabling technologies can be attributed to factors such as "infrastructure, literacy, economic development, and culture" (Rorissa and Demissie, 2010, p.2). The collective term for such an instance is "information poverty" – which refers to a country that experiences challenges related to information illiteracy, stringent government censorship policies, and standards of infrastructures that lag behind those of developed nations (Rorissa and Demissie, 2010).

Not only are African and other developing countries among the last to adopt technologies that enable the provision of e-Government, but these countries have the highest failure rate of e-Government projects once these systems are implemented. To reiterate what was mentioned earlier, more than half of the e-Government projects in developing countries fail completely, or partially (Anthopoulos, Reddick, Giannakidou and Mavridis, 2016) due to various factors. A number of authors have delved into research regarding the challenges that hinder the success of e-Government projects in developing countries.

Thus, this section will analyse some of this research in the form of e-Government adoption models. These models were developed to assist researchers and government agencies to design and implement e-Government systems which are readily adopted by the citizens. This section will continue to pave the way for the introduction of user engagement or involvement, which will be explored in the Agile systems development approach, in **Chapter 5**.

4.6.1. Jordan e-Government Adoption Model

In their study on e-Government adoption in Jordan, Alomari *et al*. (2012) sought to identify the key factors that encourage citizen adoption of e-Government websites in Jordan. Similar to the user adoption frameworks and models mentioned in the preceding sections; Alomari *et al*. (2012) developed their theoretical framework based on the underlying adoption theories of Diffusion of Innovation (DOI) and the Technology Acceptance Model (TAM).

While other studies tend to draw attention to the similarities between the DOI constructs (relative advantage and complexity) and the TAM constructs (Perceived Usefulness and Perceived Ease of Use) (Plewa *et al*., 2012); Alomari *et al*. (2014) contradict this and assert that each of these constructs are independently significant in the e-Government adoption context.

The approach used by Alomari *et al*. (2012) to determine e-Government adoption factors in Jordan is entailed with citizen-centricity, and interacting with the end-user in the development and deployment of e-Government services. They assert that low citizen participation during the implementation of e-Government systems has an inverse effect on the success of the e-Government project (Alomari *et al*., 2012). For that reason, they theorize that the success of an e-Government initiative in Jordan is dependent upon the participation of various stakeholders, like citizens, to "adopt it as a normal form of interface" for obtaining public services, and to take ownership of the e-Government system (Alomari *et al*., 2012, p.208).

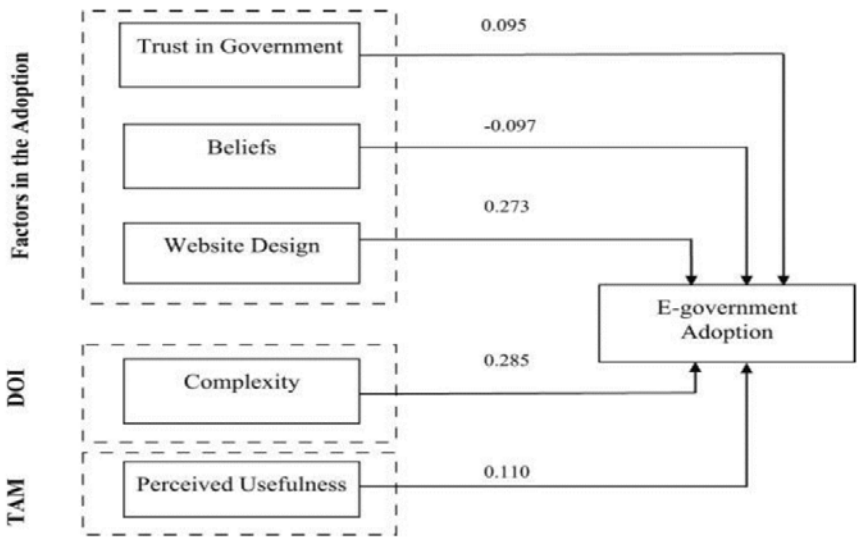

Figure 4.13: Jordan e-Government Adoption Model (Alomari *et al*., 2012)

Figure 4.13 above indicates that there is a positive relationship between the constructs in the model and e-Government adoption (Alomari *et al*., 2012). The findings that emerged from this study indicate that trust in the government; beliefs (fear of job loss, for example); and website design, are determinants of e-Government adoption in Jordan, a developing country (Alomari *et al*., 2012). Thus, to increase citizens' intention to adopt e-Government services, e-Government users need to be educated on how e-Government services can improve their work and not replace workers; and the e-Government websites need to be attractive and well-organised (Alomari *et al*., 2012). The government ought to provide citizens with up-to-date and adequate information as a way to ensure citizens' trust in online government services (Alomari *et al*., 2012).

4.6.2. E-Government Adoption and Utilisation Model (EGAUM)

Alghamdi and Beloff (2014) developed the e-Government Adoption and Utilisation Model (EGAUM), to highlight the key factors that influence e-Government acceptance and utilisation, in their view. The authors state that the purpose of the model is "to determine factors that could influence the users' beliefs and intentions, as well as the behaviour that influences their adoption and usage levels (Alghamdi and Beloff, 2014, p.1219). The model expands on the common adoption models, by adding a new variable: *E-Readiness of e-Government (ER)* (Alghamdi and Beloff, 2014). **Figure 4.14** below illustrates the relationship between the variables, where arrows represent a positive relationship (Alghamdi and Beloff, 2014).

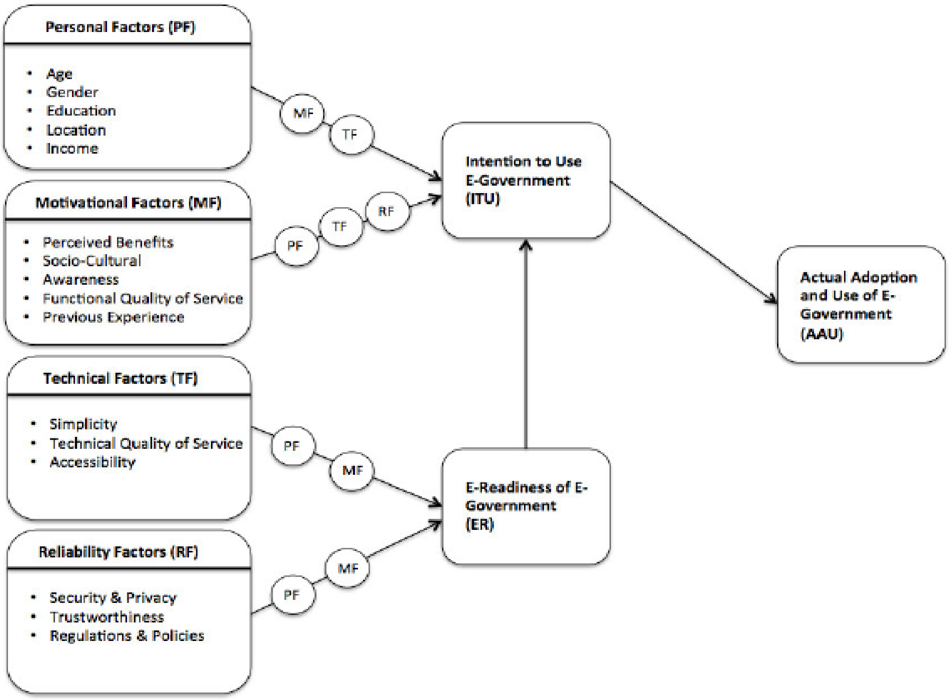

Figure 4.14: E-Government Adoption and Utilisation Model (EGAUM) (Alghamdi and Beloff, 2014)

The *Personal Factors (PF)* category has not been covered by any of the previous studies consulted in this thesis. This category states that demographic factors such as Age, Gender, Education, Location, and Income can influence the ability for users to adopt an e-Government system (Alghamdi and Beloff, 2014). Age is essential for the study of e-Government adoption, as studies have indicated that there is a correlation between age and the adoption of Information Technologies (IT) (Alghamdi and Beloff, 2014). Education is important as it determines whether the potential users possess the knowledge and literacy to make use of the e-Government services. For instance, citizens who are computer literate are more likely to adopt e-Government services, over their lesser computer-skills educated counterparts (Alghamdi and Beloff, 2014). Location is an important factor to be considered by e-Government developer,s as the ability to adopt and use these services is dependent on the location of these services, particularly for on-site services. Therefore, individuals in rural areas are less inclined to adopt on-site e-Government services due to their proximity (Alghamdi and Beloff, 2014). The income factor indicates that an individual's income can hinder them from possessing the necessary resources (computers; cell phones; internet, for instance) to adopt and use e-Government services (Alghamdi and Beloff, 2014). The gender factor will not be considered for this research, as it is specific to the Saudi Arabia religious context. To ensure that citizens adopt and use e-Government services, all of these EGAUM factors need to be addressed by the project team during the development of these systems.

4.6.3. Online Tax E-Filing Adoption Model

Vietnam, like many other developing countries, faces the challenge of low citizen adoption of e-Government services (Lu and Nguyen, 2016). According to Lu and Nguyen (2016, p.1499), the acceptance of an e-Government system is not solely based on the technology itself, as alluded to by Alomari *et al*. (2012) in **section 4.6.1** above; but based largely upon the "citizens' willingness to adopt" the e-Government system.

To investigate the adoption factors of online tax e-filing in Vietnam, Lu and Nguyen (2016) proposed an adoption model which is a blend of the Unified Theory of Acceptance and Use of Technology (UTAUT) as well as the Information Systems Success Model. This model is illustrated below in **figure 4.15**.

Similar to (Plewa *et al*., 2012; Melzner *et al*., 2014; Aizstrauta *et al*., 2015), Lu and Nguyen (2016) suggest that their adoption model can be of benefit to e-Government projects, in that it can be utilised by academics and e-Government stakeholders to evaluate and improve the adoption rate of e-filing system in Vietnam.

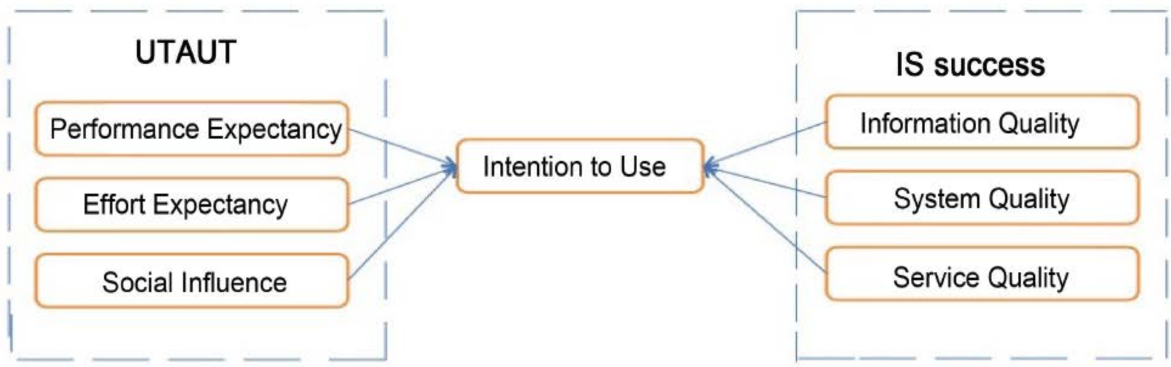

Figure 4.15: Online Tax e-Filing Adoption Model (Lu and Nguyen, 2016)

Figure 4.15 illustrates the constructs which have been extracted from the UTAUT and IS Success models to develop this tax e-filing adoption model for Vietnam. The six (6) constructs that are significant determinants of intention to use the e-filing system are *Performance Expectancy, Effort Expectancy, Social Influence, Information Quality, System Quality* and *Service Quality* (Lu and Nguyen, 2016). The UTAUT constructs have been explained in depth in **section 4.3.4** of this chapter, and Lu and Nguyen (2016) indicates that there is a direct relationship between these constructs and the intention to use tax e-filing services.

The IS Success constructs (*Information Quality; System Quality; Service Quality*) have a direct relationship with the intention to use an e-Government system. The quality of the information on the e-Government service, and the quality of the e-Government system, can be associated with the citizens' willingness to use the e-filing website (Lu and Nguyen, 2016). These IS success constructs are essential in the e-filing context, as they determine the extent to which users are comfortable with the service to conduct payments online, as is the nature of online tax filing services (Lu and Nguyen, 2016).

4.6.4. User Participation in e-Government development

Holgersson (2014) takes a different approach for understanding e-Government adoption to that of the authors in the preceding sections. He considers user participation as a key determinant of e-Government user adoption (Holgersson, 2014). According to Holgersson (2014), government agencies tend to approach the development of e-Government services from an "inside-out" approach, whereby the needs and motives of the potential users are neglected. He further asserts that e-Government systems that are developed in the absence of the target users are "likely to be rejected" (Holgersson, 2014, p.1). e-Government users range from public administrators, citizens, business organizations, and other government stakeholders who have their own needs, interests and preferences. Therefore each of these user groups need to participate in the development process.

Holgersson (2014) conducted a study where he explored how user participation techniques can be implemented during the development phases in order to improve the user adoption of e-Government services. He identifies various user participation techniques which can be applied to the different types of stakeholders. These techniques are categorised into three (3) schools of thought: User Centred Design (UCD); Participatory Design (PD); and User Innovation (UI) (Holgersson, 2014). These design schools are outlined in **table 4.1** below.

Table 4.1: User participation schools of thought

Participatory dimension/Design school	UCD	PD	UI
Type of participation	Advisory or representative	Advisory or representative	Representative or individual
Degree of participation	Advisory, in some cases sign- off responsibility	Mostly sign- off responsibility, in some cases advisory	Sign- off responsibility, in some cases full responsibility
Content of participation	Mainly technical	Technical and social	Technical and social
Extent of participation	Requirements elicitation, testing, evaluation	Requirements elicitation, design, testing, evaluation	Project definition, requirements elicitation, design and building, testing
Formality of participation	Semi-formal	Semi-formal	Informal, semi-formal
Influence of participation	Low to medium	Medium to high	High

Earlier researchers indicated that user participation techniques are not relevant when developing e-Government systems – further stating that stakeholder involvement has little to no impact on the success of a project (Holgersson, 2014). However, more and more e-Government projects recently collaborated with target users to ensure buy-in and e-Government acceptance (Alomari *et al*., 2012; European eGovernment Action Plan, 2011-2015, p.3 cited in Holgersson, 2014).

The Agile Systems Development approach, to be introduced in **Chapter 5**, is very similar to these user participation techniques, in that it advocates for customer collaboration throughout the development phase of a technology.

4.7. Internal and external adoption factors

The adoption factors identified by the technology adoption models and theories in the preceding sections of this chapter represent the external adoption factors. These external adoption factors are the user's "perceptions of [the newly implemented] technology that influence [their] adoption decisions" (Straub, 2009, p.626). Therefore, external in this context, refers to adoption factors that are outside of the organization (that arise once the technology is implemented); while internal adoption factors are those influenced by the operations of the organization, such as the development approach used. Unlike most research on user adoption, which focuses on the external factors, this study will focus on the internal factors that influence user adoption.

For decades, the study of technology adoption has focused on the post-implementation (external) adoption factors: in other words, those adoption factors that come after a technology has been built. The angle which this research has taken is to explore factors that can improve user adoption while the technology is being developed, and not afterwards. The reason for this is because the Agile Systems Development approach, which will be expanded in the following chapter, states that customer collaboration – and continuous delivery of working software, among other things – result in customer satisfaction (Barlow *et al.*, 2011). This implies that there are pre-implementation (internal) factors that can be explored in order to ensure the adoption of an e-Government system.

Table 4.2 below is a summary of the external adoption factors, as identified from the literature reviewed in the previous sections (**sections 4.3 – 4.6**). This table demonstrates the technology adoption factors that were most cited by the various adoption models in this chapter.

The adoption factors that appeared most in the above literature are the top six (6) listed in the **table 4.2** below. These six (6) factors will be incorporated in the research interview schedule (see **Appendix G**), to determine whether the e-Government participants believe that these factors are relevant in their context.

Table 4.2: Adoption Factors as Identified in Literature

	Adoption Factors	Definition	References
Usability	Perceived Ease of Use (PEOU) / Complexity	"The degree to which a person believes that using a particular system [or technology] would be free from effort."	Venkatesh and Bala (2008); Alomari *et al*. (2012); Plewa *et al.* (2012); Venkatesh, Thong and Xu (2012); Joo and Sang (2013); Alghamdi and Beloff (2014); Gelbrich and Sattler (2014); Melzner *et al*. (2014); Aizstrauta *et al*. (2015); Lu and Nguyen (2016)
	Perceived Usefulness (PU) / Output Quality	"The degree to which a person believes that using a particular system [or technology] would enhance his or her job performance."	Venkatesh and Bala (2008); Alomari *et al*. (2012); Plewa *et al*. (2012); Joo and Sang (2013); Melzner *et al*. (2014)
	Experience	"An opportunity to use a target technology (training and post-training)."	Venkatesh and Bala (2008); Venkatesh, Thong and Xu (2012); Alghamdi and Beloff (2014)
	Relative Advantage / Perceived Benefits	"The benefits of using technology are immediate and that is an advantage of using this technology."	Alghamdi and Beloff (2014); Aizstrauta *et al*. (2015)
	Trialability / Need for Interaction	"There are mechanisms (free downloads, trial versions, prototypes), that enable the users to easily try the technology".	Alghamdi and Beloff (2014); Aizstrauta *et al*. (2015)
	Accessibility	"The users' ability to access the e-Government system".	Alghamdi and Beloff (2014)

	Computer Playfulness	"The degree of cognitive spontaneity in microcomputer interactions."	Venkatesh and Bala (2008)
	Awareness	"Making users aware of and familiar with e-Government, particularly users in remote areas."	Alghamdi and Beloff (2014); Lallmahomed *et al*. (2017)
	Objective Usability	"A comparison of systems based on the actual level (rather than perceptions) of effort required to complete specific tasks."	Venkatesh and Bala (2008)
	Perceptions of External Control	"The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system."	Venkatesh and Bala (2008); Melzner *et al*. (2014)
	Facilitating Conditions	"Consumers' perceptions of the resources and support available to perform a behaviour."	Venkatesh, Thong and Xu (2012); Melzner *et al*. (2014); Kurfali *et al.* (2017); Lallmahomed *et al*. (2017)
	Hedonic Motivation	"The fun or pleasure derived from using a technology."	Venkatesh and Bala (2008); Venkatesh, Thong and Xu (2012); Melzner *et al*. (2014)
	Observability	"The results and benefits of technology is easily visible by potential users."	Aizstrauta *et al*. (2015)
Behaviour / Attitude	Attitude toward a behaviour	"Attitude towards use."	Fishbein and Ajzen (1975, cited in Gelbrich and Sattler, 2014); Ajzen (1991); Plewa *et al*. (2012); Melzner *et al*. (2014)
	Habit	"The extent to which an individual believes the behaviour to be automatic."	Venkatesh, Thong and Xu (2012); Alghamdi and Beloff (2014)
	Control Beliefs	"An individual's belief regarding the accessibility of resources	Melzner *et al*. (2014)

		and opportunities required to perform a behaviour."	
	Computer Self-efficacy	"The degree to which an individual believes that he or she has the ability to perform specific tasks / jobs using computers."	Venkatesh and Bala (2008); Lallmahomed *et al*. (2017)
	Job Relevance	"Individual's perception regarding the degree to which the target system is relevant to his or her job."	Venkatesh and Bala (2008)
Social	Subjective norm / Social Influence / Normative Belief	"The degree to which an individual perceives that most people who are important to him think he should or should not use the system."	Fishbein and Ajzen (1975, cited in Gelbrich and Sattler, 2014); Ajzen (1991); Venkatesh and Bala (2008); Alomari *et al*. (2012); Venkatesh, Thong and Xu (2012); Melzner *et al*. (2014); Lu and Nguyen (2016); Kurfali *et al*. (2017); Lallmahomed *et al*. (2017)
	Image	"The degree to which use of an innovation is perceived to enhance one's status in one's social system."	Venkatesh and Bala (2008)
	Trust in Government / Trustworthiness	"The perceived risk and uncertainty involved in using online services."	Alomari *et al*. (2012); Alghamdi and Beloff (2014); Kurfali *et al*. (2017); Lallmahomed *et al*. (2017)
	Regulations and Policies	"Usage terms and conditions, e-Service delivery policies, payment policies, users' and providers' rights, data protection policies, and security and privacy policies."	Alghamdi and Beloff (2014)
	Voluntariness	"The extent to which potential adopters perceive the adoption decision to be non-mandatory."	Venkatesh and Bala (2008)

Demographics / User's Background	Age	The number of years a person has lived.	Venkatesh, Thong and Xu (2012); Alghamdi and Beloff (2014)
	Gender	Identifying with a gender group.	Venkatesh, Thong and Xu (2012)
	Education	"Correlation between computer and information literacy and the education level of a user."	Alghamdi and Beloff (2014)
	Price Value	"Costs associated with the purchase of devices and services."	Venkatesh, Thong and Xu (2012); Lallmahomed *et al.* (2017)
	Computer Anxiety	"The degree of an individual's apprehension, or even fear, when she / he is faced with the possibility of using computers."	Venkatesh and Bala (2008); Gelbrich and Sattler (2014)
Technology	Quality of technology	"Quality of information and services provided by government."	Alomari *et al*. (2012); Alghamdi and Beloff (2014); Lu and Nguyen (2016); Kurfali *et al*. (2017); Lallmahomed *et al*. (2017)
	Security and Privacy	"Users need to feel safe when interacting with such systems."	Alghamdi and Beloff (2014)
	Compatibility	"The use of technology is positioned as compatible with previously introduced ideas."	Aizstrauta *et al*. (2015)

Therefore, in answering research question 1, which reads: *what are the key factors that influence e-Government user adoption?* it can be deduced that, the key factors (according to the literature reviewed) are:

a. A user's attitude

b. Social pressure (or influence)

c. The ease of use of the technology

d. The usefulness of the technology

e. The user's experience of using the technology

f. The quality of the technology

4.8. Conclusion

This chapter sought to understand the motives of users when adopting a new technology. It first explored user adoption (how it is measured): the underlying adoption theories which form the basis of all technology user adoption studies; then proceeded on to examine technology adoption models, and e-Government adoption models. In answering research question 1, according to the literature reviewed, the key user adoption factors, in different variations, are ease of use, usefulness, normative or social influence, relative advantage, trust in government and access. Holgersson (2014) took a different approach to the other studies examined and concluded that instead of identifying user adoption constructs as a way to improve user adoption of e-Government services, user participation techniques should be applied to involve stakeholders in the design and implementation of e-Government services. This approach is in line with the goal of this thesis, which seeks to view adoption from an internal (pre-implementation) perspective, rather than analysing external (post-implementation) adoption factors as done in adoption theory.

This approach will, furthermore, enable the researcher to explore how an Agile Systems Development approach to developing e-Government systems can improve e-Government adoption. Therefore, the following chapter will delve into Agile Systems Development in e-Government as a contributory factor for improving user adoption through constant user engagement throughout the development of e-Government systems.

CHAPTER 5: AGILE FOR E-GOVERNMENT USER ADOPTION

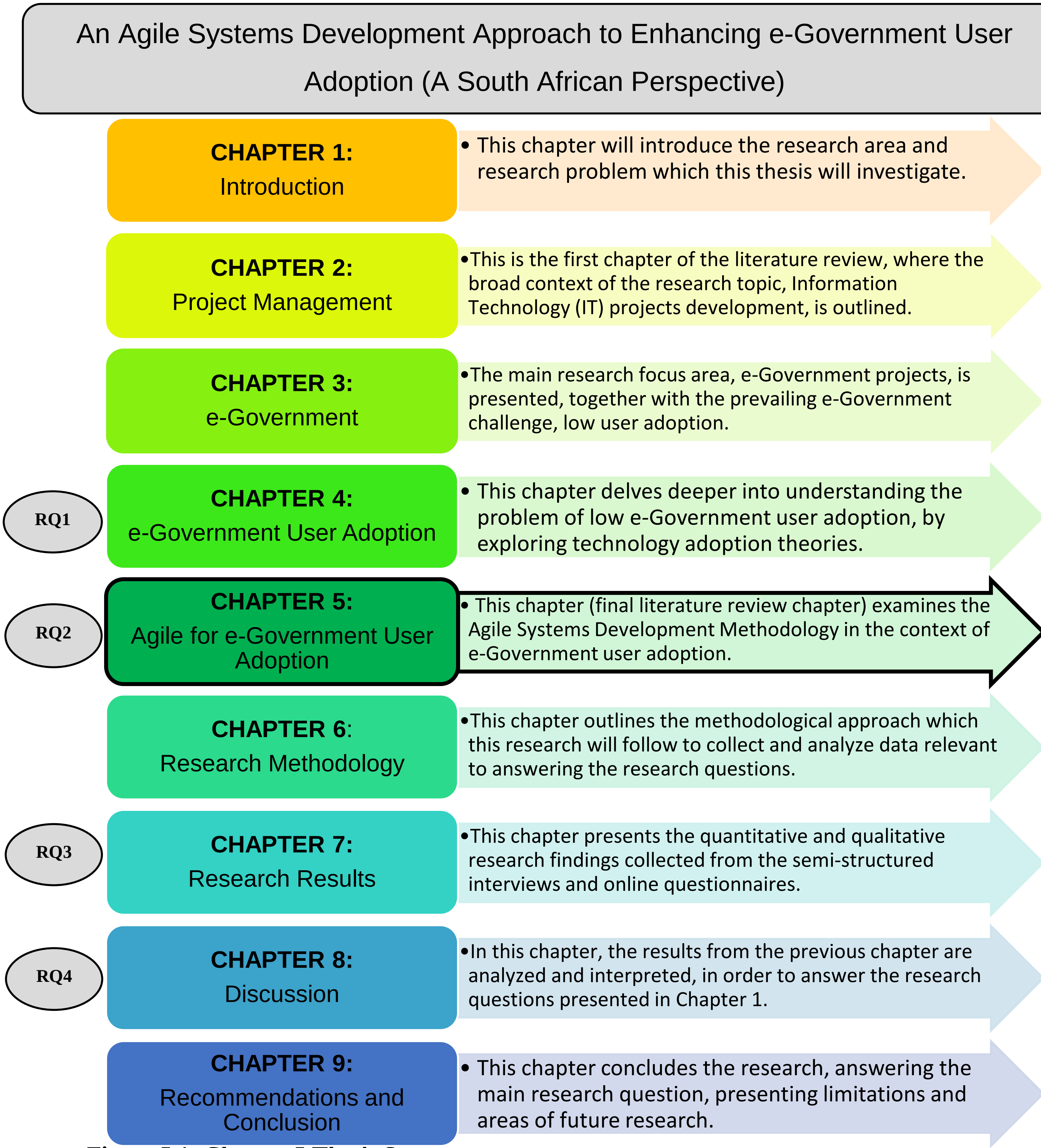

Figure 5.1: Chapter 5 Thesis Structure

Figure 5.2: Chapter 5 Outline

***Abstract**: As the final literature review chapter, Chapter 5 seeks to consolidate all the literature, to present a coherent case, and current situation of the research phenomenon. This is concluded with the analysis of an Agile Systems Development Methodology in the context of e-Government user adoption.*

5.1. Introduction

To recap the literature review thus far, we can see that the first chapter, **Chapter 2** on Project Management demonstrated the difference between generic Project Management and Project Management in the Information Technology field. This then paved the way for the following chapter, **Chapter 3** on public sector IT projects, also known as e-Government projects. These chapters outlined the context of this research, e-Government projects (hereinafter e-Government systems). Succeeding this was the previous chapter, **Chapter 4**, which honed into the e-Government context by focusing on the problem area that this thesis aims to address: low e-Government user adoption (one of the key barriers to the success of e-Government systems).

The literature examined indicates that this is as a result of the incorrect use of project management (systems development) tools, as well as inadequate user engagement during the development of these systems.

This chapter will merge the preceding chapters, **Chapters 2** to **4**, and expand on how the phenomenon of low e-Government user adoption can be tackled by changing the systems development methodology used. Therefore this chapter will explore ways to improve e-Government user adoption from a systems development perspective, using an Agile Systems Development (hereinafter Agile SD) approach in particular. Rahmanian (2014, p.1096) defines Agile as "a highly iterative and incremental process, where developers and project stakeholders actively work together to understand the domain, identify what needs to be built, and prioritise functionality".

To adequately examine how e-Government user adoption can be improved using the Agile systems development methodology, this thesis will first broadly discuss the various systems development methodologies; thereafter hone in on the Agile SD methodology in the e-Government context. The Agile methodology will be appraised to determine whether (its incorporation into) / a change in a systems development approach can improve e-Government user adoption, and ultimately e-Government success. Then, finally, the author will extract some Agile practices to develop the Agile-informed User Engagement Guidelines which will form the solution to this research topic.

5.2. System Development Methodologies

In a similar way that generic projects follow the guidelines stipulated by the Project Management methodologies (see **section 2.3**), system development teams also have their own industry-prescribed methodology for developing IT systems (Despa, 2014). These methodologies are referred to as System (Software) Development Methodologies (Schwalbe, 2017).

A System (Software) Development Methodology is “a set of rules and guidelines that are used for, planning, designing, developing, testing, [implementing] and maintaining a software product” (Despa, 2014, p.41). It consists of development processes that are either sequential, or iterative (Rajagopalan and Mathew, 2016). The choice of the methodology applied has an impact on the performance of the project team, as well as on the quality of the e-Government system developed. Equally, an inappropriate methodology can also result in project lags, cost overruns and customer dissatisfaction (Rajagopalan and Mathew, 2016).

The purpose of these methodologies is to provide structure to the development (project management) of e-Government systems. The benefits of applying these methodologies are: an improved quality of the end-product; better project development; “standardizing processes and procedures”; enhanced stakeholder communication; and improved project management (Nkone, 2013, p.23). As discussed earlier, in **Chapter 2**, systems development methodologies are categorised into two prevailing schools of thought: Traditional Systems Development Methodologies, and the Agile Systems Development Methodologies.

Conventionally, large-scale organizations, such as government agencies, employ “plan-driven, heavyweight, Waterfall style approaches” in managing the development of e-Government systems (Glaiel, 2012, p. 20). These ‘plan-driven, heavyweight, Waterfall style approaches’ are referred to as Traditional Systems Development Methodologies.

Although most large organizations make use of one or other Traditional Systems Development methodology, this approach tends to experience the most project failure with regard to project cost, time and quality (Glaiel, 2012).

The following sections will introduce the different Traditional Systems Development methodologies and the different Agile Systems Development methodologies.

5.2.1. Traditional Systems Development Methodologies

Traditional System Development methodologies (Traditional methodologies) are based on the premise that all the requirements – and design of the software – are available and complete prior to any development or implementation (Glaiel, 2012).

These Traditional methodologies are characterised by "structured processes, extensive documentation and detailed planning and management" (Estler *et al*., 2013, p.1199). Other researchers refer to the Traditional methodologies, as structured, sequential, or predictive system development methodologies (Estler *et al*., 2013; Schwalbe, 2014). Isaias and Issa (2015) refer to the System Development Life Cycles (SDLCs) such as the Waterfall model, the Spiral model, and the V-shaped model as the various types of Traditional System Development methodology. Therefore, for purposes of this thesis, the term Traditional Software Development Methodologies (or Traditional SDM) will be used to refer to the structured and sequential software development methodologies mentioned above.

The most common Traditional SDMs are: The Waterfall Approach; Spiral Model; Incremental; Prototyping; and the Rapid Application Development (RAD) approach (Schwalbe, 2014). Schwalbe (2014) refers to these as *predictive*, since the scope, time and cost of the project are clearly determined from the onset. This research will expand upon the Waterfall Model and the Spiral Model – as these are the primary Traditional SDM's (Estler *et al*., 2013). The main downfall of these methodologies is their lack of responsiveness to change (Barlow *et al*., 2011).

The Waterfall Approach

According to Glaiel (2012, p.25), the Waterfall approach originates from the early research of Winston Royce entitled “Managing the development of large software systems”. Winston Royce’s 1970 research on the management of software development projects, presents a model that introduced the concept of developing software systematically, even though he does not specifically use the term *Waterfall* (Glaiel, 2012; Despa, 2014). **Figure 5.3** below is an illustration of the model by Winston Royce, which has been adapted over time to what is known today as the Waterfall system development methodology (Glaiel, 2012).

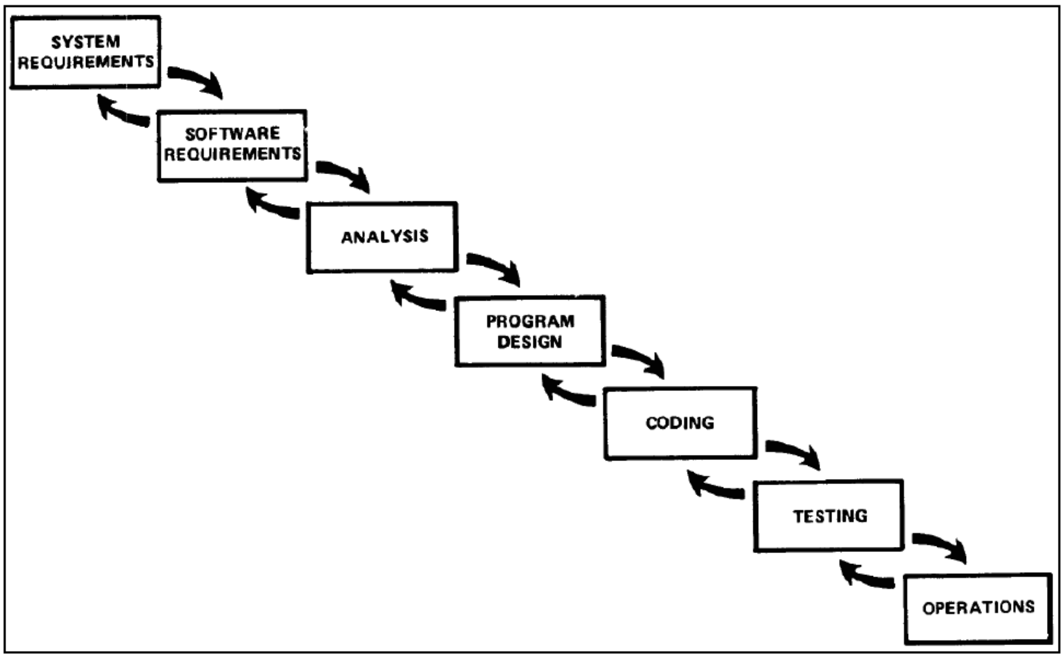

Figure 5.3: Winston Royce’s Waterfall Approach (Glaiel, 2012)

This approach is referred to as Waterfall due to the cascading project management processes, where one phase starts when the previous phase is completed, in a linear manner, with deliverables at the end of each phase (Despa, 2014), as illustrated in **figure 5.3** above.

The advantage of employing this methodology – especially in large organizations that face strict time, cost and scope constraints – is that it places emphasis on soliciting complete requirement specifications at the beginning of the project (Glaiel, 2012). This methodology also focuses extensively on rigorous project planning and exhaustive documentation (Despa, 2014).

This approach has been critiqued for its rigidity regarding changing the system requirements or design (Glaiel, 2012). This is due to the cascading nature of this methodology – which stipulates that the output of the current phase becomes the input for the following phase (Glaiel, 2012) – as illustrated in **figure 5.3** above. This implies that any changes made to the system requirements, or design, would result in the entire project moving backwards to the previous stages.

However, Despa (2014) alludes to the fact that system development projects are infamous for changing requirement specifications – which implies that the rigidity of the Waterfall approach cannot easily handle frequent changes. Therefore, this methodology is best suited for system development projects that contain clear, detailed requirements upfront (Despa, 2014).

Spiral Methodology

The spiral methodology emerged as an improvement of the Waterfall approach: for use, primarily, in the context of government system development (Schwalbe, 2014). It is an improvement from the Waterfall approach, of developing systems in a linear manner, and proposes a system development approach that is iterative, or circular, like a spiral (Schwalbe, 2014). Unlike its predecessor (the Waterfall approach), the Spiral methodology accommodates some level of change to the project, resulting in minor cost increases and time delays (Schwalbe, 2014).

The main phases of this methodology are: planning, analysis, development and evaluation (Despa, 2014). These phases repeat a number of times in that order until the project is complete (Despa, 2014), allowing for the project to be revised at each spiral (Schwalbe, 2014).

Figure 5.4 below illustrates the spiral model, with the main phases as: analysis, design, implementation, and testing (Schwalbe, 2014). Each of these cycle iterations produce a deliverable for the project owner to provide feedback (Despa, 2014).

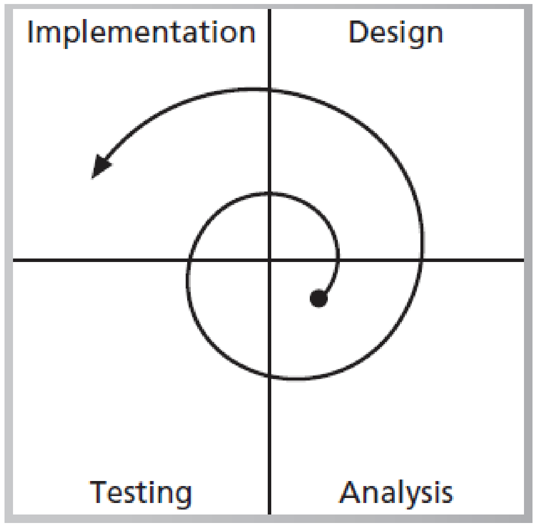

Figure 5.4: Spiral Model (Schwalbe, 2014)

While the Spiral approach is classified as a Traditional Systems Development Methodology, it will soon be apparent that this methodology has some similarities to the Agile SD approach (concerning its iterative nature) which will follow in the next section.

5.3. Agile Systems Development Methodologies

According to Weerawarana *et al*. (2012), e-Government projects that are funded by the World Bank, such as the e-Sri Lanka e-Government program, are required to make use of a sequential systems development model – such as the Waterfall Model, mentioned in the preceding paragraphs. However, literature indicates that such sequential approaches to developing e-Government systems typically result in significant wastage, and are thus financially risky (Weerawarana *et al*., 2012). On the other hand, the Agile iterative approach to development achieves the intended project goals, and minimises waste, by developing components of the product as and when they are needed (Weerawarana *et al*., 2012).

The Agile Systems Development methodology was first conceived from the desire to tackle complex IT system development, through the reductionism approach of breaking down a somewhat complex system into smaller, manageable units of work (Rajagopalan and Mathew, 2016). The Agile SD approach allowed for the rapid development of prototypes with each work cycle (iteration).

Agile SD methodologies have gained popularity over their counterparts (Traditional SD methodologies), as Agile methodologies address the challenge of user experience and usability (a common problem highly researched in the IT domain) (Venkatesh, 2012). Agile methodologies address user acceptance and usability challenges by involving the project stakeholders and end-users during the system development process (Venkatesh, 2012). They achieve this through soliciting user feedback, providing frequent deliverables and constantly testing the software with the user (Venkatesh, 2012).

The core characteristics of Agile methodologies – which distinguish it from the Traditional System Development methodologies – are, “individuals and interaction over processes and tools; working software over documentation; customer collaboration; and responding to change” (Venkatesh, 2012, p.14). According to Barlow *et al*. (2011, p.27) “a truly Agile process must also be self-organising and emergent”. Self-organising teams as those that communicate informally, and make decisions without relying on one owner to guide them: and emergent means that the project team welcomes requirements throughout the course of the project (Barlow *et al*., 2011).

While Agile methodologies have gained widespread use in the system / software development context, Rajagopalan and Mathew (2016) has indicated that these methodologies are not without their limitations. The limitations of the Agile SD approach to developing e-Government systems have been cited as lack of comprehensive documentation and implementation guidelines; and dependence on user commitment, organisational culture, and team composition (Rajagopalan and Mathew, 2016).

According to Vlaanderen *et al*. (2011) and Raslan and El-Licy (2012), the most commonly-used Agile SD Methodologies are: Extreme Programming (XP), SCRUM, Feature Driven Development (FDD), and the Dynamic Systems Development Method (DSDM). Therefore, in order to understand how an Agile approach can positively influence e-Government user adoption, the following section will expand on the common Agile methodologies, beginning with SCRUM.

5.3.1. Scrum

SCRUM originated in 1986 when it was first mentioned in an article entitled "The New Product Development Game" – where it was contrasted to the Waterfall or Traditional System Development approaches (Glaiel, 2012, p.34). Today, it is the most widely-used Agile methodology, which realises benefits such as: an accelerated development time, increased productivity, and responsiveness to change (Verma and Gupta, 2014).

This methodology is iterative in nature, consisting of short development work cycles notably known as *sprints* (Verma and Gupta, 2014). Sprints are work cycles that are three (3) to four (4) weeks long, whereby self-organising project teams prioritise the work packages to implement (Glaiel, 2012). Each sprint ends with the production and presentation of a working deliverable to the client (Glaiel, 2012).

The key characteristics of the SCRUM methodology are that it encourages flexibility, productivity and adaptability through the integration of Project Management and Systems Development processes (Rajagopalan and Mathew, 2016). However the flexibility of this methodology can also be viewed as a flaw – as it implies that the coding and testing of the system are not clearly defined at the beginning of the project (Rajagopalan and Mathew, 2016). The core Systems Development phases of this methodology are: "requirements specification and integration test" (Rajagopalan and Mathew, 2016, p.43).

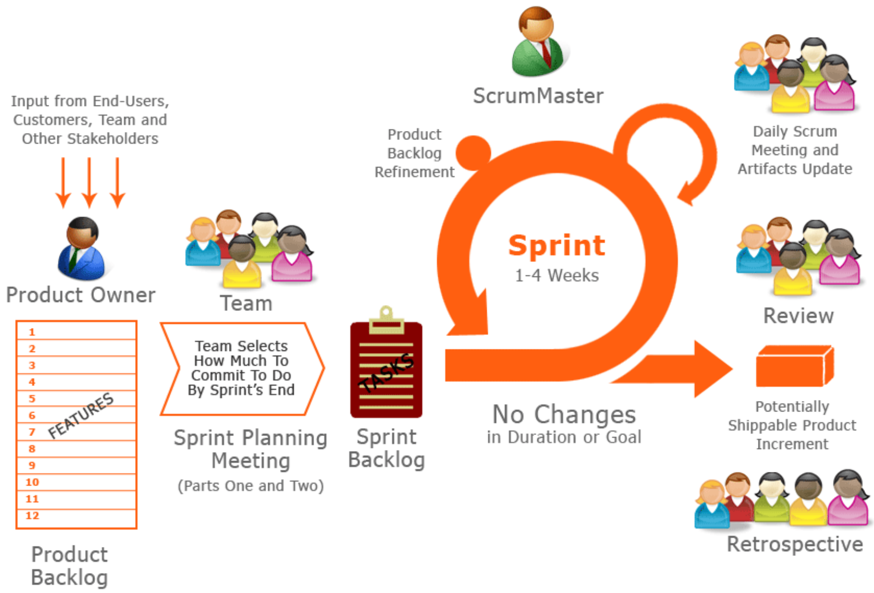

Figure 5.4: SCRUM Process (Glaiel, 2012)

Figure 5.4 above is an illustration of the SCRUM methodology from Glaiel (2012). This process starts with the input from the project stakeholders providing their requirements for the system to the product owner (a representative of the stakeholders). In the e-Toll e-Government project, for example, this would entail getting input from the Gauteng Province motorists or end-users, government officials, the private sector, and other stakeholder groups.

The self-organising team records the requirements as user stories, and then stores them in a product backlog – where each user story is prioritized and allocated to a sprint. These grouped sprints are known as a sprint backlog (Glaiel, 2012). The team members and scrum master (team lead) select a sprint from the backlog, and tackle those requirements in a period of 1-4 weeks; producing a deliverable (or product release) at the end of each sprint. Each set of requirements (sprints) are also tested, reviewed by the client and refined in the following sprint cycles (Glaiel, 2012). This process encourages constant stakeholder (end-users; customers; team; and other stakeholders) involvement from the beginning to the end of each sprint.

5.3.2. Extreme Programming (XP)

Extreme Programming (XP) is "a lightweight methodology for small-to-medium-sized teams developing software" with unclear or constantly changing user requirements (Glaiel, 2012, p.35). Similar to SCRUM, it places emphasis on iterations and the incremental development of smaller project units. It is customer-focused and emphasises customer engagement during the development process, and consists of short iterations and product deliverables (Verma and Gupta, 2014; Rajagopalan and Mathew, 2016).

While this methodology pays close attention to customer interaction and short development cycles, its limitation is that it tends to neglect management or organizational practices, which would originally be accounted for by the traditional system development methodologies, like Waterfall (Rajagopalan and Mathew, 2016).

This software development methodology goes through the following lifecycle phases: “requirements; design; code; unit test; integration test; and system test” (Rajagopalan and Mathew, 2016, p.42). XP is best suited for high risk projects with constantly changing requirements, and projects where customer involvement is possible (Verma and Gupta, 2014).

XP project teams are directed by 12 sets of rules for system development. Glaiel (2012) identifies these XP rules as:

1. **Planning**: This entails specifying and updating the requirements and scope of each product release, by merging business priorities and technical capabilities. As the requirements change, the project plan needs to be updated.
2. **Small Releases**: Developing and releasing small versions of the product at regular intervals.
3. **Metaphor**: The development should be informed by a clear view of how the whole system should work.
4. **Simple Design**: The design of the system should be as simple as possible, eliminating any complex design features.
5. **Testing**: Software developers and the user need to test whether the product works as it should.
6. **Refactoring**: The software developers should restructure the software to improve the performance of the software, without changing the behaviour of the software.
7. **Pair Programming**: Developers collaborate to write the software code together.
8. **Collective Ownership**: The flexibility of enabling any project team member to alter the software code.

9. **Continuous Integration**: Each product release (or version) from each project cycle should be integrated to the other components of the project which have already been developed.
10. **40-Hour Week**: The project team should only work a maximum of 40 hours a week.
11. **On-site customer**: The project team needs to involve an end-user throughout the development of the software, to solicit feedback or input.
12. **Coding Standards**: The product developers must abide to the coding standards that emphasise communication.

5.3.3. Feature Driven Development (FDD)

Feature Driven Development (FDD) uses the concept of reductionism, by breaking down the system into smaller, manageable work units, referred to as *feature sets* (Glaiel, 2012). FDD ensures "scalability [to larger teams], repeatability, and encourages creativity and innovation along the way" (Verma and Gupta, 2014, p.6).

The best practices of the FDD methodology, as stated by Verma and Gupta (2014), are:

1. **Domain Object Modelling**: This methodology subscribes to an object-oriented approach, which stipulates that the project team build diagrams to understand the various components of the project, and how they relate to one another.
2. **Developing by Feature**: As mentioned above, the FDD approach breaks down the project into manageable chunks of work, based on features, and delivers each feature incrementally to the user.
3. **Individual Class Ownership**: Unlike XP's collective ownership that allows any project team member to alter the software code, FDD states that each unit of code needs to be solely controlled by only one individual.
4. **Feature Teams**: The project team comprises of sub-teams, referred to as feature teams, and each feature team is required to produce a certain feature of the system.
5. **Inspections**: The code must be formally reviewed to prevent defects in the software.
6. **Regular Builds**: The project team should ensure that they present the client with prototypes of the software, and take note of any integration issues that may arise.
7. **Configuration Management**: Each version of the software needs to be tracked.

8. **Reporting and Visibility of Results**: The project progress is regularly reported, containing updates of the product features.

5.3.4. Dynamic Systems Development Method (DSDM)

Dynamic Systems Development Method (DSDM) is one of the earliest Agile methodologies (Verma and Gupta, 2014).

The purpose of the DSDM is to solve complex problems in both the Agile and Traditional development contexts (Verma and Gupta, 2014). This methodology "covers the full project lifecycle, including guidance on the principles; project roles; processes; practices and products" (Plonka *et al*., 2014, p.3). It can also be adapted to cater for different types of organizations, or project sizes (Plonka *et al*., 2014).

The key benefits of using the DSDM, according to Verma and Gupta (2014), are:

1. Prototyping
2. Users are actively involved in the development of the technology
3. Rapid delivery of basic functionality
4. Improves communication between stakeholders
5. Constant user feedback ensures that the system meets the needs of the users
6. Development method enables developers and testers to determine whether the system will work or not, in the early phases
7. Delivery of the complete system, on time and on budget
8. User have the power to influence the direction of the project

The DSDM is most appropriate when the project has clearly defined users, fixed delivery dates (time constraints), and, the project can be broken down into smaller components (Verma and Gupta, 2014).

Therefore, it can be deduced from the Agile SD methodologies above that some of the common benefits of using an Agile SD approach are:

- Accelerated development time.

- Increased productivity.
- Responsive to changes in user requirements.
- The ability to produce system prototypes and solicit stakeholder feedback.
- Incremental systems integration.
- On-site end-users.
- Scalability.
- Repeatability.
- Encourages creativity and innovation.
- Improves stakeholder communication.
- Constant user feedback.
- The delivery of an on-time, on-budget end product (Glaiel, 2012; Verma and Gupta, 2014).

5.4. The Agile Manifesto

Accompanying the different Agile SD methodologies highlighted above is the Agile Manifesto: which is the cornerstone of the Agile Systems Development approach. The Agile Manifesto was developed in 2001 for Agile Software Development (Vlaanderen *et al*., 2011), where the term *Agile* was first coined. Seventeen (17) software engineers gathered in Utah (a state in the United States of America) to develop Agile Software Development: a software development approach which enabled efficiency and effectiveness; and, also sought to educate other software engineers on this approach (Williams, 2012).

The core values of the Agile approach, as presented by the Agile Manifesto Organization (2001, p.1), which enable the efficient delivery of software, are:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan.

Table 5.1 below briefly explains these Agile SD values.

Table 5.1: Agile Values (Barlow *et al*., 2011)

Agile Values	Description
Customer collaboration over contract negotiation	Reduce formalities to start and finish faster, with a strong focus on the customer throughout the development process
Individuals and interactions over processes and tools	Enhance communication within teams and barrier removal
Working software over comprehensive documentation	Developers spend more time coding and testing than they do writing extensive documentation
Responding to change over following a plan	Give teams the freedom to make changes and adjust to project needs

5.4.1. Principles

While each of the Agile methodologies presented in the previous section employ different practices and techniques, they are all based on the twelve (12) core principles of the Agile Manifesto (Williams, 2012, p.73), listed below.

1. "Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity, the art of maximizing the amount of work not done, is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly" (Agile Manifesto Organization, 2001, p1).

Rather than comparing and contrasting the different Agile SD methodologies (see **section 5.3**), these 12 principles represent the common characteristics inherent in all Agile approaches (Williams, 2012).

Williams (2012) conducted research on the Agile principles by asking Agile project teams to provide their opinions of these guiding principles. Based on the feedback, Williams (2012) proceeded to revise the original principles (listed above), according to the perceptions and feedback obtained from surveying Agile project teams. The revised principles are listed below, with the changes emboldened.

1. Principle 1 remains the same, with no changes.
2. Welcome changing requirements **at the start of each iteration**, even late in development; Agile processes harness change for the customer's competitive advantage.
3. Principle 3 was removed due to redundancy with principle 1.
4. **The whole team**, from business people through testers, must communicate and collaboratively work together throughout the project.
5. Build projects around **empowered**, motivated individuals with a shared vision of success; give them the environment and support they need, clear their external obstacles, and trust them to get the job done.
6. The most efficient, effective method for conveying information to and within a development team is **through synchronous communication; important decisions are documented so are not forgotten**.
7. **Valuable, high-quality software** is the primary measure of **progress at the end of each short time boxed iteration.**

8. Agile processes promote sustainable development. **The whole team** should be able to maintain a reasonable work pace **that includes dedicated time for exploration, visioning, refactoring, and obtaining and responding to feedback.**
9. Principle 9 remains unchanged.
10. Principle 10 remains unchanged.
11. The best architectures, requirements, and designs emerge from self-organizing teams **guided by a vision for product release.**
12. **With each iteration, the team candidly reflects on the success of the project, feedback, and how to be more effective,** then tunes and adjusts its plans and behaviour accordingly.

The Agile project teams surveyed by Williams (2012) agreed with the revised principles, and indicated that they would prefer if the principles were shortened and simplified. The participants also indicated that communication is much more effective when it is face-to-face, rather than synchronous communication (phone calls or instant messaging) (Williams, 2012). Overall, the project teams surveyed agreed with these principles for developing software in an Agile approach.

5.5. Agile Appraisal

While this thesis seeks to propose the use of an Agile approach in developing e-Government systems, to ensure user adoption (through constant user engagement); it goes without saying that this approach, like any other, is not without its flaws and inadequacies. Therefore, this section will review the strengths and weaknesses of this approach, to ensure a holistic view and appreciation of this methodology for use in the e-Government context.

The Agile principles (in **section 5.4.1** above) exhibit the merits of employing an Agile System Development methodology, such as rapid development and customer-centeredness; yet some critics have questioned whether the benefits of Agile outweigh its costs (Barlow *et al*., 2011). This criticism stems from the fact that the Agile development methodology pays too much attention on software coding, and neglects the fundamental steps of planning and design (Barlow *et al*., 2011). It lacks formal communication channels, which results in a lack of crucial documentation; and most importantly, the Agile approach tends to experience implementation failure when used in large, complex projects (Barlow *et al*., 2011; Rahmanian, 2014).

Turk and Rumpe (2005) also state that in an outsourced project (very common with government projects), the Agile SD principles may not always be followed – as the sub-contractor may be required to provide some predictability by presenting a plan-driven approach when bidding for the contract.

According to Barlow *et al*. (2011) Agile methods such as Scrum are most effective in smaller projects, and less effective in large projects, such as e-Government projects. This is because the flexibility – and lack of detailed plan of the Agile methodologies – hinders project teams from accurately estimating the time and resources required for the project (Barlow *et al*., 2011). Therefore, minimal documentation and vague project costs can be detrimental in larger, more complex projects; whereas smaller projects would be more capable of bearing the uncertainty (Barlow *et al*., 2011). **Table 5.2** below summarizes the strengths and weaknesses of the Agile methodology.

Table 5.2: Strengths and weaknesses of the Agile approach (Barlow *et al*., 2011)

STRENGTHS	WEAKNESSES
Focus on customer needs	Does not promote formal communication
Adaptable to changing requirements	Time and resources might be unknown initially
Fast development time	Requirements not well defined
	Lack of documentation

Some researchers have expressed concern with a purely Agile development methodology for large-scale complex projects, like e-Government projects, and suggest the use of hybrid methodologies, which combine sequential plan-based approaches like Waterfall (see **section 5.2.1**) with Agile methods like Scrum (Barlow *et al*., 2011; Wolfe, 2013; Rahmanian, 2014). Agile-Waterfall hybrid methodologies enable project teams to take advantage of the flexibility of Agile methods, without neglecting the stability of traditional methods (Barlow *et al*., 2011)

To determine whether to adopt a hybrid methodology, or not, requires that "organizations evaluate project size, volatility, and project interdependencies" (Barlow *et al*., 2011, p.35). Combining the benefits of the Agile approach with the Traditional approach results in a hybrid methodology that counteracts the drawbacks of either one of these methodologies when used alone (Barlow *et al*., 2011).

Hence, large organizations can appreciate the benefits of Agile development by using a hybrid approach; while not negating the structured elements presented by Traditional methods.

An example of a hybrid methodology is Rahmanian's (2014) Hybrid Model for Software Development and Project Management, illustrated below in **figure 5.5**. The Waterfall methodology is used for specifying requirements upfront; while the Agile methodology is used in the design, implementation and testing phases to improve the development time. Lastly, the Waterfall approach would be used again at the end of the project for high-level testing and user acceptance (Rahmanian, 2014).

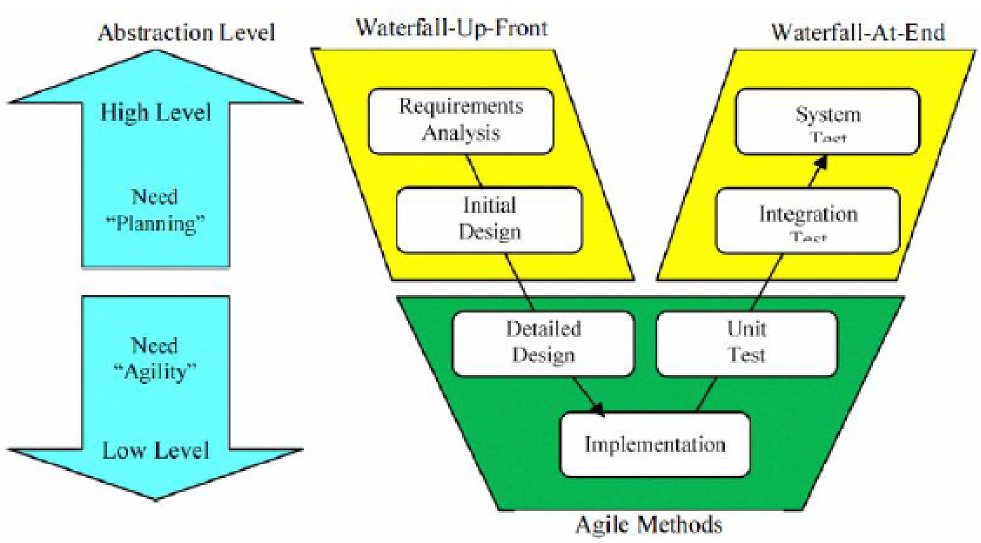

Figure 5.5: Hybrid Model for Software Development and Project Management (Rahmanian, 2014)

Barlow *et al*. (2011) provides hybrid suggestions suitable for large-scale projects in **table 5.3** below.

Table 5.3: Hybrid Practices for large projects (Barlow *et al*., 2011)

Hybrid Practices Suited for Large Organizations and Projects	Description
Designing upfront	While Agile methodologies usually eliminate upfront design, large or complex projects cannot live without some design being done before work begins. For smaller projects, this issue might not be as important.
Short release cycles with layered approach	No matter the size of the project or organization, it is useful to have working software at the end of each cycle to be ready for testing and feedback.
Surrogate customer engagement	Because of the difficulty in soliciting constant feedback from all affected customers on large and complex projects, projects should have product managers who have direct contact with customers for constant feedback on projects.
Flexible pair programming	Pair programming is successful in a wide variety of projects and organizations. Cao *et al*. [2004] recommend "flexible" pair programming, meaning that developers can use it as much as possible but should be flexible enough to realize that it won't work in all situations.
Identifying and managing developers	Hire and use developers that are more capable of working in an Agile development environment. If using hybrid methodologies on only some projects, be sure to assign the right developers.
Reuse with refactoring	Reuse existing code to create new features. While lack of documentation in Agile methodologies makes reuse more difficult, refactoring (cleaning up the code so it is easier to adapt to new projects) can help.
Flatter hierarchies with controlled empowerment	Empowering developers to make important decisions in the code makes development faster, and short cycles help to correct any problems that might arise due to this practice.

In advocating for a blended development approach, Turk and Rumpe (2005) state that one needs to be cognisant of the fact that not all Agile systems development characteristics are applicable to all projects or all organizations. Therefore, it can be deduced from this statement that it is possible for an e-Government project to make use of the Agile systems development approach, even though the development approach does not contain or follow all the typical practices of an Agile methodology, but makes use of a blended approach instead.

5.6. Agile e-Government

According to Aggoune and Khadraoui (2012), agility in e-Government is vital for embracing disruptions in the political, economic, societal, and technological environments which may cause a threat to e-Government systems. e-Government systems are volatile in that they experience changing requirements from various sources, such as: legislation changes; changes in the organization; end-users changes; developments in technology; and interoperability concerns which express the significance of an Agile approach (Aggoune and Khadraoui, 2012).

Project Management researchers recommend the Agile approach as a methodology that promotes systematic collaboration between IT and business teams on a project; as well as iterative and incremental development of software (Raslan and El-Licy, 2012). In other words, the use of the Agile approach can foster collaboration between the project team and e-Government users, thus producing an e-Government system which meets the needs of the users.

Weerawarana *et al*. (2012) advocate for Agile e-Government as it improves the success of the e-Government project. It achieves this through engaging stakeholders, and satisfying their needs by providing working software on a regular basis (Weerawarana *et al*., 2012). In their study of “Why e-Government projects fail”, Anthopoulos *et al*. (2016) state that low user satisfaction is one of the reasons why e-Government projects fail. This challenge can be remedied with the use of the Agile methodology – which ensures user satisfaction, as mentioned in the Agile manifesto above. Holgersson (2014) recommends user participation practices such as Agile development during the development of the e-Government system to improve user adoption.

The view held by Ditibane (2014) also supports the use of the Agile approach in delivering e-Government projects in South Africa; to improve the user satisfaction, user involvement, system quality and overall success of the e-Government project.

However, it may become apparent during data collection that a hybrid or blended systems development approach was used by the South African e-Government projects, which will be examined; as these blended approaches combat the flaws of the Traditional, and Agile Systems Development Methodologies.

Raslan and El-Licy (2012, p.57) propose "an integrated approach for software development for e-Government". This framework (illustrated below in **Figure 5.6**) is an Agile-based practice for e-Government that integrates two Agile methodologies, Extreme Programming (XP) and SCRUM, to offer a solution to handle large requirements (Raslan and El-Licy, 2012). The process of refining the large e-Government requirements consists of four phases: vision, theme, concept, and definition. The project team engages with the project stakeholders to understand the business problem. This then feeds into the product managers (stakeholder representative) assessment of the main issues, which are then converted into themes. The themes are further clarified to develop concepts – which include prioritized user stories that become the set of project backlogs.

A decision tool is used to determine which Agile methodology (XP or SCRUM) to use for each backlog. The criteria for choosing between the two Agile methodologies is based on various factors, such as: task and team size, work environment and business culture. **Figure 5.6** below illustrates the process for selecting an appropriate Agile methodology.

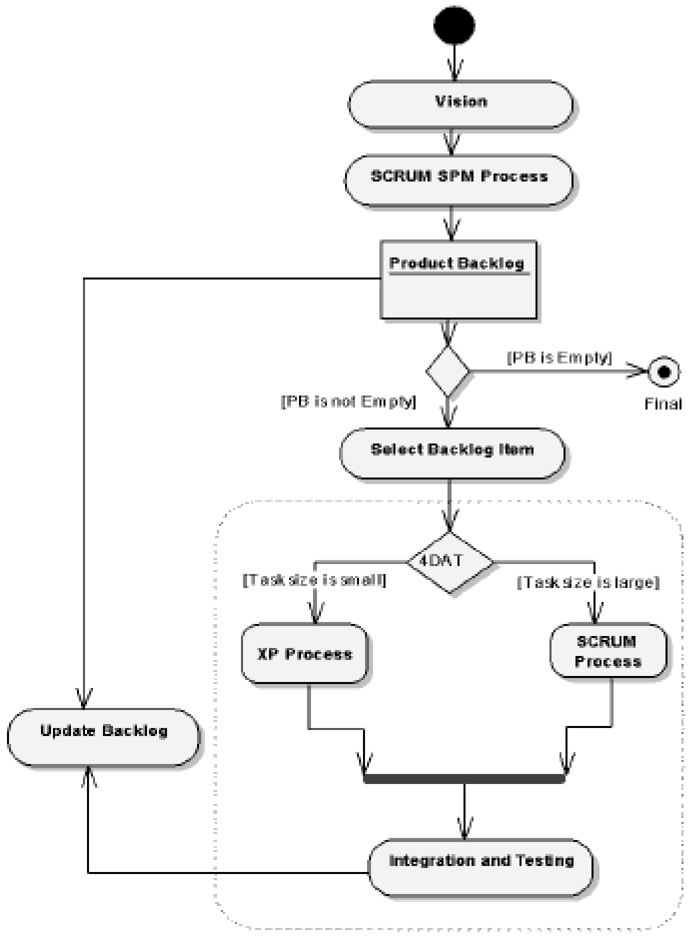

Figure 5.6: Integrated Approach for e-Government System Development (Raslan and El-Licy, 2012)

This framework provides a guideline for selecting the most appropriate Agile methodology (XP or SCRUM). Essentially the choice between the XP Process and the SCRUM process is determined by the size of the task, as illustrated by the decision tree in figure 5.6 above. However, the criticism with this framework is that it simply suggests Agile methodologies to apply to e-Government projects depending on their requirements – but does not indicate how the Agile approach can be used to enhance the user adoption of the respective e-Government system.

Thus, it fails to highlight the correlation between the use of an Agile approach and e-Government success. This thesis will fill this gap by proposing the use of an Agile approach in developing e-

Government systems – and indicating how such use has the potential to positively impact e-Government user adoption.

The following section will demonstrate how the author believes the use of Agile can enhance e-Government user adoption.

5.7. Using Agile to improve e-Government Adoption

According to Iyawa *et al*. (2016, p.3), "customer involvement has been identified as one of the key factors for successful software projects". This involvement can take the form of soliciting feedback from customers – and enabling customers to test the software releases (Iyawa *et al*., 2016). Iyawa *et al*. (2016) further state that user interaction can be attained through employing an appropriate software development methodology, such as an Agile development methodology. The Agile principles indicate how employing an Agile development methodology can achieve such customer involvement. The Agile principles encourage that customers should receive frequent delivery of working software (principle 1); allows customers to make changes to their requirements throughout the project (principle 2); and promotes daily stakeholder engagement (principle 4 and 8). Various studies (Lohan *et al*., 2011; Sharma *et al*., 2012; Iyawa *et al*., 2016) recommend Agile methodologies as a development methodology which promotes customer interaction. Venkatesh (2012) asserts that for software to be successfully developed, continuous collaboration with all stakeholders needs to occur. Such collaboration can be realised through the use of Agile practices (Venkatesh, 2012). He further elaborates that many IT projects fail to achieve customer satisfaction and adoption (Anthopoulos *et al*., 2016).

To assess the extent to which the Agile System Development methodology can be used to improve e-Government user adoption, one ought to understand the current system development methodologies used by e-Government project teams in South Africa.

According to Ditibane (2014), most e-Government project teams in South Africa continue to use the traditional Waterfall life cycle – with the exception being using an Agile approach to develop e-Government systems. Weerawarana *et al*. (2012) indicates that there is a direct correlation between the high failure rate of e-Government projects, and the use of the Waterfall or sequential methodology. Barlow *et al*. (2011, p.27) state that “Agile methods promote a focus on customer needs”, with the project team constantly ensuring that the customer needs are kept central to the development of the technology, thus improving customer adoption of the technology.

Heeks (2003) recommends client-vendor relationship management as a way to mitigate e-Government project failure due to low user adoption. In doing so, Heeks (2003, p.10) suggests the use of innovative techniques to “build mutual understanding and shared objectives” between the user and the e-Government development team.

The Agile principles and practices – outlined earlier in this chapter – can be employed as such techniques used to facilitate shared development of e-Government systems; through constant customer collaboration. Wahid (2011) concurs, and suggests stakeholder involvement to build user support and reduce resistance through designing and implementing systems that meet user needs. Similarly, Ray (2011) also highlights proactive user engagement in the planning and implementation of e-Government projects as a determinant of success.

As mentioned throughout this thesis, Holgersson (2014) also recommends user participation practices during the development of an e-Government system, to ensure e-Government user adoption. Such user participation techniques are encouraged by the Agile approach. Weerawarana *et al*. (2012) also advocate for the use of Agile e-Government development, as it improves the success of the e-Government project. It achieves this through engaging stakeholders and satisfying their needs by providing working software on a regular basis (Weerawarana *et al*., 2012). Unfortunately, many developing countries, South Africa included, continue to use the Waterfall (sequential development) approach to develop e-Government systems (Ditibane, 2014), despite the high rate of failure associated with this approach for e-Government (Weerawarana *et al*., 2012). The Waterfall approach requires a large amount of the system requirements to be specified up-front, which (in the e-Government context) tends to lead to insurmountable wastage and financial risk (Weerawarana *et al*., 2012).

The Agile approach to e-Government system development follows the teachings of the Participation Design school (Kautz, 2011), as explained by Holgersson (2014) in the previous chapter, as it enables user consultation and participation throughout the development of the system (Holgersson, 2014). With this approach, users can play an informative role - providing information; a consultative role - contributing to the decision-making, design and implementation of the system; or a participative role - be on the project team and have project responsibilities assigned (Kautz, 2011). This form of user participation results in a successful project and product that is accepted by users (Kautz, 2011).

Therefore, it can be deduced from this that the use of an Agile Systems Development approach to developing e-Government systems has the potential to enhance e-Government user adoption. This deduction is drawn from the fact that user participation in Agile development "reduces resistance to change" by allowing the users to contribute to the development of the software through feedback and suggestions (Kautz, 2011, p.219).

In summary, the Agile approach to developing e-Government systems can improve e-Government user adoption, through its focus on constant user engagement (participation or involvement).

However Kautz (2011) asserts that the use of the Agile Systems Development methodology as a technique to ensure user participation during system development is relatively understudied. As a result of this, there is a gap in the literature regarding the use of an Agile approach to e-Government projects for enhancing user adoption. This thesis will contribute to this body of knowledge by presenting recommendations regarding how e-Government user adoption can be improved, using an Agile SD approach.

5.7.1. Agile-Informed User Engagement Guidelines

Thus far, this chapter has identified and described the different Systems Development methodologies, from the Traditional (sequential) approaches, to the Agile (iterative) approaches: highlighting each one's merits and drawbacks. However, as the Agile approach (collective term for the Agile methodologies) is the focus of this thesis; it was explored more extensively, to determine whether it can be applied in an e-Government context. An array of studies were reviewed, which pointed towards the notion that the Agile approach – through its stakeholder engagement focus – can ensure that South African e-Government systems receive positive user adoption.

Looking at the various Agile methodologies (as presented in **section 5.3** above), we can extract the common Agile practices that encourage stakeholder engagement, and develop a set of guidelines that e-Government project teams can make use of when developing e-Government systems.

These guidelines are referred to as Agile-informed User Engagement Guidelines, as they are essentially Agile practices that prescribe ways to engage stakeholders throughout the development process. Consequently, application of these practices in an e-Government project can result in user satisfaction and user adoption of the e-Government system (Holgersson, 2014; Anthopoulos *et al*., 2016).

The guidelines are listed below in **table 5.4**. These guidelines were constructed through consolidating Agile practices, and grouping these into the different guideline categories.

These Agile practices were extracted from the Agile methodologies and principles in **section 5.3** and **5.4** above. To supplement and confirm these findings, an additional search was done using search terms such as “key characteristics of Agile systems development”; “key elements of Agile software development”; “success factors of Agile software development”, “Agile best practices”, “best practices of FDD”; “key benefits of DSDM”; “XP rules”, and other variations.

Therefore, in essence the guidelines below are Agile characteristics and best practices categorised into six (6) clusters.

According to the Agile methodologies reviewed in **section 5.3** above and supporting literature, the following are practices that should be used when developing a system using an Agile approach.

Table 5.4: Agile-Informed User Engagement Guidelines

	Guideline Category	Description	References
Guideline 1	**Requirements Gathering**	The system requirements, or input should be elicited from the project end-users, customers, team and other stakeholders.	Glaiel (2012)
Guideline 2	**Product Prototyping**	Valuable product is developed and delivered to the customer in small components, known as prototypes. These prototypes are delivered at regular intervals throughout the system development. The project team should ensure that they present the client with prototypes of the system between a few weeks, to a couple of months.	Turk and Rumpe (2005); Misra *et al*. (2009); Barlow *et al*. (2011); Stoica *et al*. (2013); Verma and Gupta (2014); Vithana *et al*. (2015); El Hameed *et al*. (2016)
Guideline 3	**Product Testing**	Each product / system iteration is tested and reviewed by the client, and refined in the following work cycles (sprints), to determine whether the system works as it should.	Miller (2001); Turk and Rumpe (2005); Vinekar *et al*. (2006); Glaiel (2012); Stoica *et al*. (2013); El Hameed *et al*. (2016); Iyawa *et al*. (2016)
Guideline 4	**Product Feedback**	Constant user feedback is solicited after each work cycle (sprint), to ensure that the system meets the needs of the users.	Glaiel (2012); Verma and Gupta (2014); Iyawa *et al*. (2016)
Guideline 5	**Changing Requirements**	The project team should welcome changing requirements, from the customer, throughout the system development process.	Miller (2001); Turk and Rumpe (2005); Vinekar *et al*. (2006); Misra *et al*. (2009); Barlow *et al*. (2011); Glaiel (2012); Stoica *et al*. (2013); Vithana *et al*. (2015); El Hameed *et al*. (2016)
Guideline 6	**Constant User Involvement / Customer Collaboration**	The project team needs to involve the end-users and customers, throughout the system development process. Business people and developers must work together and communicate daily throughout the project.	Miller (2001); Turk and Rumpe (2005); Vinekar *et al*. (2006); Misra *et al*. (2009); Barlow *et al*. (2011); Glaiel (2012); Stoica *et al*. (2013); Verma and Gupta (2014); Vithana *et al*. (2015).

These guidelines will form the basis of the data collection process (later in this thesis) to examine whether the use of an Agile approach (using these guidelines) in South African e-Government projects, has the potential to enhance user adoption.

However, it is important to note that the above guidelines – which will be presented again in the recommendations section – are essentially Agile best practices; as evidenced by the studies referenced in the table above as well as by the Agile principles (**section 5.4.1**). The purpose of this study is merely to identify these, and propose their use in an e-Government context; to foster user adoption.

The data collection procedure of interviewing Agile practitioners working in the public sector will provide results (see **Chapter 7** and **8**), which detail how each one of these guidelines can be implemented in a practical South African e-Government project. These chapters will also present some of the challenges that one can anticipate when applying these guidelines in a previously Waterfall-oriented environment. The findings from the research participants may even consider the use of a hybrid approach (merging existing Waterfall techniques, with the Agile guidelines) in the more large-scale and complex e-Government projects, as to leverage on the benefits of both methodologies.

This section sought to identify the Agile practices that are fundamental for stimulating constant user engagement (during the development phase), for the purpose of ensuring user buy-in and adoption. While this may have answered **research question 2**, it depicts one dimension of the proposed solution – as it has not yet demonstrated the link between the use of an Agile approach (proposed guidelines above), and the attainment of e-Government user adoption.

Therefore, as the contribution of this research, the following section will clarify the connection between the use of the Agile-informed User Engagement Guideline, and positive e-Government user adoption.

5.7.2. How Agile SD relates to user adoption

Principle 1 of the Agile principles (see **section 5.4.1**) emphasizes user satisfaction through the delivery of working software (Barlow *et al.*, 2011). This focus on users is one of the main characteristics of Agile systems development methodologies (Glaiel, 2012; Stoica *et al*., 2013; Verma and Gupta, 2014; Vithana *et al*., 2015).

This user-centric approach ensures user satisfaction through constantly engaging users throughout the development process; and by providing the user with working software on a regular basis (Ditibane, 2014; Verma and Gupta, 2014; Iyawa *et al*., 2016). The Agile Systems Development approach encourages user testing and feedback (Kautz, 2011; Venkatesh, 2012; Iyawa *et al*., 2016), to refine the product according to the user's specifications (Glaiel, 2012). Consequently, this iterative process results in user satisfaction, which is derived from producing a final product that meets user requirements.

This suggests that user satisfaction is proceeded by using (or adopting) the system i.e. user adoption. In other words, applying user engagement techniques, such as an Agile SD approach, ensures that the users or project stakeholders are satisfied with the end product, and subsequently make use of said product (Holgersson, 2014).

Kumar *et al*. (2007) and Rodrigues *et al*. (2016) postulate that user satisfaction leads to e-Government user adoption. However, Kumar *et al*. (2007, p.69) also suggests that user satisfaction can also be as a result of user adoption, by stating that "satisfaction [is] the perception of a pleasurable fulfilment of a service".

As the Agile Systems Development approach is iterative, allowing for stakeholders to view and trial the system regularly (see **guideline 2 in table 5.4**), it can be inferred that satisfaction is reached before the completion and roll-out of the system. This confirms the above statement by Kumar *et al*. (2007), as, indeed, the Agile approach requires user satisfaction with each project iteration. This indicates that adoption of the final (complete) system is as an outcome of stakeholder requirements (and specifications) being considered (and addressed) throughout the development process.

Therefore, to link this back to the previous chapter, **Chapter 4,** it can be gathered from the above paragraph that user satisfaction is a contributing factor of e-Government user adoption. It can also be inferred that the use of an Agile approach (through the proposed Guidelines) has a positive impact on user satisfaction (Barlow *et al*., 2011; Venkatesh, 2012; Ditibane, 2014; Holgersson, 2014).

To illustrate this relationship diagrammatically, in a similar fashion as the adoption models in **Chapter 4**, would require a model that depicts the correlation between the Agile-informed User Engagement Guidelines, user satisfaction and user adoption respectively. **Figure 5.7** below demonstrates the relationship between the proposed guidelines and e-Government user adoption.

This diagram illustrates how an Agile Systems Development approach (using the guidelines) can positively contribute towards e-Government user adoption. **Figure 5.7** illustrates that there is a positive relationship between the use of the stipulated Agile practices, on a user's satisfaction, and subsequently, adoption of an e-Government system.

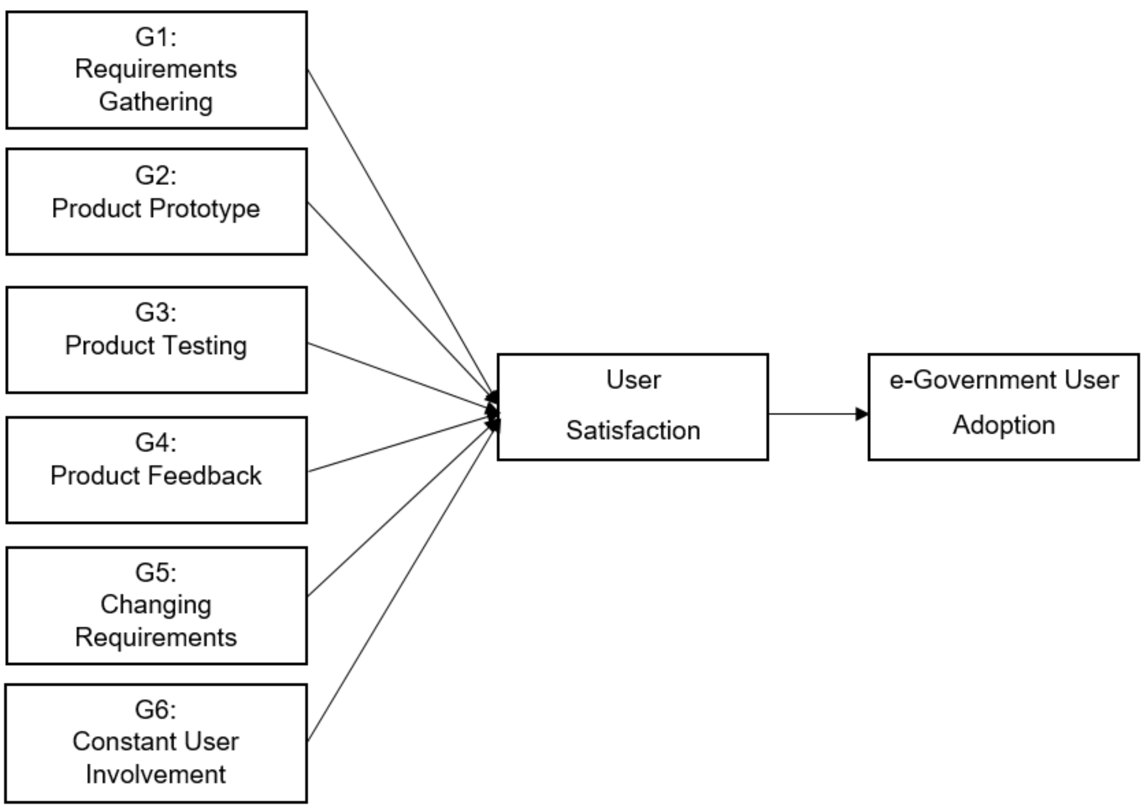

Figure 5.7: Agile Systems Development impact on e-Government User Adoption

Thus, it can be concluded that **figure 5.7** above demonstrates how the use of an Agile System Development approach, which possess similar attributes to the proposed Guidelines, holds the potential to improve e-Government user adoption.

5.8. Why Agile is good but not sufficient for adoption

Although this chapter has presented the merits of employing an Agile System Development methodology (or a hybrid approach) to improve user satisfaction and, thus, adoption; it is important to note that alone, this methodology may be insufficient to address overall e-Government adoption in developing countries. Anthopoulos *et al*. (2016, p.163) allude that the successful use of Project Management (Systems Development) tools alone cannot prevent e-Government project failure. **Chapter 3** highlighted that e-Government success is not only hindered by the Systems Development (Project Management) approach used, but rather by a cohort of other factors as well.

While this may be the case, this study has only examined e-Government user adoption from the perspective of the System Development approach used (internal adoption factors,) and the external adoption factors to a less extent. In other words, as the study of e-Government adoption is broad, this thesis only examined e-Government user adoption from an internal (pre-implementation) perspective – as defined in the previous chapter. This explored whether user adoption can be guaranteed before the e-Government system is deployed, rather than confronting the issue of user adoption after the e-Government system is developed and rolled-out (post-implementation perspective), which is a different study altogether.

5.9. Conclusion

As the final chapter of the literature review, the purpose of this chapter was to present the Agile Systems Development approach as a contributory factor for addressing the phenomenon, acknowledged in the previous chapters, of low e-Government user adoption, which consequently inhibits e-Government success. The Agile Systems Development methodology was examined to determine whether it possesses qualities that can be used to encourage user adoption in the e-Government context. The findings revealed that the Agile SD approach is grounded in the Agile principles – which promote customer satisfaction by embracing values such as: customer collaboration, user interaction, frequent releases of working software, and changing requirements. These values, embedded in the Agile practices, were extracted to develop the Agile-informed User Engagement Guidelines – which guide e-Government project teams in developing systems with the user at the centre of the project. An adoption model was then constructed for the purpose of illustrating the direct correlation between the use of the proposed guidelines and e-Government user adoption, through user satisfaction. Thus, the Agile approach (using the guidelines) in e-Government projects can be used to foster regular user engagement to improve user satisfaction, and, as a result, overall e-Government user adoption.

Although the Agile approach can be used to address user adoption of e-Government systems, this chapter revealed that the use of an Agile SD approach does not directly address external (post-implementation) adoption issues such as the digital divide, inherent in developing countries. Therefore, the focus of this research will be on the applicability of the Agile SD approach in improving e-Government user adoption, while the e-Government system is being developed.

As a result, this research will examine a few South African e-Government projects to determine whether indeed an Agile SD approach has an impact on improving e-Government user adoption; or whether there exist other internal adoption issues that threaten the adoption, and success of e-Government projects in South Africa.

CHAPTER 6: RESEARCH METHODOLOGY

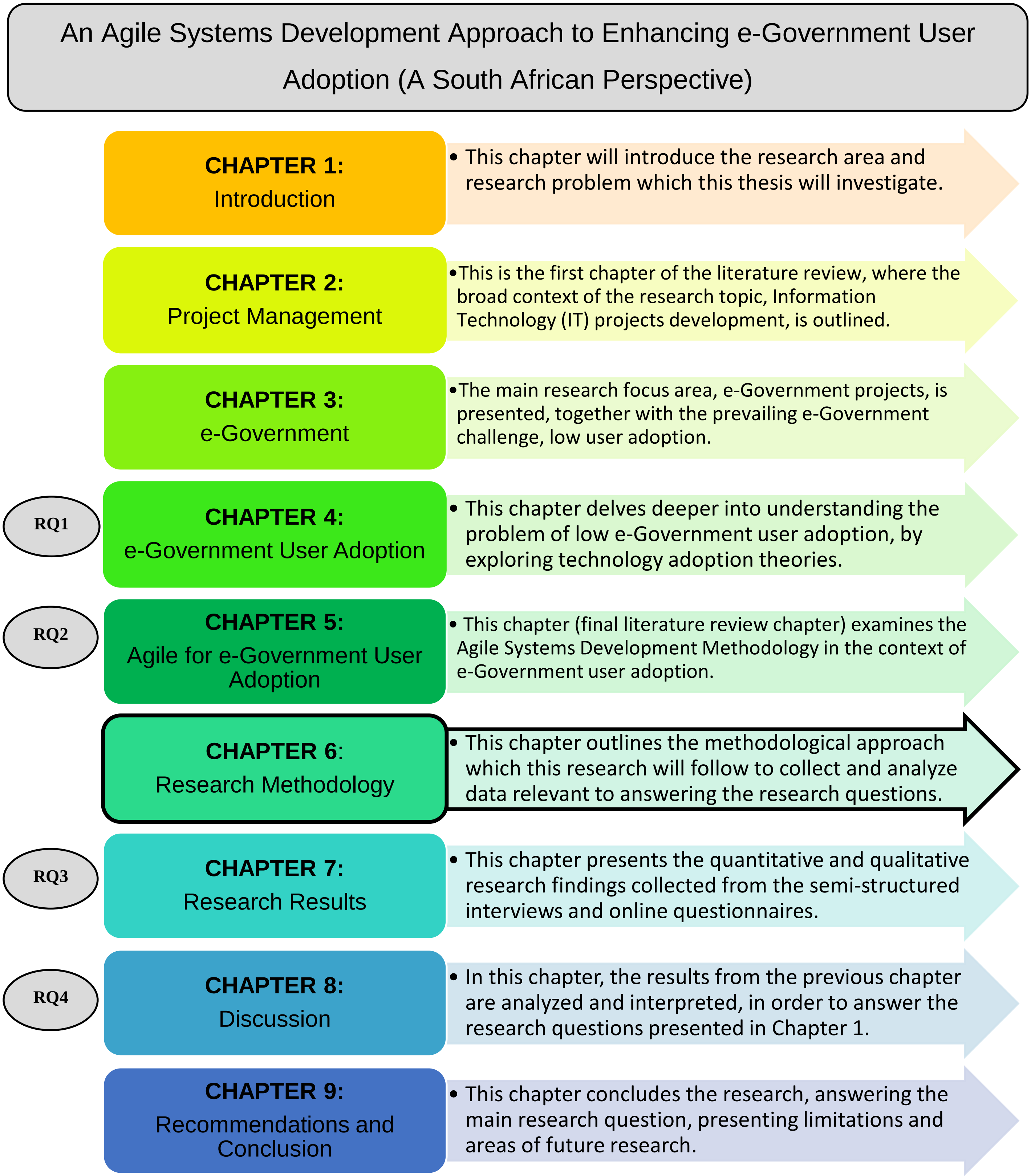

Figure 6.1: Chapter 6 Thesis Structure

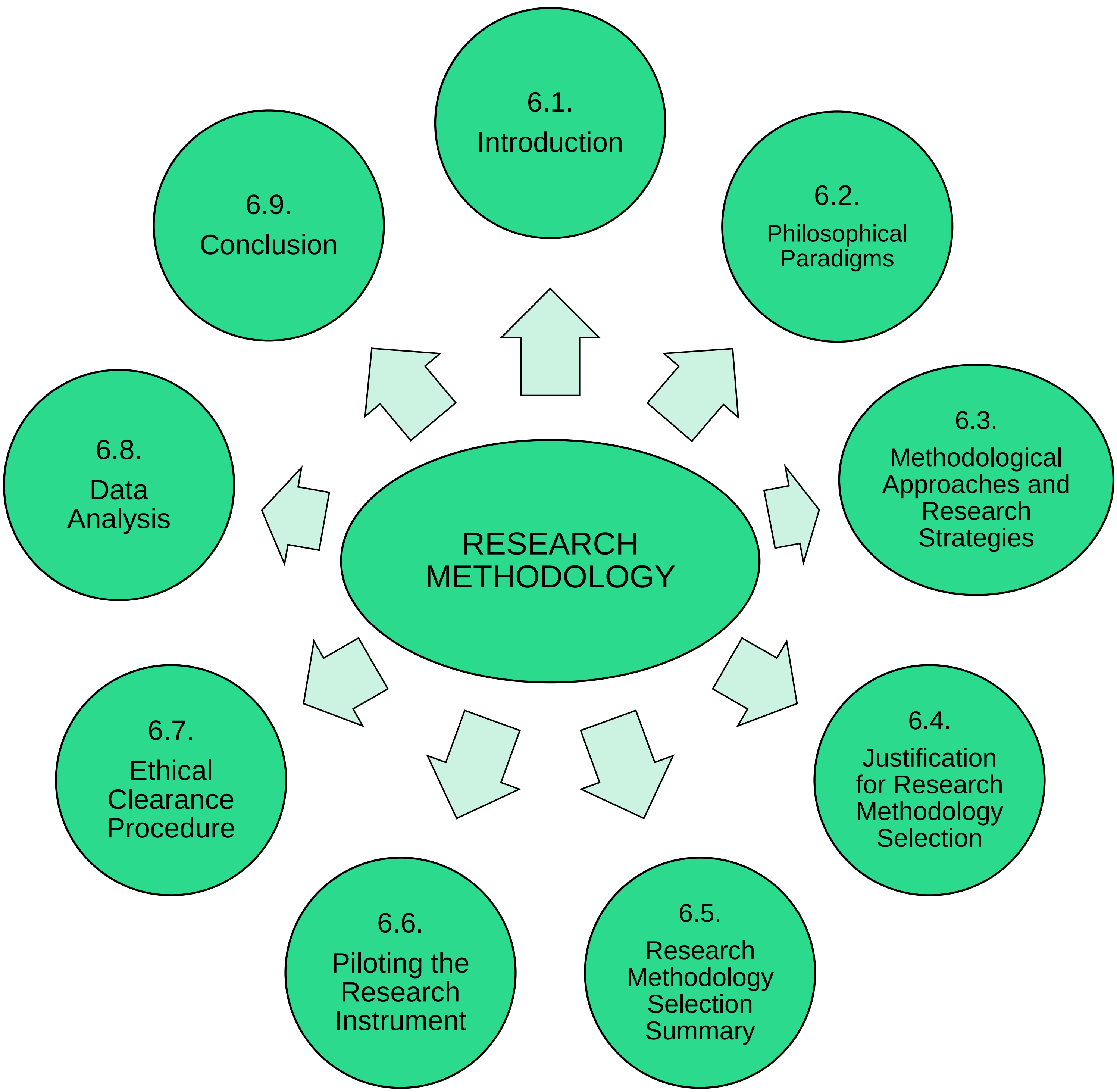

Figure 6.2: Chapter 6 Outline

***Abstract**: This chapter outlines the methodological approach that this thesis will follow to collect, analyse, and interpret data relevant for answering the research questions.*

6.1. Introduction

This chapter seeks to present the research methodology that will be guide the investigation into this study's research objective (stated in **Chapter 1**). An outline and explanation of the various dimensions of a research methodology will be addressed, using the research onion by Saunders *et al*. (2012). This will be followed by a selection and justification of the research methodology that this study will be informed by. Finally, this chapter will conclude by explaining how the data collected will be analysed, as well as the ethical considerations that will be observed.

Saunders *et al*. (2012) developed the widely-referenced Research Onion, which has been used by many researchers when explaining their research methodology. This research onion, as illustrated in **figure 6.3** below, will be used by the author to explain each component of the research methodology. There are six (6) components contained in the research onion, from the Philosophical Paradigms (on the outer layer), to the Techniques and Procedures (in the innermost layer).

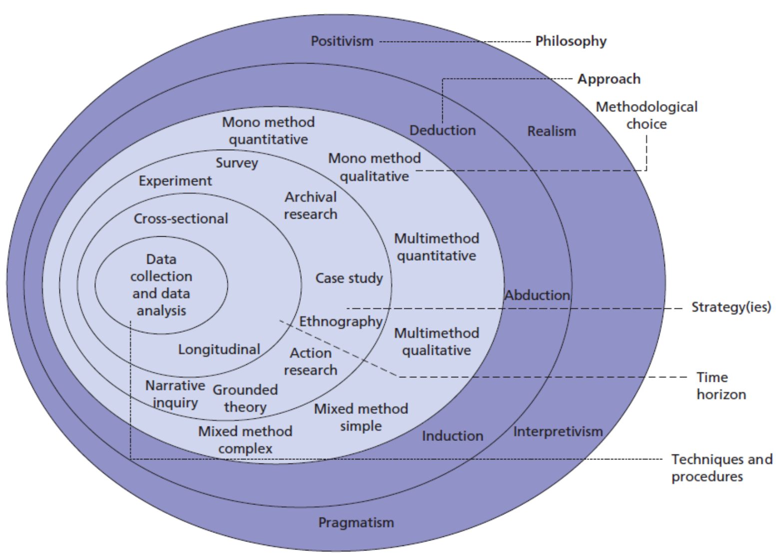

Figure 6.3: Research Onion (Saunders *et al*., 2012)

6.2. Philosophical Paradigms

Myers (1997, p.4) states "all research is based on some underlying assumptions about what constitutes 'valid' research and which research methods are appropriate". As this chapter intends to outline the chosen research methodology, this section will commence with the justification of the selected research methodology by delving into the theory of the various philosophical paradigms, according to Saunders *et al*. (2012). Thus, this section will look into the green highlighted section of the adapted research onion illustrated below in **figure 6.4**, the Philosophical Paradigm (or simply, Philosophy).

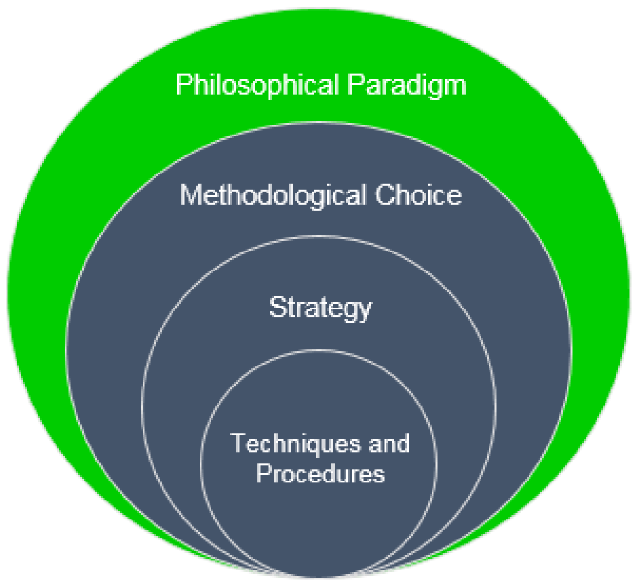

Figure 6.4: Adapted Research Onion (Philosophical Paradigm Layer)

While there are multiple competing philosophies which have generated an increasing debate over time – such as, Positivism versus Interpretivism – Saunders *et al*. (2012) lean on the lessons of Niglas (2010), who asserts that these philosophies be studied as existing on the same continua, rather than as disparate (hierarchical). Studying the research philosophy as a continuum enables us to answer three questions, which guide the choice of research methodology one should employ (Saunders *et al*., 2012). These questions are: (i) "What is the nature of reality?" – Ontology; (ii) "What is considered acceptable knowledge?" – Epistemology; (iii) "What is the role of values?" – Values (Saunders *et al*., 2012, p.129). This research will only go into extensive detail of the second question, the epistemology, as well as speak to each of the layers from the Research Onion by Saunders et al. (2012), in **figure 6.3** above.

The Ontology looks at the way in which the researcher views the world, or social entities – either objectively or subjectively. Objectivism asserts that social phenomena exist independently of social actors; and Subjectivism states that social phenomena exist as a result of the influence of social actors (Saunders *et al*., 2012).

The Epistemology studies the factors required to define acceptable knowledge, in a specific context of study. The most commonly used philosophies (Positivist, Interpretive and Critical) are examined in order to determine what constitutes acceptable knowledge (Orlikowski and Baroudi, 1991; Myers, 1997). These philosophical paradigms, together with the Post-Positivist paradigm, will be explored further in the proceeding paragraphs, starting with the Positivist paradigm, followed by the Interpretive, Critical, and Post-Positivist paradigms.

6.2.1. The Positivist Paradigm

Positivist research is based upon the assumption that reality is objective, and can interpreted through the use of measurable properties (Myers, 1997). These measurable instruments (or properties) are believed to be independent of the researcher (Myers, 1997): with the main goal of this paradigm being "the discovery of universal laws and causal relationships" (Alshehri, 2012, p.64). The Positivist paradigm generally entails testing a theory as a way to increase the understanding of a study (Myers, 1997). This relies on the causal relationships and generalizations made from the data collected (Saunders *et al*., 2012). The research strategy for collecting data involves using existing theories to generate hypotheses – which are then tested to develop new theories, or enhance existing theories (Saunders *et al*., 2012).

According to Orlikowski and Baroudi (1991, p.5), for research to be classified as positivist, it should contain "quantifiable measures of variables, hypotheses testing, and the drawing of inferences about a phenomenon from the sample to a stated population".

6.2.2. The Interpretive Paradigm

Researchers who tend to challenge or critique the Positivist philosophy, for over-simplifying the social world (by relying on the use of theories to generalize findings), often lean towards the Interpretive paradigm (Saunders *et al*., 2012). To understand Interpretive research, a definition of the term needs to be provided, as well as a clear distinction made between Interpretive research, and a closely related term: Qualitative research (Klein and Myers, 1999; Rowlands, 2005). The Qualitative research methodology is the use of techniques such as: decoding, translating or describing instead of calculations and measurements to understand social phenomena (Rowlands, 2005). Qualitative research can be either Positivist or Interpretive (Rowlands, 2005), and will be explored in more detail in the following section (**section 6.3**).

Interpretive research is when the researcher's worldview holds that knowledge of reality is socially constructed by people (through language or shared meanings), and that "theories concerning reality are ways of making sense of the world" (Klein and Myers, 1999; Walsham, 2006, p.320). Orlikowski and Baroudi (1991) and Myers (1997) explain Interpretive research as trying to make sense of phenomena through interpretations constructed by people.

This philosophical paradigm discards the belief of objective or factual narratives of events; and instead seeks to understand the social context of the phenomenon, and instances where the phenomenon influences (or is influenced) by its social context (Rowlands, 2005). This ties in with research by Walsham (1995) which states that the role of the Interpretive researcher should never be seen as an objective reporter: as the researcher's analysis of data introduces an element of subjectivity. Therefore, from an ontology perspective, the Interpretive philosophy is more akin to the Subjectivism view, where the Positivist philosophy gravitates towards the Objectivism view, as defined by Saunders *et al*. (2012).

6.2.3. The Critical Paradigm

The critical paradigm is based on understanding the historical and traditional social structures, as a way of challenging the status quo and transforming "alienating and restrictive social conditions" (Orlikowski and Baroudi, 1999, p.6; Alshehri, 2012). The Critical paradigm, sometimes referred to as Critical Realism, states that reality is established from historical incidents, produced by people (Myers, 1997; Saunders *et al*., 2012). Scotland (2012, p.13) adds that, "reality is shaped by social, political, cultural, economic, ethnic and gender values".

The aim of this paradigm is to be emancipatory, by means of opposing, contradicting and conflicting with contemporary society (Myers, 1997; Alshehri, 2012); by "exposing hegemony and injustice" (Scotland, 2012, p.13).

This paradigm is adopted by researches who seek to get involved in the research, context and "investigate shared beliefs of members of social units" (Alshehri, 2012, p.65). The findings of such research are not generalizable or repeatable (Alshehri, 2012).

6.2.4. The Post-Positivism Paradigm

Similar to the Interpretive researchers, who have criticized the Positivist paradigm for assuming the existence of an objective reality, the Post-Positivism paradigm represents a different worldview, which rejects the stance of the Positivist paradigm: of "an objective reality, independent of the knower" (Clark, 1998, p.1243).

The Post-Positivism paradigm seeks to advance beyond the traditional Positivist thinking, which relies on measurable instruments to understand reality; towards a more contemporary understanding of reality as being constructed from both measurable instruments, as well as social constructions (Clark, 1998). Clark (1998) states that socially-constructed knowledge (such as knowledge obtained using the Interpretive paradigm) has the ability to explain knowledge constructed from measurable instruments (such as knowledge obtained using the Positivist paradigm).

The post-positivist paradigm is centered on the significance of observing both qualitative and quantitative data sources (Clark, 1998). A combination of qualitative and quantitative data collection methods enables the researcher to acquire a more holistic understanding of the phenomenon under study, through data triangulation, rather than using a purely qualitative, or quantitative method (Clark, 1998; Creswell, 2014).

The Post-Positivism paradigm is also characterized by its focus on theory verification (or theory testing) (Creswell, 2014). This suggests that the researcher who seek to test theories or laws that govern the way in which we understand the world can adopt the Post-Positivist paradigm (Creswell, 2014). The Post-Positivist researcher begins with a theory, then collects qualitative and quantitative data to validate or refute the theory (Creswell, 2014).

In verifying theory, the Post-Positivist researcher seeks to determine relationships, predictions and causal effects within the phenomenon under study, in a similar way to the Positivist paradigm (Clark, 1998). The research problem of the Post-Positivist researcher is one that seeks to identify the factors that cause a particular outcome (Creswell, 2014). In this way, the Post-Positivism paradigm is deterministic (Creswell, 2014).

It is for the above explanation why this thesis will be steered by a Post-Positivist paradigm (worldview), as the researcher's choice of philosophical paradigm.

6.3. Methodological Approaches and Research Strategies

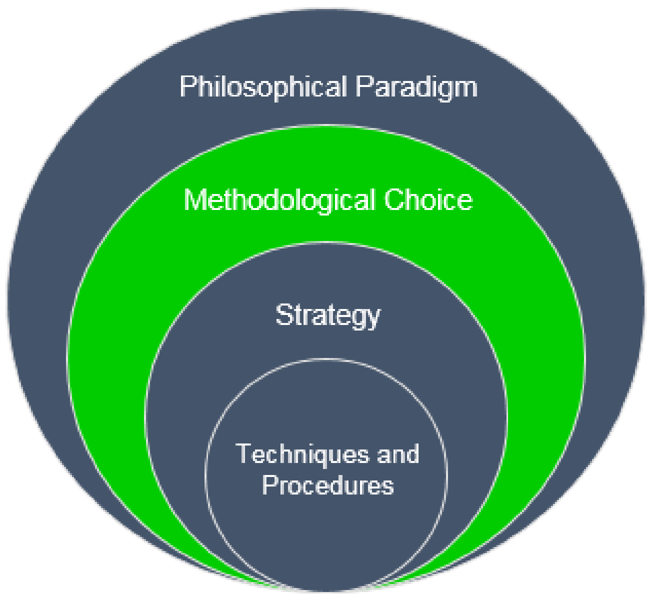

Figure 6.5: Adapted Research Onion (Methodological Choice Layer)

The researcher's philosophical paradigm choice (discussed in the former section), together with the research questions, are used as a guide to inform the selection of the most appropriate research methodology followed. As indicated in **figure 6.5** above, this section will explore the various research methodologies.

There are two prevailing research methodology choices: Qualitative and Quantitative methodologies (Alshehri, 2012): while some researchers adopt some variety of a Mixed Methodology (Creswell, 2014). The choice between which research methodology to adopt is based upon the nature of the research i.e. the aim of the research; the research questions; and the audience for whom the research is written (Alshehri, 2012; Creswell, 2014). The following sections will expand further on the Quantitative, Qualitative, and Mixed-Methods research methodologies, and advise on when to use each method.

6.3.1. Quantitative Approach

The Quantitative approach entails testing theory by observing the relationship between variables or entities – which can be measured with measuring tools – to produce numerical data which can be statistically analyzed (Creswell, 2014). According to Saunders *et al*. (2012), one way of distinguishing between Quantitative and Qualitative research, is that Quantitative research is concerned with numeric data such as numbers and statistics; whereas Qualitative research is concerned with non-numeric data such as words, pictures, videos, to list a few. As a result, Quantitative research is typically associated with any data collection technique that results in numeric data or data that can be statistically analyzed, such as questionnaires (Saunders *et al*., 2012).

Quantitative Research Strategies and Techniques

The research methodology selected has an influence on the type of data collected, and the techniques used to collect such data (Alshehri, 2012). As mentioned above, quantitative research entails the collection of numeric or measurable data, or data which can be statistically analyzed (Alshehri, 2012; Saunders *et al*., 2012). Quantitative research strategies typically entail the use of surveys or questionnaires, structured interviews; structured observation (Saunders *et al*., 2012); as well as tests or measures (experiments) (Alshehri, 2012). These techniques are expanded below:

Surveys

The use of surveys seeks to obtain the data on the same questions asked from a large group of participants, through either email, internet, phone, or in person (Alshehri, 2012). This data may consist of "demographic information, opinions, or satisfaction levels" (Alshehri, 2012, p.65), to represent trends of a sample of the population (Creswell, 2014).

Experiments, Test, or Measures

This technique involves collecting data to measure behaviour or quality (Alshehri, 2012), or the outcome of some intervention on the sample population (Creswell, 2014). With experiments, the researcher makes use of hypotheses (instead of research questions), to test the relationship between variables (Saunders *et al*., 2012).

Observation

Alshehri (2012) states that participant observation is the most widely-used quantitative research technique. This strategy is used to supplement other data gathering techniques to improve the quality of the information obtained (Alshehri, 2012).

Structured Interviews

Structured interviews are face-to-face questionnaires, which are conducted by an interviewer and the participant (Saunders *et al*., 2012). These interviews are not like semi-structured or unstructured interviews, as they follow a fixed set of questions that cannot be changed (Myers and Newman, 2007; Saunders *et al*., 2012).

6.3.2. Qualitative Approach

The Qualitative methodology arose from the limitations of the Quantitative approach (mentioned above); such as the inability to make sense of research involving the study of human behavior, relationships, culture, politics, and economics (Alshehri, 2013). This methodology is often likened to the Interpretive Research Paradigm, in that it is concerned with studying social phenomena within a specific context – from the perspective of the participants (Myers, 1997), or individual significance (Creswell, 2014). This approach encompasses collecting data from the participant in the participant's environment, and extrapolating this data to derive meaning and interpretations relevant to the research (Creswell, 2014).

Alshehri (2013) lists the following as some of the characteristics of Qualitative research:

- The sample population is typically small and not randomly selected, as is in Quantitative research (Merriam, 1998, cited in Alshehri, 2012).
- Qualitative research aims at gathering data which is descriptive; from understanding the processes, words and meanings in the interviews or observation notes (Myers, 1997).
- The focus of this approach is on non-numeric data and the perceptions and experiences of the participants on a specific topic (Lee, 1999, cited in Alshehri, 2012).
- The Qualitative research generates theories through the process of induction (extrapolating to make meaning of the data) (Saunders *et al*., 2012).
- The Qualitative research approach is most appropriate for research questions starting with "what" or "how", which typically seek to understand complex phenomenon.

6.3.2.1. Qualitative Research Strategies and Techniques

As indicated above, Qualitative research is concerned with non-numeric data – and data relating to the participant's perceptions and experiences – to understand relationships, behavior and social phenomena. Therefore, to gather data that contributes to understanding such complex social constructs, qualitative research strategies (or techniques) need to be employed. There are a variety of Qualitative research strategies which influence the researcher's approach to collecting data, such as: Case Study Research; Grounded Theory Research; and Ethnography, among others (Myers, 1997; Alshehri, 2012). These strategies are explained in the following paragraphs, starting with Case Study Research, proceeded by Grounded Theory, and Ethnography.

Case Study Research

Case study research entails the study of a phenomenon in a specific context, or within a couple of contexts (Saunders *et al*., 2012). Eisenhardt and Graebner (2007, citied in Saunders *et al*., 2012) state that this strategy can be applied when the researcher wants to obtain a deeper understanding of the context – and the processes and practices exercised within that context. The researcher can choose to study one, or multiple cases: where the selection of one case study may be used for a unique or critical case (Saunders *et al*., 2012). The data collection techniques employed in case study research can range between interviews, document analysis, or observation (Saunders *et al*., 2012).

Grounded Theory

Grounded Theory is a research strategy used to make meaning of a participant's experiences; and, as a result, develop theoretical explanations that may apply in wider contexts (Saunders *et al.*, 2012). The aim here is to develop theories from the data collected from the interviews or observation (Myers, 1997; Alshehri, 2012; Saunders *et al.*, 2012).

Ethnography

The Ethnography research strategy is employed when studying groups of people (Saunders *et al.*, 2012). This approach aims to study the interaction of a group of people in the same context, experiencing a specific social issue (Saunders *et al.*, 2012). This entails the researcher immersing themselves in the context of the participants to gain detailed data on the interactions of the participants (Myers, 1997; Saunders *et al.*, 2012).

6.3.3. Mixed-Methods Approach

Saunders *et al*. (2012, p.161) criticize the use of a purely Qualitative, or Quantitative approach, stating, "many business and management research designs are likely to combine Quantitative and Qualitative elements", into a Mixed-Methods approach. For instance, a research design may seek to combine methods to make use of both open-ended and closed questions in a questionnaire so as to gain a deeper understanding of the phenomenon (Saunders *et al.*, 2012). The Mixed-Methods approach of combining both Quantitative and Qualitative methods in one study is encouraged, as it enables triangulation (Myers, 1997).

The core characteristics of a Mixed-Methods methodology are as follows (Creswell, 2014):

- The collection of Quantitative and Qualitative data which is relevant for answering research questions or hypothesis.
- Appropriate data analysis techniques are used on both sets of data.
- The two sets of data are merged in the analysis phase.
- Data collection techniques are guided by the specific Mixed-Methods design selected, which also determines the time when each group of data is collected.
- Data collection procedure is informed by the philosophical paradigm of the study.

Creswell (2014) presents three (3) main types of Mixed-Methods approaches, which determine the timing of data collection – as well as the aim of using the two different data collection approaches.

Figure 6.6 below illustrates the three (3) Mixed-Methods approaches as: Convergent Parallel; Explanatory Sequential; and Exploratory Sequential (Creswell, 2014).

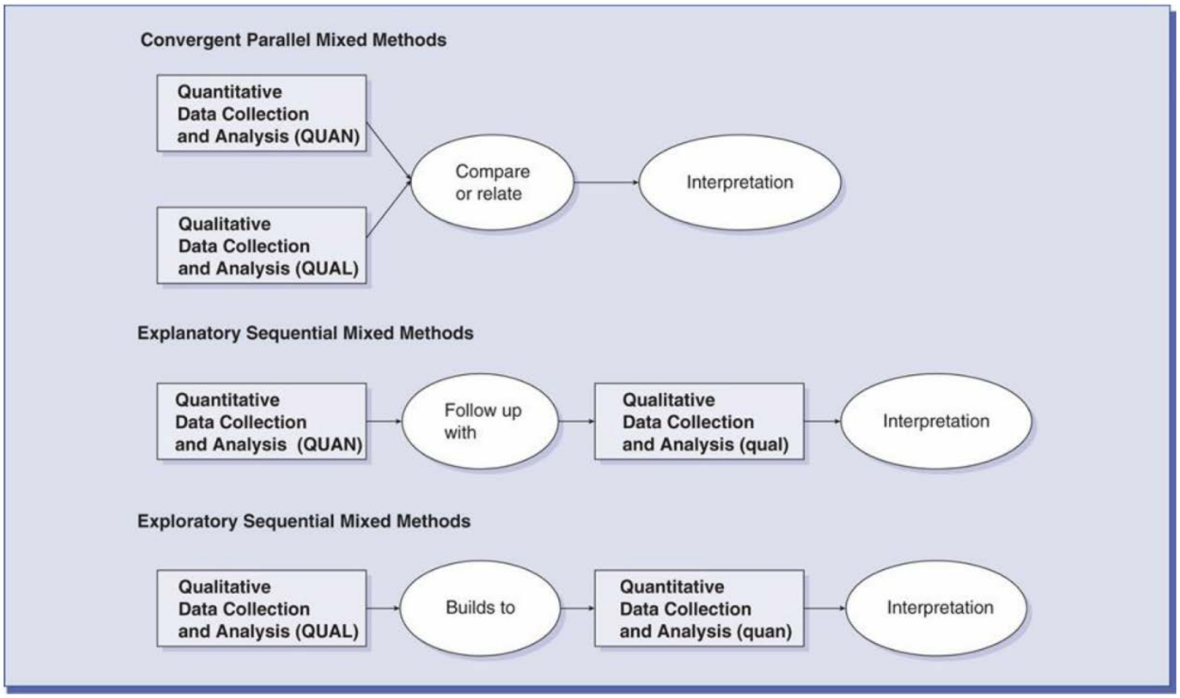

Figure 6.6: Mixed-Methods Approaches (Creswell, 2014)

The three (3) main research methodologies analyzed in the preceding sub-sections above (Quantitative, Qualitative, and Mixed-Methods) are summarized in **table 6.1** below, for convenience.

Table 6.1: Summary of Quantitative, Qualitative and Mixed-Methods (Creswell, 2014)

Quantitative Methods	Mixed Methods	Qualitative Methods
Pre-determined	Both predetermined and emerging methods	Emerging methods
Instrument based questions	Both open- and closed-ended questions	Open-ended questions
Performance data, attitude data, observational data, and census data	Multiple forms of data drawing on all possibilities	Interview data, observation data, document data, and audiovisual data
Statistical analysis	Statistical and text analysis	Text and image analysis
Statistical interpretation	Across databases interpretation	Themes, patterns interpretation

6.4. Justification for Research Methodology Selection

With the above sections outlining the two outermost layers (Philosophical Paradigm; and Methodological Choice) of the Saunders *et al*. (2012) research onion, this section will select and justify the selection of the research methodology this thesis will follow.

The aim of this research is *to contribute towards improving the user adoption of e-Government systems, through the development of Agile Systems Development (SD) informed user engagement guidelines*; thus, working towards addressing the bigger problem of high e-Government project failure in developing countries. The research questions that have led this investigation are as follows:

1. *What are the key factors that influence e-Government user adoption?*
2. *Which of the Agile systems development practices are fundamental for user engagement in the development phase?*
3. *How do e-Government project teams currently engage end users in the development of e-Government systems, to ensure user adoption or buy-in?*
4. *Which Agile User Engagement practices are applicable in the e-Government context?*

Therefore, the research aim, and questions, will be used to guide the selection of a suitable research methodology – which will enable the researcher to obtain the required data to achieve the research aim.

To achieve the research goal, it is essential for the researcher to exam the practicality of the Agile-informed User Engagement guidelines in different South African e-Government projects. To test the applicability of these guidelines in the e-Government context, the researcher will assess the perceptions and opinions of Agile practitioners – working in the public sector. The findings from the data collected will enable the researcher to review and refine the proposed guidelines.

Figure 6.7 below is an illustration of the data collection process, to be followed by the researcher.

The Agile-informed User Engagement guidelines will be presented to e-government system development practitioners for comments and recommendations. This information (findings) will then be used to inform and refine the initial Agile-informed User Engagement guidelines.

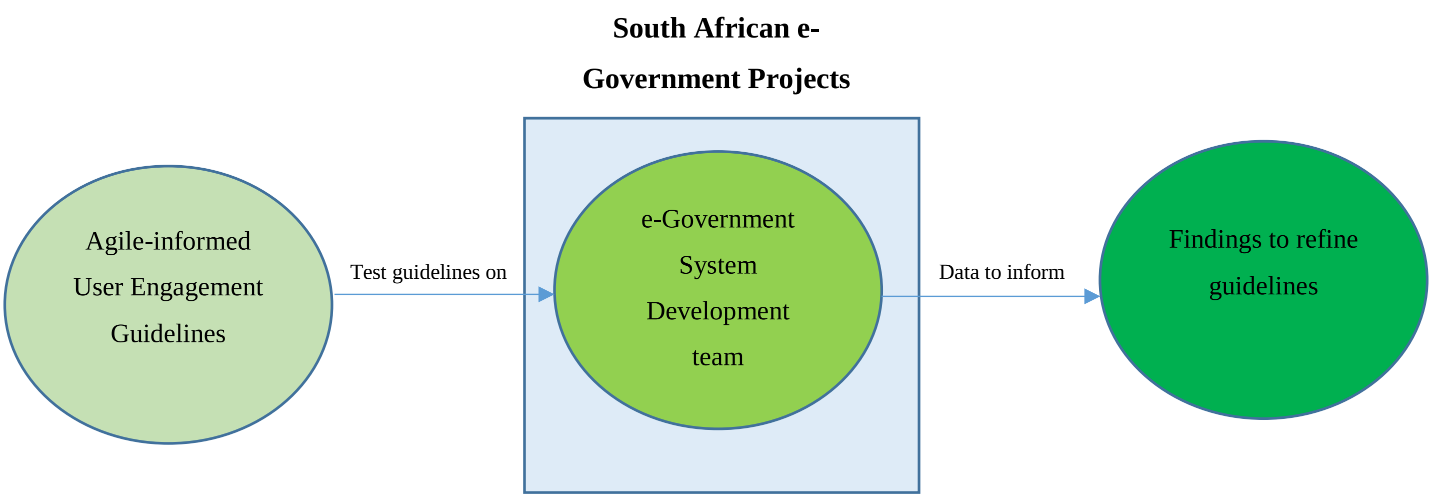

Figure 6.7: Data collection procedure

Therefore, in order to achieve the above illustrated data collection procedure, this research will make use of a Mixed-Methods, multiple case study research methodology – informed by the Post-Positivism philosophical paradigm. The following sections will explain the selection of this research methodology.

6.4.1. Justification for using the Post-Positivist Philosophical Paradigm

As mentioned earlier in this chapter, the Post-Positivism philosophical paradigm is based on presenting a contemporary understanding of reality – which is derived from both measurable instruments, as well as social constructions: which, together, create a holistic understanding of the phenomenon (Clark, 1998).

In other words: to truly understand e-Government user adoption from an Agile systems development user engagement perspective, the researcher needs to obtain measurable data – as well as data on the perceptions of respondents – in order to have a holistic understanding of the effect of Agile user engagement on e-Government user adoption. This also means that to determine whether an Agile SD user engagement set of guidelines have an impact on user adoption, the researcher would need to consult with Agile e-Government system development team members.

The researcher will not be making use of hypothesis testing as the Positivist paradigm employs. Instead, the researcher will provide recommendations through the Agile SD informed user engagement guidelines. However, the researcher's worldview is one which accepts the reality that consists of testing generally understood laws and theories; as well as by making sense of a phenomenon from the perspective of the people from within the context of the phenomenon.

Thus, following the Post-Positivist paradigm, the researcher seeks to understand the social phenomenon of e-Government user adoption from the user engagement perspective. This will determine whether an Agile SD informed set of user engagement guidelines can positively impact e-Government user adoption – by testing the Agile SD user engagement guidelines – on those individuals who are involved in developing e-Government systems.

6.4.2. Justification for using a Mixed-Methods Case Study Methodology

The Post-Positivism paradigm stipulates the use of a Mixed-Methods approach – which requires the use of Qualitative and Quantitative data collection approaches (Clark, 1998). As a result, the selection of a Concurrent Mixed-Methods Case Study Methodology is deemed most appropriate for this research: as Mixed-Methods research enables the researcher to obtain data relating to subjective perceptions, experiences and people's opinions (Lee, 1999, cited in Alshehri, 2012); as well as data that can be analyzed statistically (Creswell, 2014).

As this research seeks to gain an understanding of e-Government user adoption – and the use of Agile SD user engagement practices for improving user adoption – the Qualitative method will be appropriate for obtaining data about the user engagement practices in the e-Government context, and challenges of user engagement. The Qualitative data collection approach will also enable the researcher to collect data on the opinions of the research participants (with regards to the applicability of the proposed guidelines) in an e-Government context. The use of a Quantitative data collection approach will be equally beneficial, as the researcher will be able to collect measurable data that indicates the appropriateness and applicability of the guidelines. Mixing the two (2) research methodologies will support each other in gaining a deeper understanding of the e-Government user adoption phenomenon; and whether the Agile guidelines are suitable for the e-Government context.

The data obtained will also enable the researcher to make extrapolations (or interpretations) which will be used to conclude on the applicability of the user engagement guidelines for improving e-Government user adoption.

The Concurrent Mixed-Methods approach will be used only at the implementation stage – which Saunders *et al*. (2012) explains as the stage of data collection and analysis: making it a partially integrated Mixed-Methods approach. The data collection process will take place in one single step, with both Qualitative and Quantitative data collected respectively, making this a Concurrent Mixed-Methods approach (Saunders *et al*., 2012).

The Concurrent Mixed-Methods data collection technique enables the researcher to collect both Quantitative and Qualitative data from the same group of respondents in a single phase of data collection (Driscoll *et al*., 2007). According to Creswell and Clark (2007), the use of a Concurrent (or parallel) Mixed-Methods approach requires an equal focus on both Quantitative and Qualitative data during a single phase; for the purpose of answering the research questions. In other words, both methods should be employed to collect data pertaining to all the research questions.

This technique consists of the separate collection and analysis of Quantitative and Qualitative data, which is concluded by merging (mixing) both findings to better understand the phenomenon (Creswell and Clark, 2007).

The rationale for using this approach is to achieve data triangulation – where the quantitative data analyzed is merged with the qualitative data analyzed – in order to "support the results with different methods" (Bentahar and Cameron, 2015, p.6).

Researchers who seek to compare or validate the Quantitative data with the Qualitative data, use the Concurrent Mixed-Methods design (Creswell and Clark, 2007). **Figure 6.8** below is an illustration of the Concurrent Mixed-Methods Design – with the focus being on triangulation.

An example of such a technique is presented by Driscoll *et al*. (2007, p.21) – who indicate that such an approach can be achieved using a set of an open-ended question for each "topic-specific set of structured questions".

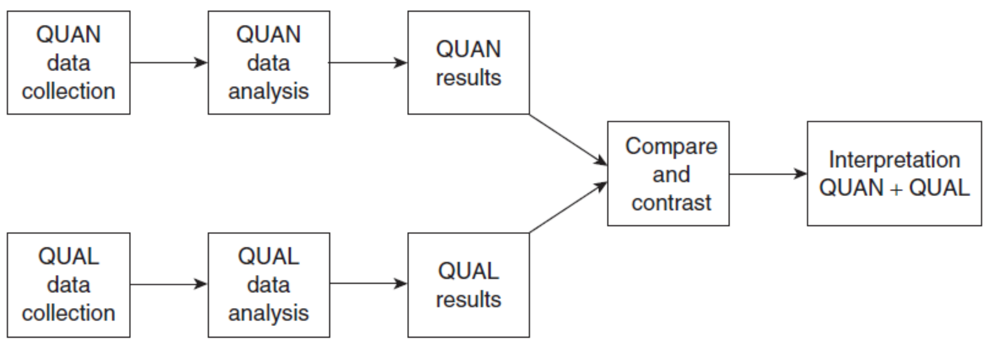

Figure 6.8: Concurrent Triangulation Mixed-Methods Design (Creswell and Clark, 2007)

This research will incorporate the concurrent Mixed-Methods design during data collection by collecting quantitative data (through online questionnaires), and qualitative data (through the semi-structured in-depth interviews) with the e-Government project team members as representatives of some South African e-Government projects. **Figure 6.9** below illustrates the adapted concurrent Mixed-Methods design by Creswell and Clark (2007), to depict the methodology that this research will follow.

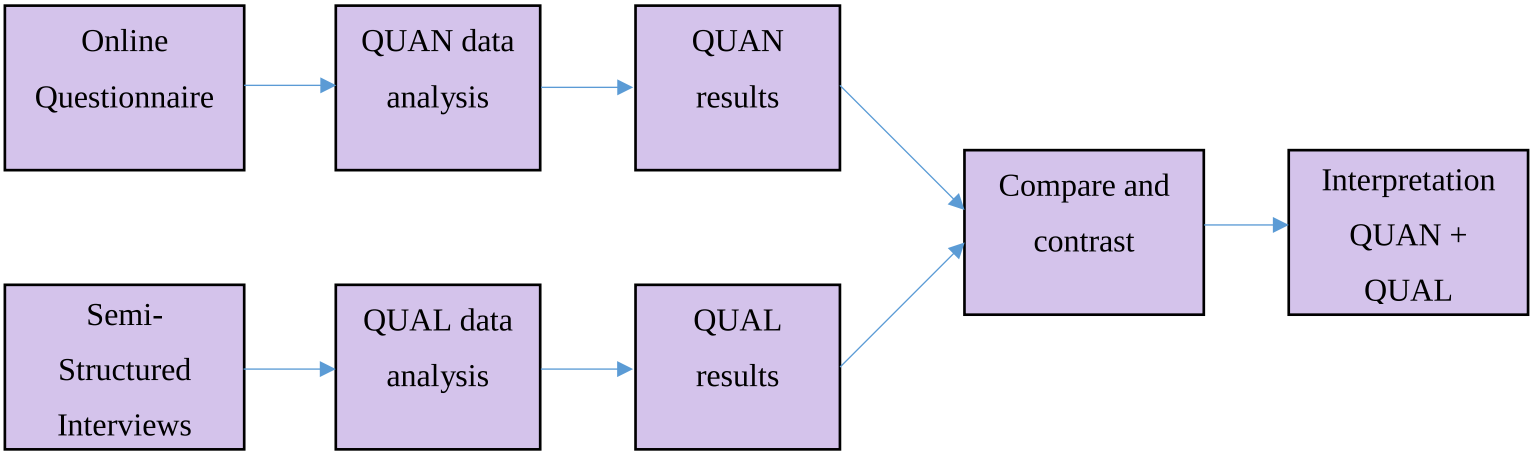

Figure 6.9: Concurrent Mixed-Methods design for e-Government project team participants

This Mixed-Methods approach will be used in the Case Study approach – which is explained in greater detail in the following sections. The Case Study methodology is within the Strategy layer of adapted Saunders *et al*. (2012) research onion, illustrated in **figure 6.10** below.

Figure 6.10: Adapted Research Onion (Strategy Layer)

Case Study Justification

According to Yin (2003, cited in Baxter and Jack, 2008), research should follow a case study approach when: (i) the research aims to answer “what” and “how” questions; (ii) the behavior of the participants cannot be influenced; (iii) the researcher wants to address a phenomenon within a specific context; (iv) the boundaries between research context and phenomenon are unclear. A case study is used in this research because the case is e-Government user adoption, within the South African e-Government context. Appreciating the phenomenon of e-Government user adoption challenges requires the researcher to examine the case within its context.

An instrumental case study is a type of case study that is developed for the purpose of understanding a particular issue (Gordin, 2006). Therefore, an instrumental case study is employed as the case is used as a mechanism for studying user adoption of e-Government systems from the perspective of the Agile User Engagement guidelines (Baxter and Jack, 2008; Langston, 2012). The core components of the Case Study research method are explored in the following section.

Advantages of Case Study Research

An advantage of using Case Study research is that it enables the researcher to examine multiple cases to better understand a phenomenon, and validate the findings (Baxter and Jack, 2008). This approach also allows the researcher to make use of various data sources, and data collection techniques (triangulation), to strengthen the credibility of the data (Hamel, Dufour and Fortin, 1993; Baxter and Jack, 2008). Unlike other research approaches, Case Study research enables the researcher to obtain a deeper and more detailed understanding of a phenomenon, and answer ‘what’ and ‘how’ research questions (Rowley, 2002).

Disadvantages of Case Study Research

While diversity of empirical material is one of the main advantages of Case Study research, Hamel, Dufour and Fortin (1993) assert that different sources of data provide different types of knowledge of the phenomenon, which may present complications with the analysis of data – with regards to finding compatibilities in data. Rowley (2002) states that one of the greatest challenges of using Case Study research is to steer away from simply providing an account of events: to gaining meaningful research knowledge instead. Tsang (2014) also contributes to this list of Case Study drawbacks, stating that a common disadvantage of Case Study research is that the findings cannot be easily generalized to other settings.

However, Case Study research is a legitimate research strategy, and is as equally valid as any other natural science experimental research strategy (Tsang, 2014).

6.4.3. Case Study Research Components

According to Johansson (2003), the Case Study methodology is comprised of three (3) main questions, which the researcher should address in the methodology section of the research. These questions are listed below, and will be examined in detail to provide valid justification for the use of Case Study research method:

1. "How are findings validated?
2. How is a case for study selected?
3. How are generalizations made from a single case?" (Johansson, 2003, p.8).

Validity of Data

Johansson (2003) asserts that making use of triangulation ensures that data collected from case study research is validated. Triangulation entails combining different research methods, data sources, or theories in one study (Myers, 1997; Johansson, 2003); and enhances the quality of the research findings (Baxter and Jack, 2008). However, different research methods or data sources should only be used if they will enhance the researcher's understanding of a phenomenon, or the quality of the data: as combining methods may sometimes cause confusion rather than do good (Johansson, 2003; Baxter and Jack, 2008).

Saunders *et al*. (2012) identify four tests of validity which can be used to ensure quality data. These validity tests are: construct validity; internal validity; external validity; and reliability (Saunders *et al*., (2012). **Construct Validity** is commonly used in Positivist or Quantitative research to ensure that the research techniques are appropriate for the type of data the researcher seeks to acquire (Saunders *et al*., 2012). **Internal Validity** is also associated with Positivist or Quantitative research that is based on causal relationships, to test whether a certain variable has a statistical impact on some outcome (Saunders *et al*., 2012). **External Validity** is concerned with whether the findings of this research can be applied to other contexts, or determining the contexts to which the findings can be generalized (Saunders *et al*., 2012). The **Reliability** test seeks to establish whether the research findings would remain the same if the data collection techniques or researcher were different (Saunders *et al*., 2012). To ensure reliability of research findings, the researcher would need to ensure methodological rigor in conducting the research (Saunders *et al*., 2012). These tests of validity are listed in **table 6.2** below, with the stage in the research when the test should be considered.

Table 6.2: Case Study Design Tests (Yin, 2003)

Tests	Case Study Tactic	Phase of Research in which Tactic Occurs
Construct Validity	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft case study report	⇒ Data collection ⇒ Data collection ⇒ Composition
Internal Validity	• Do pattern-matching • Do explanation-building • Address rival explanations • Use logic models	⇒ Data analysis ⇒ Data analysis ⇒ Data analysis ⇒ Data analysis
External Validity	• Use theory in single-case studies • Use replication logic in multiple-case studies	⇒ Research design ⇒ Research design
Reliability	• Use case study protocol • Develop case study database	⇒ Data collection ⇒ Data collection

This study will make use of multiple sources of data to triangulate and enrich the data, repetition in the data collection of all the cases to ensure external validity; as well as the use of case study protocol – and a case study database – to ensure reliability of data through rigor (Yin, 2003, cited in Andrade, 2009). The different data sources which will be triangulated in the Discussion chapter (**Chapter 8**) are the literature reviewed sources (**Chapters 2** to **5**); Quantitative data (collected using an online questionnaire); and Qualitative data (collected through semi-structured interviews).

Selection of Case Studies

In selecting a case to examine, Baxter and Jack (2008) recommend binding a case in order to narrow the scope of study – rather than attempting to address a broad research goal. Binding a case entails establishing boundaries which detail what will, and will not, be included in this research; as well as the breadth and depth of the study (Baxter and Jack, 2008).

Yin (1993) provides the following criteria for selecting a case:

- Choosing a case based on the criticality of the case, or theory, being tested.
- Selecting a case according to the relevance of the case to the phenomenon being studied.
- Opting for a case which is convenient for the researcher (feasible and easy access to case subjects).

Therefore, this study will only look at the development phase of e-Government projects – with particular focus on the user engagement practices during the development phase. This study will not examine the other project phases of the e-Government cases. As the systems development process is broad, this study will focus, in particular, on the aspects of the development process that encourage user engagement: for the purpose of improving the user adoption of the e-Government system.

This study will look at multiple cases to draw comparisons from other e-Government projects, so as to determine the overall perceptions of e-Government developers (or project teams) – with regards to the proposed guidelines as a contributory factor of e-Government user adoption. With that said, this research will not explore other user engagement techniques or practices apart from those informed by the Agile guidelines.

The purpose of the study, as well as the research question, guides the researcher's decision to study one – or multiple – cases (Baxter and Jack, 2008). To reiterate the purpose of this research, *this research seeks to contribute towards improving the user adoption of e-Government systems: through the development of Agile systems development-inspired user engagement guidelines.*

According to Yin (2003, cited in Baxter and Jack, 2008), there are different types of case studies, and the selection of either type of case study is dependent on the purpose of the research. These case study categories are: Exploratory; Explanatory; Descriptive; and Multiple-case studies (Baxter and Jack, 2008). These different types of case studies are explained below in **table 6.3**, from descriptions provided by Baxter and Jack (2008).

Table 6.3: Types of Case Studies

Type of Case Study	Explanation
Explanatory	This type of case study is used in research that seeks to examine complex real-world causal relationships, which cannot be studied using Quantitative techniques.
Exploratory	This type of case study is used when the researcher seeks to study a case where the intervention used displays no clear, or specific result.
Descriptive	This approach is used to describe a phenomenon and the context in which this phenomenon exists.
Multiple-case	Multiple case studies are used when a researcher strives to draw comparisons or contrasts between different cases, and generalize their findings to other cases.

Single Case Study

Single case studies are conducted when examining more than one case study may not enhance the understanding of a phenomenon (Baxter and Jack, 2008). Holistic single case studies are also employed when the phenomenon being studied is in one context or environment – or when the phenomenon is complex or unique (Baxter and Jack, 2008). A single case study approach can be either: explanatory, exploratory, or even descriptive: where an explanatory approach is used to test a theory (Yin, 1993).

A researcher could also decide to make use of a single case study with embedded units: which enables the study of multiple elements, spheres, or contexts of the same case study (Baxter and Jack, 2008). The advantage of using a single case with embedded units is that it fosters a better understanding of the phenomenon (Baxter and Jack, 2008). Using a single case study with embedded units requires the researcher to develop a new set of research questions and data collection instruments for each unit of analysis (Yin, 1993). However, researchers using this method need to be cognizant of the broader issue which the research is addressing – even while analyzing one sub-unit of the case – by applying the findings to the research aim (Baxter and Jack, 2008).

Multiple Case Studies

The alternative to single case studies are multiple case studies: which attempt to conduct multiple experiments so as to determine the similarities, and differences, of the various cases (Rowley, 2002; Baxter and Jack, 2008). Yin (2003, cited in Baxter and Jack, 2008) states that multiple case studies can be used to "predict similar results or predict contrasting results". Multiple cases can assist the researcher to replicate findings, to strengthen the research findings (Yin, 1993). The decision to make use of multiple cases also requires the researcher to determine whether the cases will be examined sequentially or in parallel. If sequentially, the researcher needs to define the order (Yin, 1993). The notion of parallel, or sequential, case analyzes is to be outlined below in **figure 6.11**. The advantage of this method is that the use of different types of case studies ensures reliability of findings. Yin (1994) concurs, and states that the use of multiple cases guarantees research robustness; and findings which can be regarded as compelling.

The disadvantage, however, is that this method is extremely time consuming – requiring the researcher to replicate the same study (or experiment) multiple times in order to find similarities and differences to generalize (Baxter and Jack, 2008).

Unit of Analysis

With the different types of case studies described above, this study will examine multiple case studies in order to compare and contrast findings; which will determine the general perceptions of the e-Government project teams with regards to the applicability of the Agile SD user engagement guidelines for the e-Government environment. The cases consist of a variety of e-Government projects, or government organizations, which have developed e-Government systems in South Africa. According to Eisenhardt (1989), between four (4) and ten (10) cases are sufficient for generating theory using the multi-case study approach. Yin (1994) places emphasis on the importance of focusing on achieving replication from the cases selected, rather than concentrating on a specific number of cases. However, Creswell (2014) states that one way of determining the unit of analysis is to use four (4) or five (5) cases – or to use the data saturation principle – which stipulates that data collection ends when findings become repetitive. Therefore, using these guidelines, the researcher will examine four (4) e-Government projects in parallel. The selection of these cases will be determined by convenience, and ease of access, due to the difficulty of gaining access to government agencies (Yin, 1993).

A single case study will not be suitable for this study as Yin (2003, cited in Baxter and Jack, 2008, p.549) states that a single case study can be used when the researcher is studying the case in a context which is "unique or extreme". The e-Government context is neither unique, nor extreme, as it is a well-researched area. The phenomenon of low e-Government user adoption is also not particularly unique, and widely researched, as outlined in **Chapter 4**. It is for this reason why one holistic single case study is regarded as inappropriate for this study; and that the use of multiple case studies is best suited (Baxter and Jack, 2008).

It is the belief of the researcher that the inspection of multiple cases as a technique to improve e-Government user adoption will enhance the understanding of user engagement practices in the development of e-Government systems. These cases will be examined in parallel, as illustrated in **figure 6.11** below, to optimize the researcher's time constraints: as case study research is known for being time consuming, as mentioned earlier in this section. **Figure 6.11** below illustrates the data collection and analysis steps that the researcher will follow to conduct research using the case study method (adapted from Yin, 1994). These steps will be referred to later in the Data Analysis, Discussion and Conclusion chapters (**Chapter 7, 8 and 9**).

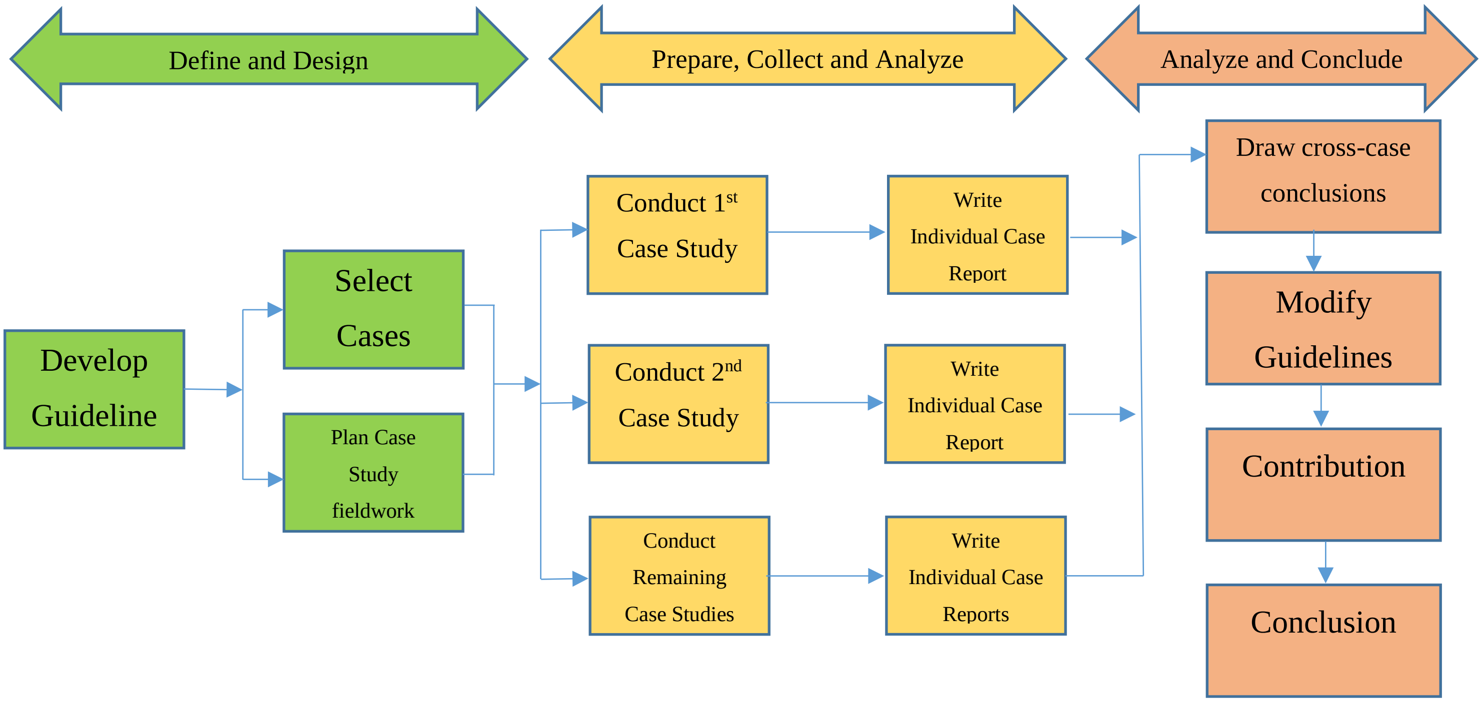

Figure 6.11: Case Study Method (Adapted from Yin, 1994)

Case Study Generalization

Tsang (2014) identifies three (3) categories of generalization in the Interpretive research paradigm. The first category states that generalization in Interpretive research is impossible; and, rather, refers to transferability (Lincoln and Guba, 1985, cited in Tsang, 2014) – as all human interaction in the Interpretive research result in different realities, meaning, or logic: thus making it impossible to generalize findings (Tsang, 2014). The second category is naturalistic generalization, which is also known as "case-to-case generalization" which grants the researcher the power to determine the extent of generalization of research findings (Tsang, 2014, p.178). In the third category, Tsang (2014) refers to Walsham's (1995) types of generalization, stating that "generating of theory" and "drawing of specific implications" are valid generalization categories.

According to Lee and Baskerville (2003) there are two types of generalization: statistical generalizability (typically associated with the Positivist paradigm); and theoretical generalizability (typically associated with the Interpretive paradigm). According to Johansson (2003), Case Study research is usually analytically (theoretically) generalized, not statistically. Statistical generalization is sometimes referred to as naturalistic generalization, or empirical generalization (Tsang, 2014). Statistical generalization is when the findings of the research are applied to the population (Tsang, 2014); while Theoretical generalization (or generalizing to the theory) is when the findings of the research are used to contribute to the broader understanding of a theory – or to develop universal laws (Lee and Baskerville, 2003; Creswell, 2014, p.253).

Theoretical generalization is most appropriate for Case Study research, where theoretical generalization is developed by constructing "explanations of the relationships between variables observed" – where such explanation can hopefully be applied to the population (Tsang, 2014, p.180). According to Rowley (2002), it is important for generalization in Case Study research to inform the theory that initially led the enquiry. For purposes of this research, theoretical (or analytical) generalizability is most appropriate – as the aim is not to generalize the findings of this research to other cases, but to gain better understanding on Agile Systems Development in e-Government projects so as to inform the Agile SD user engagement guidelines.

6.4.4. Data Collection Techniques

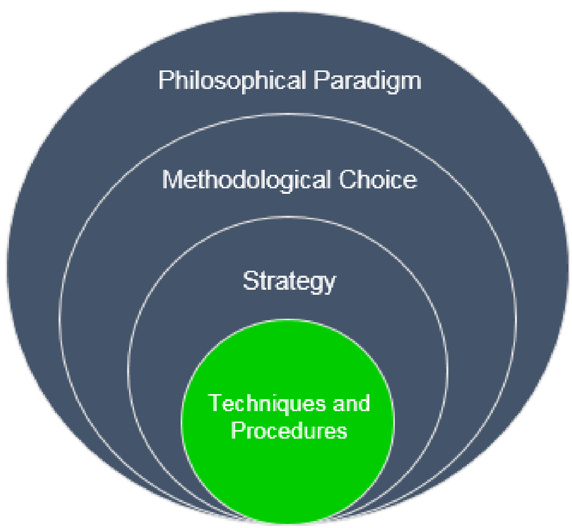

Figure 6.12: Adapted Research Onion (Techniques and Procedures)

According to the Research Onion by Saunders *et al*. (2012), the final layer of the research methodology, as illustrated in **figure 6.12** above, is the explanation of the data collection techniques, and procedures that will be employed. Since a Mixed-Methods Methodology will be used to guide the inquiry into understanding the phenomenon, the selection of data collection techniques will be informed by the Qualitative and Quantitative data collection techniques. The research instruments used in this research are semi-structured interviews, the most commonly used Qualitative data collection technique (DiCicco-Bloom and Crabtree, 2006); and an online questionnaire (a Quantitative data collection technique).

The use of a semi-structured interviewing ensures that the researcher is not restricted to the questions developed prior to the interview – but can probe the participant to obtain more relevant data, if necessary (DiCicco-Bloom and Crabtree, 2006). On the other hand, online questionnaires enable the researcher to ask all e-Government users the same questions, without deviating from the interview schedule (Myers and Newman, 2007; Saunders *et al*., 2012).

The following paragraphs will explain these data collection techniques in greater detail.

Structured and Semi-Structured Interviews

There are three types of interviews: structured, unstructured (semi-structured), and group interviews; with unstructured interviews as the commonly used technique in Qualitative research (Myers and Newman, 2007). Structured interviews are most commonly associated with the Quantitative methodology, as explained in the preceding paragraphs.

Interviews can be in the form of face-to-face verbal conversations; face-to-face group interactions; phone call surveys; or self-administered questionnaires (such as online questionnaires) (Denzin and Lincoln, 1998). They can also take as little as five (5) minutes, or span across a couple of days (Denzin and Lincoln, 1998).

The challenge with interviews is that the interviewer is usually a complete stranger to the participant, thus creating obstacles such as lack of trust (of the interviewer) and insufficient time (influencing the quality of data collected) (Myers and Newman, 2007).

Disadvantages of Semi-Structured Interviews

Myers and Newman (2007) identify some of the disadvantages of semi-structured interviews, which researchers should be aware of when selecting this data collection technique:

- The interview may prove to be artificial, as the participant is interviewed by the researcher (typically a stranger), seeking to obtain the participant's opinions under time constraints.
- Trust is a key component to ensure that the participant freely expresses their opinions, without fear. However, participants in semi-structured interviews are more likely to be weary of divulging important information.
- The researcher may display bias by choosing to interview only high-ranking personnel and, thus, fail to obtain a holistic understanding from all groups in an organization or setting.

While semi-structured interviews are a powerful qualitative data collection tool, the researcher needs to be mindful of the benefits and pitfalls of using this approach.

Advantages of Semi-Structured Interviews

The pitfalls of semi-structured interviews can be remedied by making use of Myers and Newman's (2007) dramaturgical model, consisting of seven (7) guidelines – illustrated in **table 6.4** below – which attempts to address the difficulties of this data collection technique.

The use of this model can result in the following benefits:

- Making the researcher aware of the complexity of the interview procedure beforehand.
- Providing the researcher with solutions to potential difficulties that may be encountered in the interview process, to ensure success.
- Improve the opportunity for obtaining more quality data.

Table 6.4: Myers and Newman (2007) dramaturgical model guidelines

	Guidelines	Explanation
1.	Situating the researcher as actor	The researcher, as the interviewee needs to position themselves as part of the study, and thus answer the following questions: "what is your background, experience, gender, age, and nationality?" (Myers and Newman, 2007, p.16).
2.	Minimize social dissonance	The researcher should minimize or prevent anything which may make the interviewee uncomfortable, or cause conflict. This can be achieved by being aware of first impressions; language or jargon used; as well as appearance.
3.	Represent various voices	Interview different groups of people in an environment, to avoid elite bias.
4.	Everyone is an interpreter	Acknowledge that the participants are interpreters of their context.
5.	Use mirroring in questions and answers	The researcher can use words and meanings constructed by the participants for subsequent comments and questions.
6.	Flexibility	The researcher should be open to exploring other emerging discussions during the interview.
7.	Confidentiality of disclosures	Transcripts and recording devices used in the interview should be kept confidential and safe. If necessary, the researcher can confirm factual matters with the participants, after the interview.

These guidelines will be used to guide the researcher during the semi-structured interview process (interviewing e-Government systems development project members).

6.4.5. Interview Questionnaire Structure

The structure of the interview schedule (online questionnaire and semi-structured interview) is outlined below in **table 6.5**. The researcher has structured the two (2) data collection instruments (online questionnaire and semi-structured interview) into corresponding sections. The matching sections in each of the data collection instruments are mapped alongside each other. This approach was used in order to aid in analyzing and comparing the data collected from the different techniques.

Table 6.5: Structure of Interview Questionnaires

PART 1: **Online Questionnaire** (e-Government Project Team Members)	**PART 2:** **Semi-Structured Interview** (e-Government Project Team Members)
SECTION A: DEMOGRAPHICS **Purpose:** The purpose of this section is to obtain information pertaining to the participant's professional background and e-Government experience.	**SECTION A: BACKGROUND AND EXPERIENCE** **Purpose:** The purpose of this section is to gain an understanding of the existing user engagement practices in each e-Government project **Research Question:** This section answers research question 3.

SECTION B: STAKEHOLDER ENGAGEMENT **Purpose:** The purpose of this section is to determine when in the development process each system development stakeholder is consulted or engaged. **Research Question:** This section answers research question 3.	**SECTION C: USER ENGAGEMENT GUIDELINES** **Purpose:** The purpose of this question is to obtain the perceptions and opinions of the usefulness of the proposed user engagement guidelines to e-Government user adoption. **Research Question:** This section answers research questions 2 and 4.
SECTION C: USER ADOPTION **Purpose:** The purpose of this section is to determine which adoption factors influence the user's decision to adopt (or satisfaction of) an e-Government system (from the perspective of the development team). **Research Question:** This section answers research question 1.	**SECTION B: USER ADOPTION** **Purpose:** The purpose of this section is to determine the applicability and potential challenges of implementing the proposed user engagement guidelines in the e-Government context. **Research Question:** This section answers research question 1.
SECTION D: USER ENGAGEMENT GUIDELINES **Purpose:** This section relates directly to the proposed User Engagement Guidelines, to determine the applicability of these in e-Government context. **Research Question:** This section answers research questions 2 and 4.	**SECTION D: GUIDELINES AND ADOPTION** **Purpose:** The purpose of this section is to determine whether the potential implementation of the user engagement guidelines can positively influence e-Government user adoption. **Research Question:** This section answers research question 4.

6.4.6. Research Participants

As mentioned earlier in this chapter, the participants will consist of individuals from the e-Government systems development team of four (4) e-Government projects in South Africa.

Sampling Techniques and choice of sampling

Case Study Sampling: Convenience Sampling

As mentioned in **section 6.4.3.** above, Yin (1993) states that the selection of a case can be based on convenience, or ability to obtain access into the case. The selection of e-Government projects was based on Yin's (1993) option of case selection. This type of selection can be classified as convenience sampling – which is when the researcher collects data from participants who are readily accessible (Palinkas *et al*., 2015). This sampling technique was used due to the difficulty of obtaining access into government agencies. Therefore, the researcher was restricted to those cases which were made available by a gatekeeper.

Semi-Structured Interview Sampling: Criterion Sampling

The selection of the research participants, from each e-Government project, to take part in the online questionnaire (structured interview) and semi-structured interviews will be based on a criteria. Palinkas *et al*. (2015, p.536) states that criterion-sampling is "to identify and select all cases that meet some predetermined criterion of importance". Therefore, the criteria used to select the e-Government development respondents was the following:

- Experience of working on the development of the e-Government project under study
- Experience of working in an Agile systems development environment

Data saturation

Creswell (2014) states that in survey research, a sample size of 10% of the population is acceptable. However, in Qualitative semi-structured interviews, there is no minimum threshold, hence the use of the data saturation principle. Therefore, one Agile e-Government practitioner from each project will take part in this research.

6.5. Research Methodology Selection Summary

This section will summarize the research methodology which this study will follow, by referring to the research onion by Saunders *et al*. (2012). This research will make use of the Post-Positivism research paradigm, which leads to a Mixed-Methods, Multiple Case Study Methodology; comprising of structured and semi-structured interviews. **Figure 6.13** below is an adapted research onion, which illustrates the research methodology selection of this study.

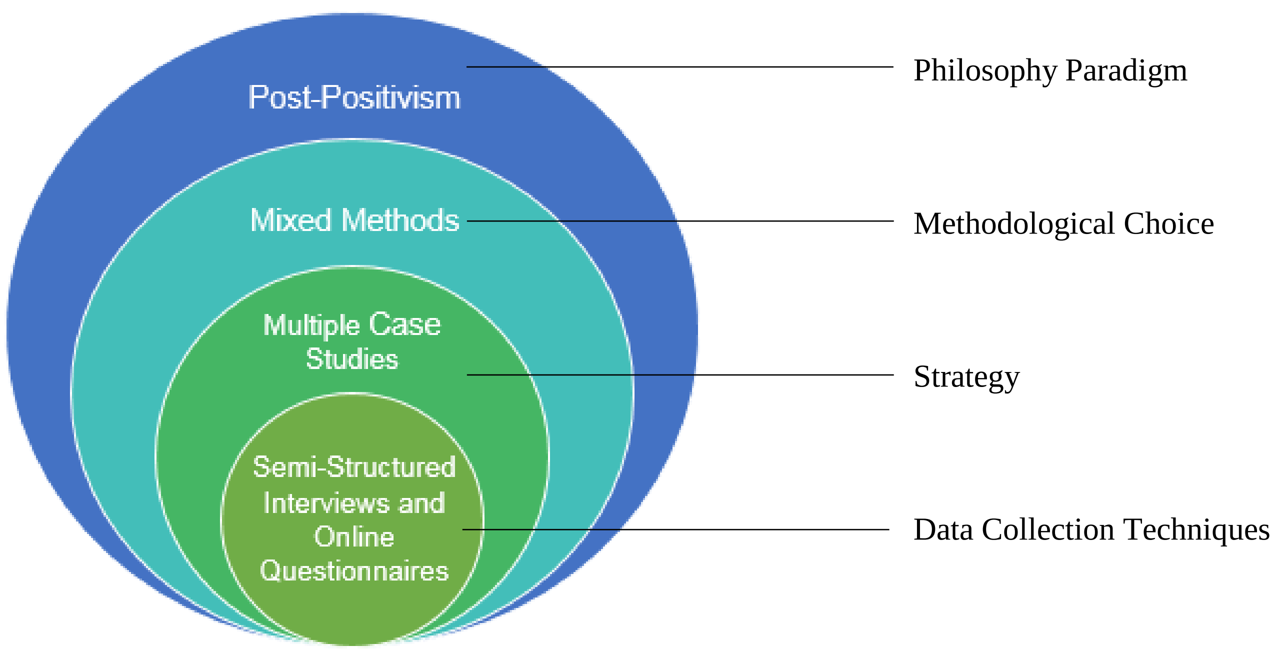

Figure 6.13: Adapted research onion representing current study

6.6. Piloting the Research Instrument

For the purpose of validity and reliability, the research instruments that will be used in this study, mentioned in the preceding section (**section 6.4**), will be piloted (or pretested) to ensure that the instruments used are appropriate, comprehendible to the participants: and to minimize any shortfalls of the instrument (van Teijlingen and Hundley, 2002; Hilton, 2017). However, the data obtained from pilot tests cannot be included in the actual results of the study as obtained in the data collection procedure (van Teijlingen and Hundley, 2002).

Hilton (2017) defines pretesting as the process of examining that the questions in the research instruments are understood, in order to improve the response rate. Hilton (2017) goes on to further recommend that pretesting should consist of the following aspects:

- "Respondents thinking out loud while completing the test questionnaire"
- "The interviewer introducing probe questions to check that the questions are understood and being interpreted as intended".

Therefore, following the Hilton (2017) method above, the test research instruments will be sent to test participants. These questionnaires will consist of a comments section below each question, probing the participants to note whether each question reads well.

Van Teijlingen and Hundley (2002) highlight that the participants used in the pilot test cannot be used as the participants for the main data collection procedure – as these individuals would have already seen the research instruments. Therefore, the test participants will be Agile Systems Development practitioners; but not e-Government personnel – as the sample size of the main respondents is too small, and data obtained would be too valuable to discard.

The piloting procedure will follow that recommended by Peat *et al*. (2002, cited in van Teijlingen and Hundley, 2002, p.4):

- Administer the questionnaire to pilot subjects in exactly the same way as it will be administered in the main study
- Ask the subjects for feedback to identify ambiguities and difficult questions
- Record the time taken to complete the questionnaire and decide whether it is reasonable
- Discard all unnecessary, difficult or ambiguous questions

- Assess whether each question gives an adequate range of responses
- Establish that replies can be interpreted in terms of the information that is required
- Check that all questions are answered
- Re-word or re-scale any questions that are not answered as expected
- Shorten, revise and, if possible, pilot again.

The researcher will send the (i) Pilot questionnaires to respondents who represent the main research participant groups, along with (ii) Invitation to participate letter; (iii) Informed consent form; and the (iv) Research information document (see Appendix A to H). Therefore, the pilot participants will consist of Agile systems developer practitioners.

6.6.1. Feedback from Pilot Questionnaires

The pilot participants (Agile practitioners) generally expressed satisfaction with the data collection instruments, stating that these could yield some insightful findings. However, the pilot participants offered the following recommendations below to the research instruments, which will inform the changes to the final version of the research instruments (see **Appendix A** to **E**).

Part 1 (Project Team Questionnaire)

Section A: Demographics

Question 3: Add "Operations" as one of the team members. This is someone who works with the software in a live environment, and interacts more directly with the client. The question should indicate that only one option may be selected.

Section B: Stakeholder Engagement

Question 9 and 13: Add "Operation / DevOps" as one of the stakeholder options after question 9 and 13.

Section C: User Adoption

Question 19: Add "Cost of the product or software" as an adoption factor.

Part 2 (Project Team Interview)

Section A: Background and Experience

Include a question which assesses the extent to which user engagement impacted development, with regards to allocating resources to attend to user issues (changing requirements); and how this influences user satisfaction and e-Government system quality.

Section B: User Adoption

Question 6: The pilot participant indicated that this question may be repetitive as it was asked in the questionnaire (Part 1).

Perhaps question 6 and 7 can be merged into one question which seeks to identify how the e-Government project team addressed, if they did, the listed adoption factors during the development of their e-Government system.

6.7. Ethical Clearance Procedure

According to the Rhodes University Ethical Standards Handbook (Rhodes University, 2014, p.24), research involving human participants should indicate how the following ethical areas will be addressed in the particular study:

a. Information to participants
b. Informed consent of participants
c. Activities involving participants that require additional attention
d. Activities that require particular attention
e. Privacy of participants
f. Anonymity of participants and confidentiality of data
g. Risks and benefits
h. Publications

Therefore, in abiding with the abovementioned ethical standards, this research has addressed each area as follows:

a. All participants were given a "Research Information" document (**Appendix C**), which consists of a brief description of the research: researcher details; purpose of research; purpose of participation data collection procedure; and matters pertaining to the confidentiality of the participant.
b. The research has provided all participants with a consent form to sign, before they can take part in the study. The consent form stipulates that participation in this research is voluntary, and that participants have the permission to withdraw from the study at any point.
c. All research participants will be acting as individuals, not groups, which means that permission from a person of authority was not required. Therefore, each participant was required to consent on their own behalf.
d. As this research does not consist of "deception of participants, concealment or covert observation; exposing participants to more than minimal risks; innovative therapy or interventions; or indigenous medical systems", part D of the ethical standards above was not applicable for this research (Rhodes University, 2014, p.31).
e. To ensure the privacy of all participants, all data will be kept confidential, with the identity of the participant protected.
f. Participants will be informed of the data collection procedure, and how the data collected will be stored and handled in confidentiality, by only the researcher and research supervisor.
g. The risks and benefits of the research have been explained to the participant in the research information document (**Appendix C**), prior to the participant providing consent.
h. The potential publication of the research has been explained to the participant in the research information document (**Appendix C**), prior to the participant providing consent. Privacy and anonymity of the participant will be maintained throughout research publications.

In addressing the above ethical standards, and providing supporting documentation (**Appendix A** to **C, F** and **G**), the Rhodes University Ethical Standards Sub-Committee, from the Departments of Information Systems and Computer Science, has approved this study (see **Appendix H**).

6.8. Data Analysis

This section will explain how the data collected using a Mixed-Methods approach will be analyzed, in quest to answer the research question: *How can an Agile Systems Development approach enhance e-Government user engagement, in support of greater user adoption?*

According to the Concurrent Triangulation Mixed-Methods Design by Creswell and Clark (2007), Qualitative and Quantitative data analysis should be done in parallel, after the collection (see **Chapter 7**). This is then followed by comparing and contrasting qualitative and quantitative findings in order to produce the interpretations which will strengthen, or refute, the proposed User Engagement guidelines (see **Chapters 8** and **9**) (Creswell and Clark, 2007).

6.8.1. Analysis of Qualitative data

Qualitative data analysis is the ongoing process of trying to make sense of the data (Bradley *et al*., 2007). This often results in multiple interpretations – which require for the researcher to determine the analysis technique that is most suitable for the purpose of the research (Cohen, Manion and Morrison, 2007). Qualitative data interpretations can seek to either "describe, summarize, discover patterns, generate themes, discover commonalities or differences" among other things (Cohen, Manion and Morrison, 2007, p.461). The choice of interpretation can guide the method of analyzing and writing up the data (Cohen, Manion and Morrison, 2007).

According to Lacey and Luff (2009), there are two (2) prevailing Qualitative data analysis approaches: Grounded Theory, and Framework Analysis (also known as Content or Thematic Analysis). Bradley *et al*. (2007) state that the Grounded Theory approach follows an inductive approach to establishing codes for generating theory. The latter is more deductive, making use of pre-determined codes to guide the analysis process for obtaining descriptive interpretations (Lacey and Luff, 2009). Thorne (2000) explain inductive reasoning as the pursuit to use data to develop ideas, whereas deductive reasoning is the process of testing ideas or concepts.

As the aim of this research is not to develop a new theory, as the Grounded Theory approach intends, but rather to test the proposed User Engagement guidelines (Thorne, 2000); the data analysis approach which will be followed is the deductive, Framework Analysis, or Thematic Analysis approach.

The Thematic Data Analysis approach consists of the following stages by Gale *et al*. (2013, p.4), which will be observed in analyzing the qualitative data collected from the semi-structured interviews of the e-Government project team members:

i. **Transcription:** In order to become familiar with the content of the interview, the researcher should undergo a process of reproducing the interview audio-recording into written form. This enables the researcher to identify themes and have a general understanding of the data obtained. Saunders *et al*. (2012, p.551) state that the researcher can choose to “only transcribe those sections of each audio-recording that are pertinent”.
ii. **Familiarization:** This step entails the researcher going through the interview recordings and transcriptions to reacquaint themselves with the data.
iii. **Indexing (or coding):** The data transcribed in the first step is then dissembled and sorted into the various pre-defined codes, phrases or labels. Gale *et al*. (2013) highlights that the researcher should be open to identifying new codes that may emerge during analysis. These codes are identified from prevailing issues which emerged from the research, and should be refined iteratively as other themes arise during data analysis.
iv. **Identifying a thematic framework:** The researcher will then develop a framework with the initial codes, and group these into categories (or themes) which are relevant for answering the research questions. This can be done in table form or in the form of a tree diagram (Gale *et al*., 2013).
v. **Charting:** In this step, all the data that was previously grouped into various themes is presented on a dataset in a comprehensible manner, according to cases or respondents.
vi. **Interpretation:** Finally, qualitative data should be interpreted by presenting the links or associations between the data themes, and what this means for the research questions. The researcher can focus on specific themes which answer the research questions; and interpret these findings.

The common limitations of the Thematic (Framework) Analysis approach of overlooking themes that appear more often in the data, such as researcher bias in identifying themes, are cited as impeding the reliability and validity of the research findings (Lacey and Luff, 2009). Therefore, the researcher has addressed each of the following validity tests as indicated in **table 6.6** below.

Table 6.6: Case Study Design Tests (Adapted from Yin, 2003)

Validity Tests	Case study tactic	Relevant phase of research	Relevant section in this research
Construct Validity	• Use Multiple sources of evidence	• Data collection	• Section 6.4.5
External Validity	• Use replication logic in multiple case studies	• Research Design	• Section 6.4.3
Reliability	• Use case study protocol • Develop case study database	• Data collection • Data collection	• Section 6.4.5 • Section 7.2

Therefore, in order to strengthen the research reliability and validity, and demonstrate rigor, the researcher made use of data triangulation in the form of collecting quantitative data – which will reinforce the qualitative data findings. The analysis of the quantitative data is explained in the following sub-section below.

6.8.2. Analysis of Quantitative data

Quantitative data can be grouped into two types of data: Categorical and Numerical; with Categorical data being data that can be divided into various categories – such as gender or age groups, and Numerical data being data that can be counted or measured numerically (Saunders *et* *al*., 2012). Each one of these different data types determine the data analysis technique a researcher may apply.

As the data which will be collected from the e-Government project development project team members through the online questionnaires (see **Appendix F**) is Categorical, by definition (Saunders *et al*., 2012), such data will be analyzed using Categorical data analysis methods – such as Descriptive statistics (Patel, 2009).

Descriptive statistics is a Quantitative Data Analysis technique used in describing categorical variables using frequency tables, percentages or proportions, and – subsequently – presenting this visually using a graph (Patel, 2009). Frequency tables indicate the number of times a particular category appeared in the data, while central tendency indicates the most occurring or middle values (using mean, median and mode) as the central tendency measures (Patel, 2009).

The quantitative data collected online through Google Forms is automatically ordered and stored in table format, and is ready for analysis by the researcher (Saunders *et al*., 2012). Similar to the qualitative data analysis method, once this data is ordered, it can be analyzed and grouped into a set of pre-determined codes, which will enable for the presentation and interpretation of the data (Saunders *et al*., 2012).

As a triangulation Mixed-Methods approach is used in this research, the researcher will make use of Qualitative codes that are similar to the Quantitative codes, to enable for triangulation, analysis and comparison of data.

6.9. Conclusion

In this chapter, the research methodology that will guide the investigation into e-Government user adoption was outlined. This chapter commenced with the presentation of the widely-referenced Research Onion, by Saunders *et al*. (2012), with its multiple research methodology layers. The researcher made use of this onion to explain each layer of the research methodology of this thesis, starting with the Philosophical Paradigm (Philosophy) layer.

The selection of a Post-Positivist paradigm, over the Positivist, Interpretivist, and Critical Realist counterparts, paved the way for the selection of the subsequent layers of the onion. As a result, the methodology, strategy, and techniques layers were influenced by the choice of Post-Positivism.

Therefore, after consulting with literature on research methodologies, the researcher made the selection of a Mixed-Methods design – which is the typical choice for a Post-Positivistic worldview.

In a similar way, the choice of research strategy and techniques were informed by the overall research objective of this thesis: "*to contribute towards improving the user adoption of e-Government systems, through the development of Agile Systems Development (SD) informed user engagement guidelines*". Therefore, the selection of a multi-case study approach, using both an online questionnaire, and semi-structured interviews, was made to enable the researcher to obtain data from different South African e-Government projects.

The use of this Concurrent Mixed-Methods design will strengthen the validity of the data findings, through the ability to compare, contrast, and triangulate the findings – which will either confirm or refute the contribution of the proposed guidelines for improving e-Government user adoption.

The chapters which follow will make use of this research methodology to collect, analyse, interpret the data, so as to refine or verify the Agile-informed User Engagement Guidelines.

CHAPTER 7: RESEARCH RESULTS

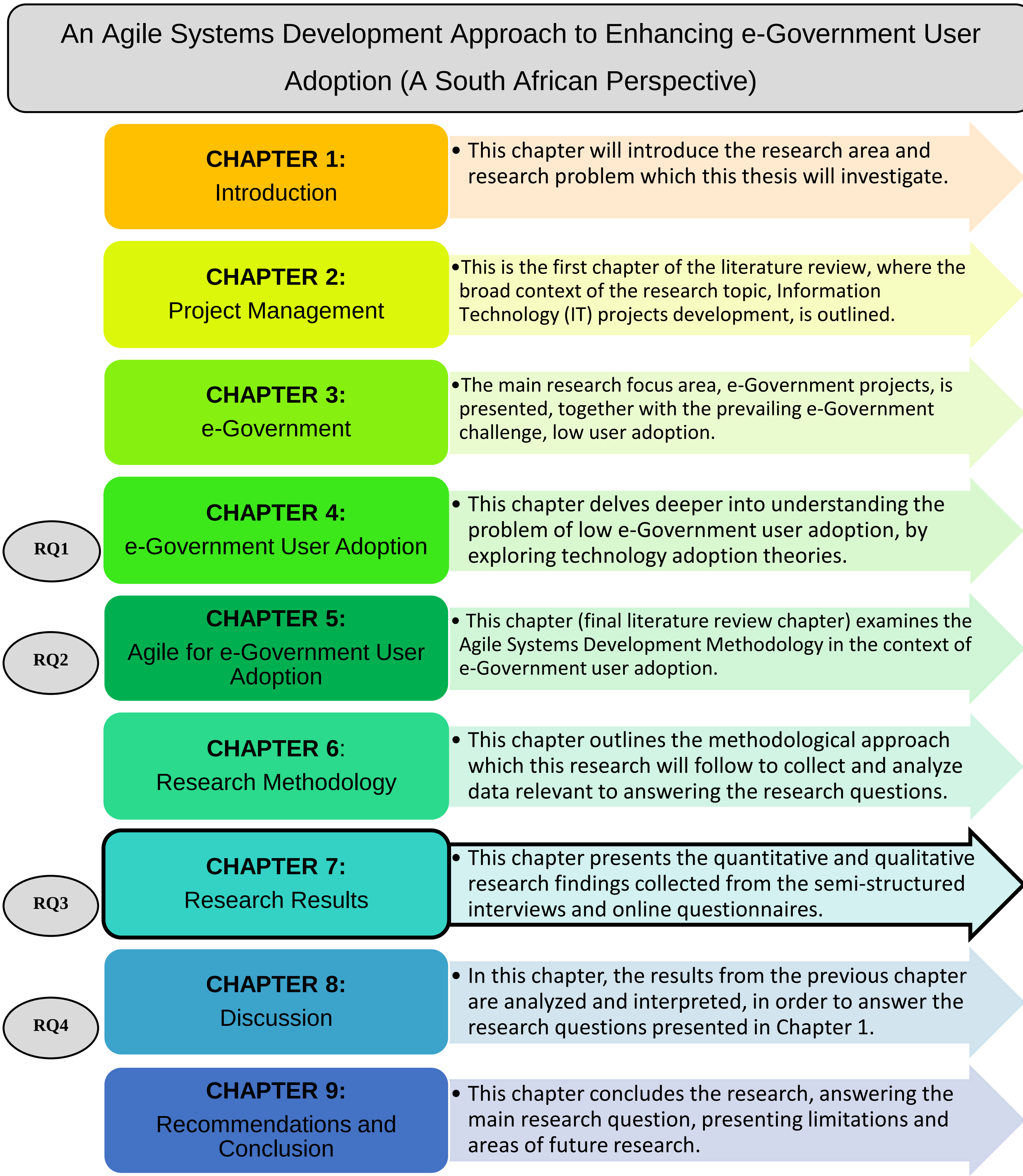

Figure 7.1: Chapter 7 Thesis Structure

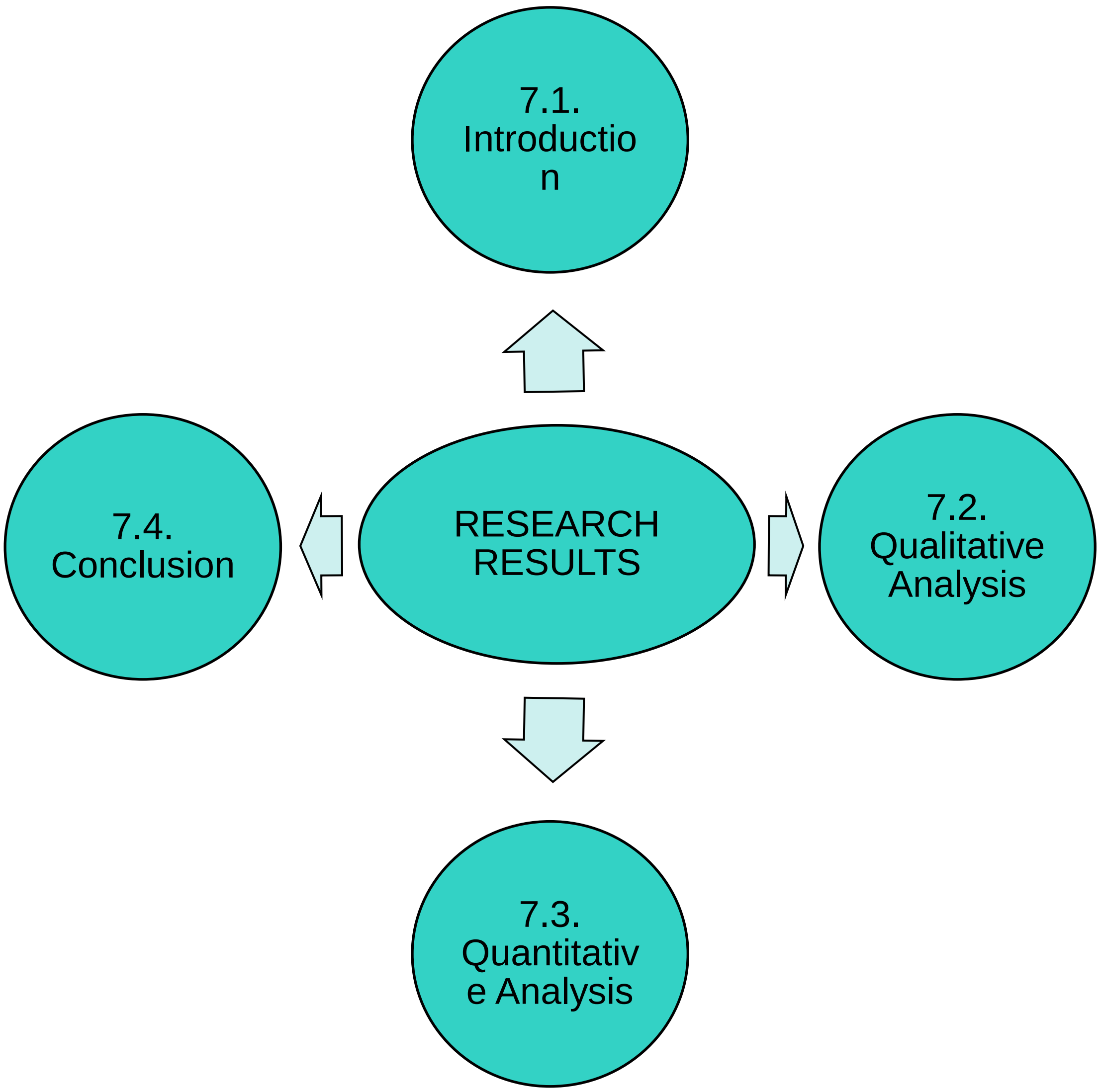

Figure 7.2: Chapter 7 Outline

***Abstract**: This chapter presents the Quantitative and Qualitative research findings from four (4) South African e-Government projects, collected using semi-structured interviews and an online questionnaire.*

7.1. Introduction

This chapter will present the results obtained through the two (2) data collection procedures used in this research – namely online questionnaires, and semi-structured in-depth interviews. The data collection procedures used were explained in greater detail in **section 6.3 to 6.4** in the previous chapter. The data presented in this chapter was collected from four (4) e-Government cases, as mentioned in **section 6.4.3**; where each case was represented by a member of a South African e-Government project.

As this research makes use of a Mixed-Methods design (selection of which was justified in **section 6.4.2** in the previous chapter), the data from each of the cases is analyzed and presented separately into the two different data groups: Qualitative and Quantitative.

The analysis of this data was informed by the themes and codes derived prior to the data collection process. Therefore, these themes will enable the researcher to organize and analyze the data, in order to answer the research questions presented in **section 1.5** of **Chapter 1**.

As this research followed a Concurrent Mixed-Methods Approach, the data collection and analysis took place separately as illustrated in **figure 7.3** below. Each of the data collection instruments will be analyzed separately in this chapter. The results obtained from these two data collection methods will be compared and interpreted in the following chapter (**Chapter 8**), in accordance with the Concurrent Mixed-Methods design by Creswell and Creswell (2017).

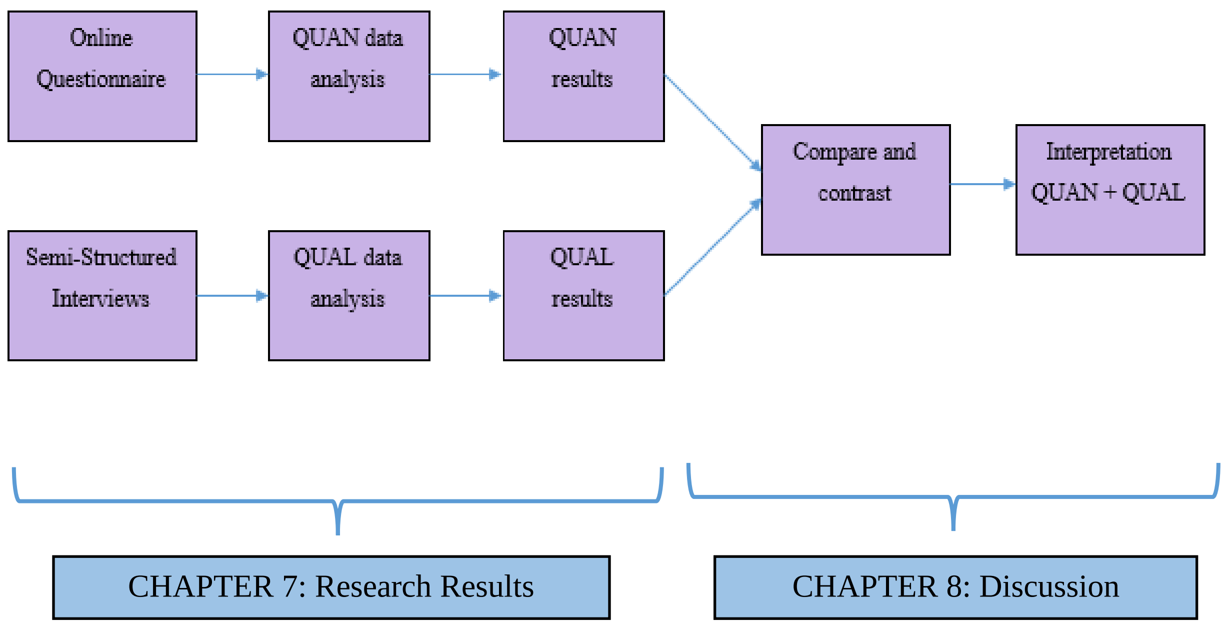

Figure 7.3: Concurrent Triangulation Mixed-Methods Design (Adapted from Creswell and Creswell, 2017)

7.2. Qualitative Analysis

As indicated in the previous chapter, a total of four (4) South African e-Government projects formed the basis of the data collection of this research. In each project a member from the e-Government system development team was consulted. The purpose of the qualitative data collection phase was to go into depth with regards to the proposed user engagement guidelines, and determine whether the participants believed that these can positively influence (improve) e-Government user adoption. This data collection phase was conducted through the use of semi-structured interviews with a member of the various e-Government project teams. These interviews were very rigorous and time consuming, where the researcher probed beyond the interview schedule, in order obtain an understanding of the e-Government and Agile systems development context. As a result, each interview between the researcher and the project team member took an average of 45 minutes.

As presented in the previous chapter, the Case Study approach was used to gather data relevant to answering the research questions. **Figure 7.4** below is an adapted version of Yin's (1994) Case Study Method, illustrating the procedure used in this research.

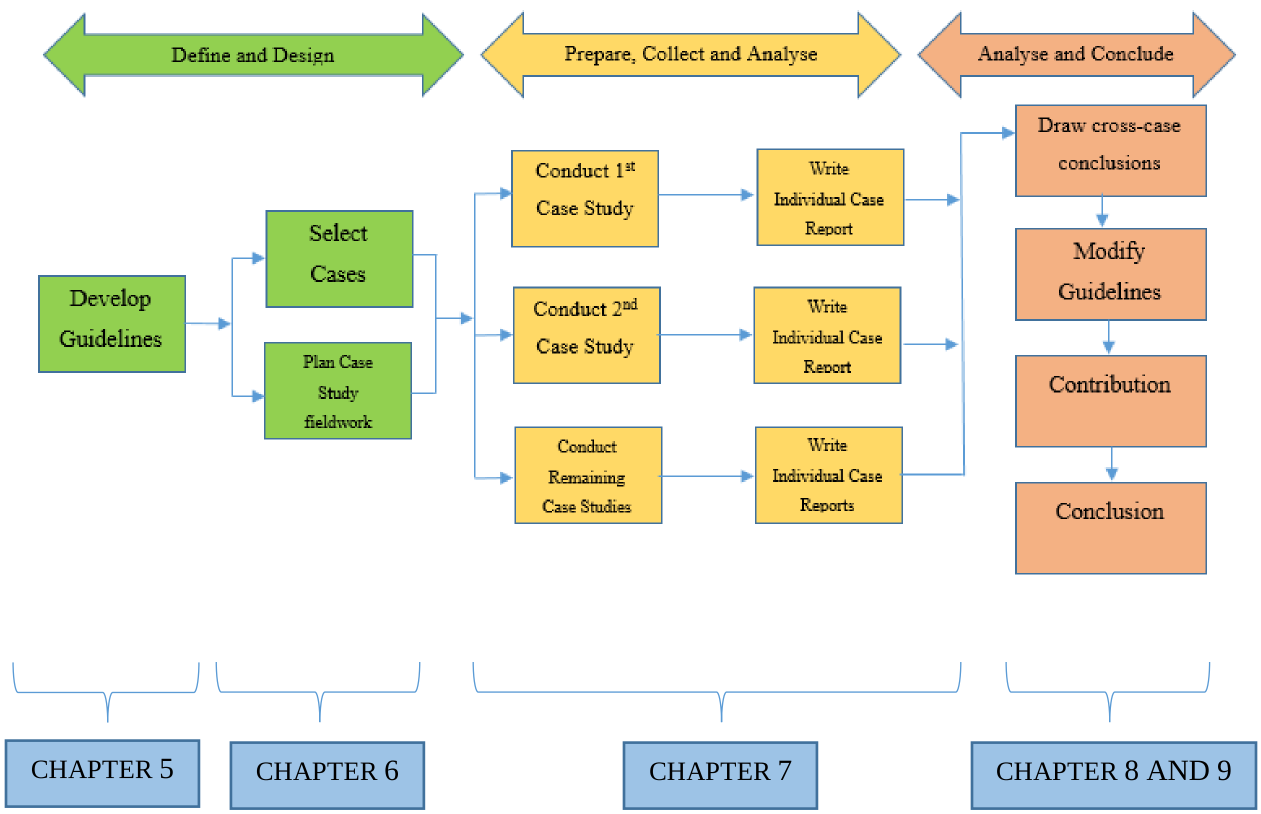

Figure 7.4: Case Study Method (adapted from Yin, 1994)

The *Define and Design* steps (green section on **figure 7.4**) were completed in the previous chapters, Agile (**Chapter 5**) and Research Methodology (**Chapter 6**).

The *Prepare, Collect and Analyze* steps (yellow section on **figure 7.4**) will be presented in the following sub-sections – where the findings of each case are to be discussed in detail. The final steps of Yin's (1994) case study method *Analyze and Conclude* (orange section on **figure 7.4**), will be presented later in the following chapters, Discussion (**Chapter 8**) and Conclusion (**Chapter 9**) respectively.

The South African e-Government cases that were selected ranged between municipality procurement (supply chain management) systems, hospital electronic health systems, and mining compliance systems; to internal local municipality fault / case reporting systems.

For the purpose of confidentiality and anonymity of the various projects and the participants, the projects will be referred to as Case 1, Case 2, Case 3, and Case 4, and the government departments or project names will not be mentioned.

The results from the interviews with the various e-Government projects are presented in the following sub-sections, with each case summarized, in table format, at the end of every section.

7.2.1. CASE 1: MUNICIPALITY PROCUREMENT SYSTEM

Case 1 was an internal procurement management system developed for a local municipality. The purpose of this system was to automate the process of requesting or making purchases, and processing tenders. This system was designed to be used by anyone in the municipality who sought to make a purchase order.

e-Government User Engagement Current Practices

The current user engagement practices followed by the project team – during the development of this Procurement system – were very much in line with the Agile-informed User Engagement guidelines proposed in this research, and not the traditional Waterfall approach. The user engagement process in Case 1 was informed by an Implementation Manual, which stipulated all the steps of the development, the various stakeholders involved in each step, as well as their level of involvement. The stakeholders that took part in the development process were: the head of the Supply Chain Management Unit and buyer; the tender administrator; the Chief Financial Officer (CFO) of the municipality (as the Process Owner); and the end users.

The user engagement process was initiated by a meeting with the key stakeholders to inform them of the new e-Government system – and how this new system might affect them. This step was intended to reduce any potential resistance as early as possible. Subsequently, the project team and stakeholders met daily to obtain information about the user requirements and context. On a weekly basis, the project team would then demonstrate the most recent functionality of the system to the stakeholders.

The participant (who played the role of Business Analyst (BA) in the project team) stressed the importance of establishing a good relationship with the client, beyond the formal business relationship, as a way of ensuring that the client feels comfortable enough to converse with the project team about any disgruntlements.

e-Government Adoption Factors

The participant felt very strongly that there were three dominant factors, which have an impact on the user adoption of an e-Government system. Firstly, if the users do not understand how the system works, and feel uncomfortable using it, then this will have a negative effect on the user's willingness to adopt that system. During the development of this Procurement System in Case 1, the project team ensured that they provided the users with constant training, through the use of system guides (user manuals), group training sessions as well as individual training sessions. The project team were able to enforce such rigorous training, as they had signed a constant training and support contract, in addition to the system development agreement with the municipality.

Secondly, the participant indicated that the type of technology available plays a role in the ease of adopting an e-Government system. On this project, some users could not effectively make use of the new system due to old computers and low internet connectivity. Therefore, to ensure that all users can effortlessly make use of the system, the project team consulted with the municipality IT department to upgrade the infrastructure hindering adoption.

Lastly, and most importantly in the government context, the participant expressed that the transparency of the system and, thus, the ability for management to monitor and micromanage how, when and by whom the system was being used – had a large influence on the user adoption of the system.

Guideline 1 (Requirements Gathering)

As mentioned in the preceding paragraphs, Case 1 made reference to the Agile practices during their development process. This meant that the project team was able to start the development process by creating a Requirements Specification document which contained diagrams and flow charts of how they envisaged the system within the scope. They would then present this to the end users, Process Owner, and Project Sponsor (CFO of Municipal manager), for approval or amendment. These requirements are not finalized, as they can change throughout the project and after the users have made use of the system.

The potential challenge of this guideline is ensuring that the documentation of these requirements is done in such a way that the users can understand. The participant went on to suggest that most e-Government requirements documents are too high-level for the users to understand – while in this particular project, the team managed to ensure that the requirements were presented in a manner that could be understood by the users.

Another challenge with soliciting input from different stakeholders is that there may be differences between their needs or requirements of the system. Therefore, the project team is required to resolve these differences and settle on a set of requirements.

When asked about the impact of Guideline 1 (Requirements Gathering) on user adoption: the participant indicated that this is a relevant step in the systems development process, as it enables the project team to understand what the client wants; and for the client to understand and agree on what the project team intends to provide.

Guideline 2 (Product Prototypes)

Subsequent to soliciting the user requirements, the project team started modelling the system and demonstrating it to the users. This step took place during the three (3) months of requirements gathering. The purpose of this was to demonstrate the system iteratively, and to show how it related to the requirements that were presented by the users. This was an opportunity for the users to see the various screens and layout of the system, and then comment on them.

According to the participant, this guideline has a positive impact on user adoption because it ensures that the client buys into and accepts the system while it is being developed.

Guideline 3 (Product Testing)

The participant indicated that when developing an e-Government system using an Agile approach, such as the one proposed in this research, the developers need to test the system iteratively before demonstrating it to the users; and once the system is complete, rigorous testing can take place. Subsequent to the testing, the project team initiates the training of the end users.

However, the participant perceives one of the implementation challenges of this guideline as the disparity between the system being tested and the final system being rolled out. The participant believes that once the users see the rolled out version of the system, it is often perceived to be very different in practice, to the original system; where steps are added or omitted.

Guideline 4 (Product Feedback)

The participant expressed that feedback on the product can be solicited by the project team once the users start making use of the system. Here, the users can comment on what they think about the system.

Guideline 5 (Changing Requirements)

In Case 1, Guideline 4 and 5 were almost seen as related, as Guideline 5 entailed the project team going back and forth to enforce the changes (or feedback) expressed by the users.

The participant indicated that one of the success factors of the project was the ability to quickly respond and build in the new requirements without the need to redesign or introduce a new release of the system.

This had a positive impact on user adoption because it enabled the stakeholders to develop a sense of ownership and buy-in of the system, by being able to suggest changes to their system.

Guidelines and Adoption

When probed for comments on the impact of the proposed guidelines, for improving e-Government user adoption, the participant indicated that this (User Engagement guidelines) is an effective methodology and a better way of working, due to the evolution of the IT industry. The participant stated that using the traditional systems development methodology in previous projects resulted in challenges such as: the project taking too long; the client not being involved in the development process (not understanding what the project team was working on). As the participant currently follows similar practices to the proposed guidelines, the participant mentioned that they can now constantly engage with the client on every level, and keep the client informed of the system.

In addition to the guidelines, the participant recommended the inclusion or emphasis of Constant Communication on the guidelines. This ensures that the client and project team are in agreement with what the system will contain. The participant strongly believes that the failure to enforce effective and constant communication is one of the main reasons for failed e-Government system implementation.

The summary of findings from Case 1 are tabulated below in **table 7.1**.

Table 7.1: Summary of Case 1 Results

	Theme	Findings
1	e-Government User Engagement Current Practices	• Agile, not traditional Waterfall approach. • User engagement informed by Implementation Manual. • Initiate user engagement by meeting with key stakeholders to minimize potential resistance. • Establish good client relationship, beyond formal business relationship.
2	e-Government Adoption Factors	• User's ability to, and comfortability with using the new system: project team provided users with constant training. • The type of technology: old and low internet connectivity hinders effective use of new system. • Transparency of the system: enabling management to monitor and micromanage use of new system.
3	Guideline 1 (Requirements Gathering)	• Creating and presenting Requirements Specification document to stakeholders for approval or amendment. • Challenge: Ensuring requirements documentation is not too high-level for users to understand. • Challenge: Disparity between different stakeholder's requirements. • Adoption: Relevant guideline, enabling team to understand client needs.
4	Guideline 2 (Product Prototypes)	• Project team modelling and demonstrating system to users, iteratively (weekly basis). • Demonstrate how system relates to user requirements. • Adoption: Positive impact on user adoption (ensures client buy-in) and acceptance of system.

5	Guideline 3 (Product Testing)	• Developers test system iteratively before demonstration. • Rigorous testing after completion of system. • End user training takes place after final product testing. • Challenge: Expectations management (disparity between old and new system).
6	Guideline 4 (Product Feedback)	• Feedback solicited once users start using system. • Users comment on what they think about system.
7	Guideline 5 (Changing Requirements)	• Guideline 4 and 5 seen as related (enforcing changes expressed by users). • Success factor: ability to respond quickly and build in new requirements without redesign and new release of the system. • Adoption: Gives stakeholders sense of ownership and buy-in.
8	Guidelines and Adoption	• Guidelines are better way of working as IT has changed. • Traditional approach: project taking too long and client not involved. • Adoption: can now constantly engage with client on every level. • Include: Constant communication (lack of, results in failed e-Government projects).

7.2.2. CASE 2: HOSPITAL ELECTRONIC HEALTH SYSTEM

This e-Government system was intended to provide doctors and pharmacists with the ability to record patient information, such as treatment, prescription and discharge, among other activities, so as to replace the paper-based system.

e-Government User Engagement Current Practices

The user engagement practices on this project followed those recommended by the Agile systems development methodology. In other words, the user engagement practices on Case 2 were on par with the User Engagement Guidelines proposed in this research.

The project started with a meeting between the project team (systems development team), the intended users of the system (a team of doctors and pharmacists), the product owner and the system testers (to flesh out the system requirements). This process took between a month and a month and a half.

Each sprint, which was two weeks long, was concluded by a demonstration of the system. During this stage, the users were able to play with the system and provide comments, feedback and recommendations to the project team. The project team would then meet with the product owner (a representative of the users at every sprint) to review and prioritize the feedback obtained from the users during the demo.

e-Government Adoption Factors

The findings from Case 2 reflect how various factors contributed to the adoption of their system. Firstly, making the system mandatory for all doctors and pharmacists in the hospital ensured that there is a high uptake of the system. Secondly, the project team member alluded to the fact that the younger aged doctors were most willing to adopt the system, compared to the older doctors, who were more comfortable using the familiar paper-based system. Therefore, in order to minimize adoption resistance, the users were introduced to the system as early in the development process as possible.

The participant indicated that the usefulness and user friendliness of the system contributed positively to the adoption and satisfaction of the system. To achieve this, the project team ensured that the new system was very intuitive (similar process flow to the paper-based system), and had as few clicks (transitions) as possible to make it quicker and easier to use.

Finally, an adoption factor that was presented in Case 2 was that of the platform required to use the system. This adoption factor looks at the ease of access to the system. Therefore, in order to ensure the system was readily available and easy to access, the development team ensured that the system could be accessed on office laptops or desktop computers; as well as on iPads and mobile devices. This ensured that the doctors could use the system while on the move, as they had done with the paper-based system.

Guideline 1 (Requirements Gathering)

It was crucial to know that the intended users of the system were doctors and pharmacists, so that they could be included in the development process of this health system. The development team member posited that the system could not be built, and would not exist, without the input from the users.

As touched on in the preceding paragraphs, the requirements gathering process in Case 2 entailed conducting meetings with all the stakeholders (development team, doctors, pharmacists), who provided input of what they required from the system. The Business Analyst, from the development team, was tasked with documenting all the requirements presented in this session: while the System Architect was tasked to determine whether the requirements would enable the system to integrate seamlessly with the other systems.

However, the challenge with implementing this guideline in Case 2 was that of getting all the stakeholders to meet at the same time to solicit the system requirements. In addition to this, as all stakeholders had a voice in the requirements gathering phase, all the stakeholders needed to agree on the proposed system requirements, before the system requirements could be finalized.

The failure to implement this guideline in the development of e-Government systems could have a negative impact on the user adoption of the system – as the stakeholders would feel that they were not involved.

Guideline 2 (Product Prototypes)

Similar to the Agile systems development methodology, the participant indicated that the project team conducted product prototyping throughout the development of the health system.

The development team, the system testers, the product owner, users (team of doctors and pharmacists), and anyone who was interested, would meet to view the demonstration of the system at the end of each sprint (every two weeks). During the demonstration, the developer or analyst would present what was planned and completed for that particular sprint, and explain how the system works. This would be followed by the stakeholders viewing and playing with the system and providing any comments.

The participant mentioned that the challenge with product prototyping during the development of e-Government systems is ensuring that all the stakeholders are present during all demo sessions; and they all present any issues or system bugs for that particular system prototype.

According to the participant, the failure to implement this guideline throughout the development of e-Government systems, means that the development methodology takes on a traditional Waterfall type of process – which does not make use of iterative user involvement.

Guideline 3 (Product Testing)

The Product Testing that took place in Case 2 entailed testing the e-Government system iteratively, two (2) or three (3) days before the end of each sprint. The system developers would test the system before sending it for quality assurance. The Testers would then proceed with in-depth functional and non-functional testing. Finally, the Business Analyst would conduct a User Acceptance Testing session with a sample user group.

The users were able to partake in the product testing phase once the system was deployed to a server, three (3) months into the project. This enabled the users to test the system in their own time and send the development team feedback of any bugs or issues identified. The user's feedback from testing was treated in the same manner mentioned in the Product Prototyping guideline above, in that it was added to the backlog and prioritized with the product owner.

The challenge experienced with implementing this guideline in Case 2 was securing a team of dedicated, qualified testers, who could thoroughly test the system – beyond the high-level User Acceptance Testing done by the Business Analyst.

Another challenge was product testing with the users – who may not understand that testing in an Agile context is an iterative process. This means that the users would be required to test the same functionality repeatedly. Product testing with the users also entailed managing the users' expectations regarding what can, and cannot be fixed, or added to the following sprint.

Failure to test the system is similar to the failure to prototype (or demo) the system – in that the users will not have a chance to test that the system meets their requirements, and works as they would like for it to work. Subsequently, this would have a negative impact on the user adoption of the e-Government system.

Guideline 4 (Product Feedback)

According to the participant from Case 2, product feedback followed the prototyping and testing phases – where the comments and recommendations from the various stakeholders were documented. The Product Owner would take part in this phase to assist the project team with fleshing out the comments and recommendations from the users. These new requirements were then added to the product backlog: and at the following sprint planning session, the project team would decide on which of those requirements to add to the upcoming sprint.

However, the challenge with this guideline in an e-Government context is that while all stakeholders are allowed to present their feedback, once the project team prioritizes the feedback into new requirements, the feedback provided by others may have been disregarded. This challenge is also related to managing the expectations of the stakeholders.

Soliciting user feedback after each sprint has a positive impact on user adoption, because this allows the users to reiterate or re-emphasize what is important to them – and what they want from the system.

Guideline 5 (Changing Requirements)

The participant from Case 2 asserted that the ability to change requirements is the cornerstone of the Agile systems development methodology – as Agile is seen as an adaptable development approach.

However, in an e-Government context, changing the requirements means that the project scope has changed – requiring more resources (time and / or money). Therefore, in order to ensure that the users had an opportunity to change the system requirements, the project team on Case 2 would ensure that any changes made to the project would still enable the project to meet the time allocations. While any changes to the requirements needed to be signed-off by a government official, the users were educated to understand that any new or changing requirements could only be accommodated if they replace existing requirements so as to ensure that the project did not exceed the specified time.

A challenge of implementing this guideline was that the project team was working according to the Agile principles – while the government does not typically observe Agile practices – and instead set a project budget and determined the functions and features that they expected from the system. This approach is similar to the traditional Waterfall systems development approach, which gives users minimal input in the development of their system.

Guidelines and Adoption

The participant from the project team expressed that the proposed Agile-informed User Engagement Guidelines were very practical and relevant for the e-Government systems development context. In addition, the participant indicated that these guidelines are the fundamentals of Agile and the cornerstone of good systems development.

A recommendation and emphasis made was on ensuring that all the stakeholders are constantly engaged throughout the entire systems development process so as to minimize any user adoption resistance as early in the project as possible. As implementing some of these guidelines could present a host of challenges in the government context, the participant still recommends that all e-Government project teams follow these guidelines when developing their systems – even if the guidelines are not followed perfectly.

The summary of findings from Case 2 are tabulated below in **table 7.2.**

Table 7.2: Summary of Case 2 Results

	Theme	Findings
1	e-Government User Engagement Current Practices	• Agile systems development methodology. On par with proposed guidelines. • Meeting with stakeholders to flesh out system requirements. • Demonstration of the system after each sprint (every 2 weeks), for users to play with system and provide feedback and recommendations. • Team meets with product owner to review and prioritize feedback.
2	e-Government Adoption Factors	• System mandatory for all - ensures high uptake. • Younger doctors most willing to adopt: Team introduced system as early as possible in development process. • Usefulness and user friendliness contributed to adoption and satisfaction. • Platform required to use the system (ability to use the system on the move).
3	Guideline 1 (Requirements Gathering)	• Meeting with stakeholders to collect their requirements for the system. • Business Analyst document requirements. • Challenge: Ensuring all stakeholders are available to meet at the same time. • Adoption: System cannot be built without input from users. Users must feel involved.
4	Guideline 2 (Product Prototypes)	• Stakeholders (project team, testers, product owner, doctors and pharmacists) and any interested parties view demonstration after each sprint (every 2 weeks). • Opportunity for stakeholders to view, demo, and provide comments on the system. • Challenge: Ensuring all stakeholders are present and submit any issues. • Adoption: Failure to implement means Waterfall approach (no iterative user involvement).
5	Guideline 3 (Product Testing)	• Users partake in testing once system is deployed, then send feedback or issues. • Challenge: Securing dedicated and qualified testers. • Challenge: Managing user’s expectations (what can and cannot be fixed). • Adoption: Allowing users to test whether system meets their requirements.
6	Guideline 4 (Product Feedback)	• Product owner and project team review and prioritize user feedback. • New requirements added to product backlog. • Challenge: Managing users’ expectations (not all feedback is used). • Adoption: Allows users to re-emphasize what they want and what is important.
7	Guideline 5 (Changing Requirements)	• Changes to requirements need to be signed-off by government official. • To stay within project scope, new or changing requirements can only replace existing requirements. • Challenge: Government operates in a Waterfall systems development approach and does not understand Agile principles of adaptability.
8	Guidelines and Adoption	• Guidelines are very practical and relevant for e-Government context (cornerstone of good systems development). • Recommendation: Stakeholders constantly engaged throughout entire development to minimize resistance early.

		• Recommendation: e-Government teams to follow guidelines, even if not followed perfectly.

7.2.3. CASE 3: MUNICIPALITY CALL CENTRE ISSUE REPORTING SYSTEM

The Call Centre Issue Reporting System is an internal Municipality system which was operated on a daily basis by the Call Centre agents (internal users) in order to log faults, or maintenance issues presented by the community (external users). This system enabled the agents to log the fault, and update the status of the fault once it has been resolved by a technician: and, thus, enabling the customer to receive status updates. This system was an integration between a system (provided by a networking hardware company) and the in-house active directory.

e-Government User Engagement Current Practices

The methodology of developing the issue reporting e-Government system in this municipality was not in accordance with the Agile best practices or principles. This project made use of a traditional Waterfall approach, whereby the product was only demonstrated at the end of the project and users were not granted the opportunity to test or change requirements throughout the project.

The user engagement which took place during the development of this Call Centre system was initiated by the requirements gathered from the system users (Call Centre agents) and management, in order to determine their expectations of the system. These requirements were communicated back to the external stakeholders: the outsourced systems development company.

Once this process was complete, the participant, who played the role of an Analyst (going between the stakeholders and the municipality management), would conclude the engagement by drafting a document of all the requirements of the system, from the various stakeholders.

e-Government Adoption Factors

The participant from Case 3 indicated that the users were highly dissatisfied with the existing system – citing that they experienced difficulty accessing certain functions; and, as a result, constantly advocated for the implementation of a new system to replace the existing one.

Therefore, the user's dissatisfaction with the existing system had a substantial impact on the positive response, adoption and satisfaction of the new system – which addressed their prior concerns.

The second factor that influences the adoption of e-Government systems is the quality, and ease of use of the system. The participant went on to further state that in order to ensure that the system is easy to use for the target user – the project team needs to include the users (the Call Centre agents) in the system development process. Another way to ensure that the system is perceived as easy to use, is to demonstrate the prototype of the system to the users – taking them through a step-by-step guide on using the system. In doing this, the users are more familiar and at ease with the system, and how to navigate around it, once it is finally deployed.

The participant also referred to the Agility of a system as a contributing factor to the user adoption of e-Government systems. This means that the ability for the system to respond to change (changing requirements) has a positive effect on the user adoption of that system – as users can recommend changes that address their issues or needs. However, this requires constant engagement with the users.

Guideline 1 (Requirements Gathering)

To reiterate what was mentioned earlier in this chapter, guideline 1 (Requirements Gathering) indicates that the system requirements and input should be solicited from the target users. The participant was then asked to provide their opinions pertaining to the practicality of this guideline, implementation method, challenges, and the guideline's impact on user adoption.

For that reason, the participant responded that gathering system requirements from the end users is feasible in the e-Government context – as the users are the individuals who will be using the system. The participant stressed the importance of allowing the user to provide the requirements, as they will be the ones using the system after all.

In Case 3, this guideline was implemented by the analyst who was tasked with soliciting the system requirements – as well as expectations from the call Centre agents, and the top management within the municipality. These requirements were based on what the stakeholders did not like from the current system. Subsequent to gathering the requirements from the stakeholders, a formal meeting was conducted to present all the system requirements.

However, while the participant indicated the importance of this guideline in directing the development of the system: implementing this guideline was not without its challenges in Case 3. For instance, the participant states that requirements gathering cannot take place with the absence of any of the stakeholders. Both users and the stakeholders need to express their requirements, as their requirements address various perspectives of the system; and this cannot be done without any one of these, to develop an e-Government system that receives positive user adoption.

While engaging with all the various stakeholders is crucial during this stage, one of the challenges of this is that the developers could be overwhelmed by a set of broad requirements.

The participant indicated that another challenge of implementing this guideline in the e-Government context is that in some projects, the top management of the organization may not want to include the end users in the development of the system. Consequently, this results in user resistance – where the end users feel that they were not informed and engaged.

Therefore, the failure to consult with the users about the new system can result in the non-adoption and resistance of a new e-Government system – as realized in one of the participant's previous e-Government projects.

Guideline 2 (Product Prototypes)

Guideline 2 states that the various iterations (prototypes) of the product ought to be presented to the user throughout the development process. Case 3's version of implementing this guideline entailed demonstrating the product to the users; however feedback obtained from the users could only be deferred to the next phase of the project (in the following year).

In previous projects developed in this municipality, Product Prototyping entailed presenting a completed, ready to use, Phase 1 of a 3 phase project as the interim system – while the other phases were being developed. With each phase of the project taking a year, no system demonstrations took place during the development to allow the users to see the progression of the system, and provide feedback accordingly. Therefore, the municipality management had only ever seen the completed version of the system before deployment, and the Call Centre agents only managed to view the system at the end, when they received training on the system.

The participant voiced their frustrations at the current lack of prototyping by the Agile definition of iterative product demonstrations. The participant stated that a challenge of implementing this guideline in the government context is the hierarchical structure of government – which stipulates that communication and engagement during systems development should occur with the management, rather than the users. In a more perverse situation, everyone (management and users included) only sees the complete developed system once it goes live.

While the participant was very knowledgeable on both the Agile Systems (Software) Development Methodology and e-Government Projects, qualifying them to take part in this study, Case 3 did not abide to the Agile principles and practices as encapsulated by the proposed guidelines. This explains the manner in which the following three (3) guidelines were implemented in Case 3.

Guideline 3 (Product Testing)

As the e-Government system in Case 3 was an integration of two systems, Product Testing was conducted by the company that was outsourced to develop the main component of the system, and not the municipality-based project team.

Guideline 4 (Product Feedback)

With regards to the Product Feedback guideline, the users in Case 3 would provide the project Analyst (participant interviewed) with their comments and recommendations to improve the system – such as the font size and color on the system. The participant stated that this step consisted of negotiating the solution with the users. A presentation, by the Analyst, of the user's feedback and recommendations to the project team then followed this step.

However, similar to guideline 1, the challenge of implementing this guideline in the e-Government context is that, typically, users are not given the opportunity to present their feedback. This is hindered by the fact that the users only interact with the system once the project is complete, thus making any feedback presented insignificant.

Guideline 5 (Changing Requirements)

Guideline 5, which is the quintessential Agile characteristic, stipulates that the project should accommodate changing system requirements during the development process. However, Case 3 implemented this guideline in a somewhat Waterfall-Agile hybrid approach – where any changes to the requirements were deferred to the resulting phases of the project (typically the following year). The difference between this approach and the Agile approach is that in a purely Agile systems development environment, the changes would be addressed in the following sprints: whereby a sprint is approximately two (2) weeks long. The participant indicated that the challenge with the approach used in Case 3 was such that if a loophole or gap was discovered in the system, that fault could only be fixed in the next phase (in the following year).

Guidelines and Adoption

When asked whether the implementation of the above proposed guidelines could positively influence the user adoption of e-Government systems, the participant indicated that the users in Case 3 were obliged (by the municipality management) to use the system regardless of their grievances or dissatisfaction of not being consulted. In another project, these guidelines would assist with improving user adoption.

However, the participant alluded that the use of these guidelines would enable the users to have a voice, to provide input and feedback and guide the development as they are the individuals who will be using the system.

The participant went on further to suggest that a systems development model be constructed, which guides project teams in the development of e-Government systems: as, currently, there is no such model or guide. This model would contain the proposed guidelines and the various stages and activities to be performed to ensure project success and user satisfaction.

The summary of findings from Case 3 are tabulated below in **table 7.3.**

Table 7.3: Summary of Case 3 Results

	Theme	**Findings**

1	e-Government User Engagement Current Practices	• User engagement initiated by requirements (and expectations) gathering from potential users and management. • Analyst drafting requirements document (requirements from all stakeholders).
2	e-Government Adoption Factors	• User's dissatisfaction with current system (need for new system to replace existing one). • Quality and ease of use of the system. • Ensure system ease of use by including users in development process and demonstrate prototype (ensure familiarity and comfort of new system). • Agility of the system (response to changing requirements).
3	Guideline 1 (Requirements Gathering)	• Allowing the user to provide requirements as are stakeholder to use the system. • Analyst gathers requirements from all stakeholder groups, then presents these. • Challenge: Not receiving requirements from all stakeholder groups • Challenge: Management not wanting to include users in requirements gathering. • Adoption: Failure to consult users results in resistance and non-adoption.
4	Guideline 2 (Product Prototypes)	• No demonstration took place during the development, only at end of each phase. • Users viewed system when they received training on the system. • Challenge: Hierarchical structure of government (communication and engagement occurs only with management and not users). • Did not abide to Agile principles and practices.
5	Guideline 3 (Product Testing)	• Did not abide by Agile principles and practices. • Product Testing conducted by outsourced company and not project team.
6	Guideline 4 (Product Feedback)	• Did not abide by Agile principles and practices. • Users provide Analyst with comments and recommendations to improve the system. • Analyst presents user's feedback to the project team. • Challenge: Users do not typically have the opportunity to present feedback, as they only interact with system once project is complete (feedback is irrelevant).
7	Guideline 5 (Changing Requirements)	• Did not abide by Agile principles and practices. • Waterfall-Agile hybrid approach, where any changes to requirements were deferred to the following project phase (one year later). • Challenge: The approach used means that any fault, issue or loophole discovered in the system can only be fixed in the next phase.
8	Guidelines and Adoption	• Users obliged by municipality management to use system regardless of grievances or dissatisfaction of not being consulted. • Guidelines have potential to improve user adoption (if adoption is not forced on users). • Guidelines enable users to have a voice (provide input and feedback and guide development). • Recommendations: Construction of a systems development model (containing guidelines) to guide project teams in e-Government development process.

7.2.4. CASE 4: MINERAL LICENSING SYSTEM

The Mineral Licensing System was developed for the mining community to be used for issuing licenses to existing and prospective mining firms. The purpose of the license is to ensure that minerals are mined according to the standards; and that the mines comply with the rules stipulated by the department. This system is internal facing, as it is operated by the department officials to provide a license distribution service to mining firms.

e-Government User Engagement Current Practices

The participant interviewed (who played the role of a Business Analyst) indicated that existing user engagement practices applied throughout the development of Case 4 were not like the Agile Methodology, with sprints. However, the user engagement that did take place happened during the requirements gathering stages, and even more in the User Acceptance Testing (UAT) stage. According to the participant, the procedure in the department is to engage with the users during the UAT stage. At this stage, the users are more involved in the development process in order to view the system, and determine whether their requirements were met.

Although the Agile methodology was not implemented, the participant indicated that there is some level of Agile in some of the smaller projects.

e-Government Adoption Factors

When asked to identify some of the factors which influenced the user adoption of the Mineral Licensing System, the participant highlighted that the business would not allow the project team to do anything without first consulting with them – as they wanted to know about everything the project team was doing, and how it would benefit the business. The participant indicated that adoption in Case 4, meant that the senior management had signed-off on the project, and any documentation related to the project. If a system is developed without the executives and senior management signing off, then the system will not be used.

Another factor that encouraged users to adopt the Mineral Licensing system is the training which the users were provided. This is the stage at which the UAT, with the target users, took place.

Guideline 1 (Requirements Gathering)

The requirements gathering phase in Case 4 is initiated by the executive management (in the department) presenting an organizational problem, and the need for the implementation of a new system. The Project Manager and the project team will then conduct a kick-start meeting with the relevant senior management personnel, so to gather all the high-level requirements (the business case or scope of the project). The low-level requirements are then solicited from the middle management and the target users of the system. Following these two phases of requirements gathering, the Analyst needs to construct a requirements specification document, and present the document (with all the requirements presented) to the senior management: who then need to agree, and sign-off on this document.

As the requirements gathering process is very elaborate, one of the challenges – as indicated by the participant – is that the requirements need to be written on the different levels for each of the stakeholder groups. As a paper trail is very important in government, the process of getting the requirements document signed would take too long, delaying the systems development process of building the system based on the requirements. Therefore, the team would lose about 3 months of development time, as the development methodology used was the Waterfall approach – which stipulates that no development (system building) can take place until the requirements are signed-off.

According to the participant, Case 4 had a requirements management framework which was used by the project team as a guide for handling the user requirements, and changes to the requirements. This phase had a positive impact on the adoption of the system, because the client understood the framework and the process of making and changing requests.

Guideline 2 (Product Prototypes)

The participant indicated that the guideline was indeed practical in the e-Government context, further stating that the project team had built something and showed it to the client; and this immediately got their attention. This process enabled the client to see the system and understand how the system would work to address a specific problem. The respondent indicated that guideline 2 may definitely be implemented in the e-Government systems development process. However, as the end user may not be familiar with the product prototyping phase of development, they would need to be introduced to it and trained accordingly. For the development of large systems of about 25 modules, the prototyping would take place after three (3) months – with five (5) system modules demonstrated to the client. However, for smaller systems, the client indicated that prototyping has the potential to take place in every sprint.

The potential challenges of implementing this guideline in the government context are: ensuring that the client is always available for demo presentations; as well as documentation afterwards, which was not possible in government – as every step needs to be documented and signed-off.

With that said, the participant also indicated that if this were to be introduced and explained properly to the client, it would have the potential to work well – as the client will see the value of the system at an earlier stage, and be able to refine their requirements accordingly.

Guideline 3 (Product Testing)

When asked about the practicality and implementation of the third guideline in Case 4, the participant indicated that testing was done according to the Waterfall methodology, at the end of the development cycle. This entailed the System Acceptance Testing (SAT) and User Acceptance Testing (UAT) stage coming after the Analysis, Design and Product Building stages. The stakeholders involved in this stage were the Testers, the core users, and the high-level users (senior management).

Some of the challenges experienced were liaising with one group of users during the requirements gathering, then testing with a different group of users – who showed resistance to the system, as they did not know about it nor understand its purpose. The Business Analyst from the project team was tasked with explaining the system to the new group of users, and minimizing resistance by indicating management's approval of the system.

Guideline 4 (Product Feedback)

The participant indicated that feedback on the product was solicited from the users by presenting the system (prototyping or testing stage); and then probing them (the users) to comment on the system and whether it meets their requirements. The Project Manager, Business Analyst (BA), users, and user group representative were present in this session.

The challenge experienced in this stage is similar to the challenge expressed in the previous guideline, which is the resistance of new users who could negatively influence the entire group.

Guideline 5 (Changing Requirements)

As mentioned earlier, the participant stated that Case 4 had a requirements management framework which guided how the project team handled changing requirements, or system requests made by the client. Thus, all the new or changing requirements would need to be recorded in an addendum or new specification document, and attached to the original requirements specification document. The Project Manager was tasked with prioritizing each new requirement and determining when in the project each one would be addressed. Senior management were also involved in prioritizing the new requirements so to ensure the project stayed within scope.

The potential challenge of this guideline is being able to handle input from multiple stakeholders. The participant indicated that the BA would need to be able to group the comments to decrease the number of requirements. Another challenge is for the BA, who would need to write the specifications document at a decomposed level, which takes a lot of time.

Failure to implement this guideline effectively will have a perverse effect on the adoption of the system, as one may produce a complete system which the users are not satisfied with. In the same light, not implementing the requirement changes to the system is likely to result in users who do not adopt the system as they feel that their suggestions were overlooked.

Guidelines and Adoption

The final section of the questionnaire sought to find out whether the participant believed that the implementation of these Agile-informed user engagement guidelines during the development of e-Government systems would help to improve user adoption. To this, the participant indicated that indeed these guidelines could improve user adoption. However, the participant indicated that the limitation of these guidelines is that they are one dimensional, and are only targeted towards guiding the project team; and should rather be a set of guidelines which address the project team, the users, and the senior management (client) – as this is where the buy-in starts. The use of a set of guidelines would work in an e-Government context; as, presently, the participant's department has a framework which guides the stakeholders in requirements management. Thus, a similar approach could be implemented with the use of the guidelines.

Finally, the participant reiterated that government systems development methodologies are still very Waterfall oriented, and the older generation of managers still emphasize the importance of documentation and sign-off. Therefore, the Agile-informed approach needs to incorporate the different levels of document sign-off, as a paper trail is required when developing e-Government systems.

The summary of findings from Case 4 are tabulated below in **table 7.4**.

Table 7.4: Summary of Case 4 Results

	Theme	**Findings**
1	e-Government User Engagement Current Practices	• Different to Agile Methodology, with sprints. User engagement took place during requirements gathering, and User Acceptance Testing (UAT) stages. • Procedure in department is to engage users for UAT, to view the system. • Some use of Agile Methodology in the smaller e-Government projects.
2	e-Government Adoption Factors	• Project team consulting with business stakeholders (management level), about what is being done and how it will be of benefit. • Executive and senior management signing off on the project and project stages. • Training provided to the target users (UAT).
3	Guideline 1 (Requirements Gathering)	• Senior management present organizational problem and need (high-level requirements); middle management and target users provide low-level requirements. • Analyst to develop requirements specifications document and present to stakeholders for sign-off. • Challenge: Requirements to be written on different levels for all stakeholders. • Challenge: Document sign-off process delays project (Waterfall approach). • Requirements management framework (guide for requirements gathering).
4	Guideline 2 (Product Prototypes)	• Demonstrate after building 5 modules (for a 25 module system). • Challenge: Ensuring all stakeholders are available for demo’s. • Adoption: Client can see the system and understand how it solves business need.
5	Guideline 3 (Product Testing)	• Testing according to Waterfall Methodology (at the end of the development). • System Acceptance Testing (SAT) and User Acceptance Testing (UAT). • Challenge: Testing with new group of users (resistance).
6	Guideline 4 (Product Feedback)	• Probing users to comment on the system and whether it meets requirements. • Challenge: Resistance from new group of users, who do not know about the new system (negatively influence the group).

7	Guideline 5 (Changing Requirements)	• Requirements Management framework used to guide handling of changing requirements. • New requirements attached to original systems requirements document. • Senior management prioritizes new requirements. • Challenge: Synthesizing input from multiple stakeholders. • Adoption: Failure to implement guideline may lead to non-adoption as users feel their suggestions are overlooked.
8	Guidelines and Adoption	• Guidelines have potential to improve user adoption. • Limitation: Guidelines are one dimensional (only guide project team), should rather be targeted at project team, users and senior management (client). • Government systems development methodology still Waterfall oriented. New (Agile) approach still needs to incorporate document sign-off and paper trail that government requires.

7.3. Quantitative Analysis

The Quantitative data collection consisted of an online questionnaire which was sent to the Agile practitioners working in the e-Government context. A total of four (4) participants took part in this study: with each participant representing each e-Government project, mentioned in the previous sub-section. As alluded to in **section 6.4.6** of the Research Methodology chapter (**Chapter 6**), Creswell (2014) states that a sample size of 10% of the population is acceptable. Therefore, since this research was largely case-study based, the researcher focused on 10% of the e-Government project team members, from each project (with each project consisting of 7 to 10 members).

As prescribed in **section 6.8.2** of **Chapter 6**, the Quantitative data, which is categorical (Saunders *et al*., 2012), will be examined using Categorical data analysis methods, such as Descriptive Statistics (Patel, 2009). However, as only a handful of participants were selected to take part in this research, the use of frequency tables, percentages and proportions will not be necessary. Instead, the researcher will visually present the results of the online questionnaire though the use of graphs.

The data from the questionnaire was automatically sorted by Google Forms, then exported into a Microsoft Excel spreadsheet where it was stored in table format, ready for analysis (Saunders *et al*., 2012).

The following sections will present the findings from quantitative data collection, starting with the demographical and background information of the participants, and ending off with the findings on the proposed Agile-informed User Engagement guidelines.

7.3.1. Demographics of Participants

This section of the online questionnaire sought to gather data pertaining to the participant's professional background information, so as to ensure that they were qualified to take part in this research as Agile practitioners working in an e-Government context. The participants involved in this research were selected based on Criterion Sampling, as mentioned in **section 6.4.4** of the previous chapter, based on the criteria that:

- The participant had experience of working on the development of the e-Government project under study.
- The participant was experienced in working with the Agile Systems (Software) Development methodology.

The demographic (background) information of the participants from each of the four (4) e-Government projects is tabulated below in **table 7.5**.

Table 7.5: Demographics of Participants

Participant / Case	Type of e-Government Project	Role in Project Team	Years of Experience in e-Government	Agile Maturity of Organization
1	Municipality Procurement	Business Analyst	More than 10 years.	Major Agile Experience.
2	eCCR (Hospital Electronic Health)	Analyst	1 - 2 years.	Major Agile Experience.
3	Municipality Call Centre	Operations / DevOps	More than 10 years.	Little Agile Experience.
4	Mineral Licensing	Analyst	1 - 2 years.	Moderate Agile Experience.

Table 7.5 indicates the variety of e-Government projects which were examined: from municipality procurement, and call Centre systems; to hospital, and mining systems. These projects also varied in their level of Agile maturity, where some projects were very conversant with the Agile approach, following the Agile principles and practices (as outlined by the proposed guidelines) – while others had little Agile experience.

7.3.2. e-Government User Engagement Current Practices

This section of the questionnaire was intended to collect data that answers research question 3: (How do e-Government project teams currently engage users in the development of e-Government systems, to ensure user adoption or buy-in?).

The questions asked in this section were linked to the proposed guidelines i.e. the stages at which user engagement should take place, according to the Agile approach. The participants were asked, at which stage, and how often, in the development process, each stakeholder group is consulted.

Figure 7.5 below illustrates the responses received from the participants, pertaining to the stages in the development process (according to the Agile approach) that each group of stakeholders were consulted. Most of the participants indicated that the Product Owner (Client) was engaged in all stages of the development, and was the most consulted stakeholder during the Requirements Gathering, Obtaining Product Feedback, Changing System Requirements, and Final Product Release stages of the project. On the other hand, most of the participants indicated that internal users are engaged most in the Product Prototyping stage.

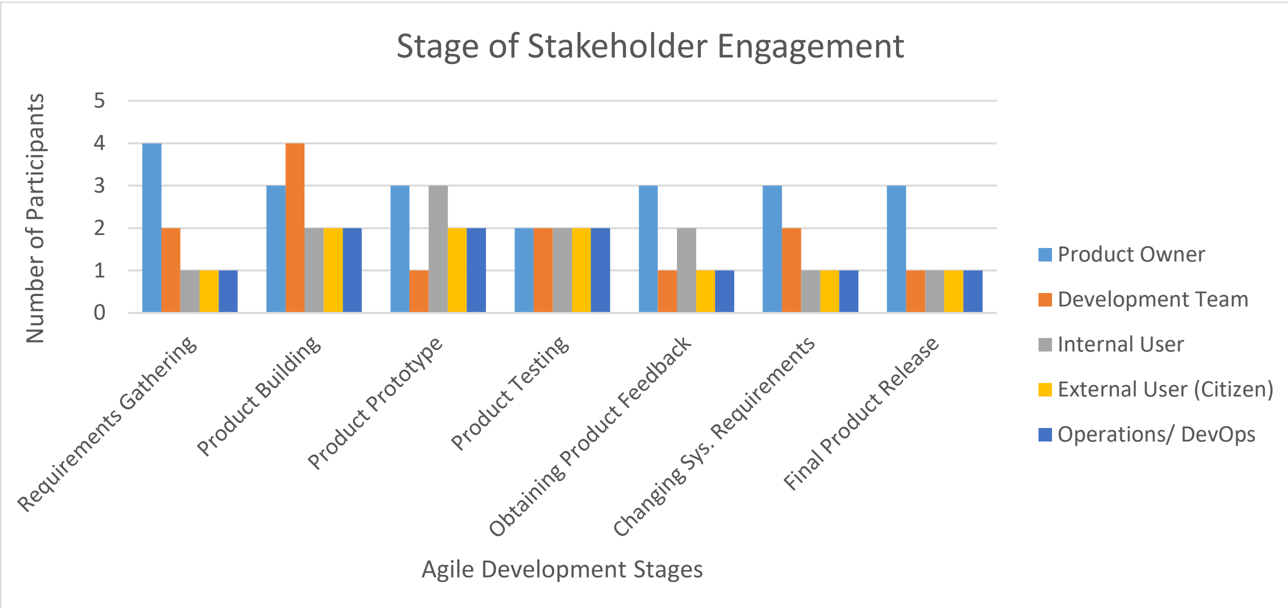

Figure 7.5: Stages of engagement

As illustrated in **figure 7.6** below, all the participants indicated that the External User (Citizen) are generally engaged at the end of the project – while most participants stated that the Internal Users were consulted after each iteration. As one of the most important stakeholders, the Product Owner (Client) is engaged at the beginning of the project, on a weekly basis, as well as after each development cycle (iteration).

However, neither Internal nor External users were engaged at the beginning of the project: perhaps because their requirements were represented by the Product Owner.

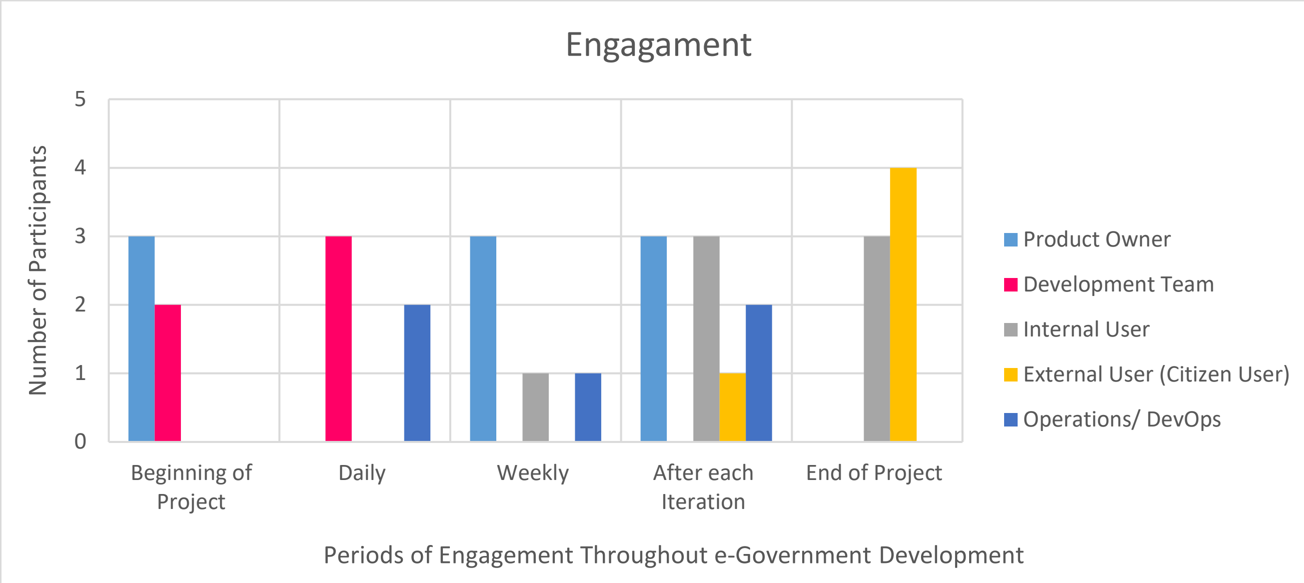

Figure 7.6: Period of Engagement

7.3.3. e-Government Adoption Factors

As this research seeks to identify a solution to enhancing the adoption of e-Government systems; a critical area of investigation was understanding the factors that influence e-Government user adoption, as detailed in **Chapter 4** of this research. Although the focus of this research is on addressing adoption while the system is being developed (pre-implementation); the researcher wanted to identify which one of the adoption factors listed in **figure 7.7** below (identified from literature – see ***section 4.5*** of ***Chapter 4*)** were deemed most important contributors of adoption in the South African e-Government context. The purpose of this was to determine whether the proposed User Engagement guidelines can be employed to address some of the prevalent adoption factors during the development process of the e-Government systems.

As illustrated in **figure 7.7** below, the adoption factors which most of the participants indicated were important determinants of e-Government user adoption were: Ease of Use; Usefulness of Technology; and Quality of Technology. Following these were, User's Attitude, and User's Experience.

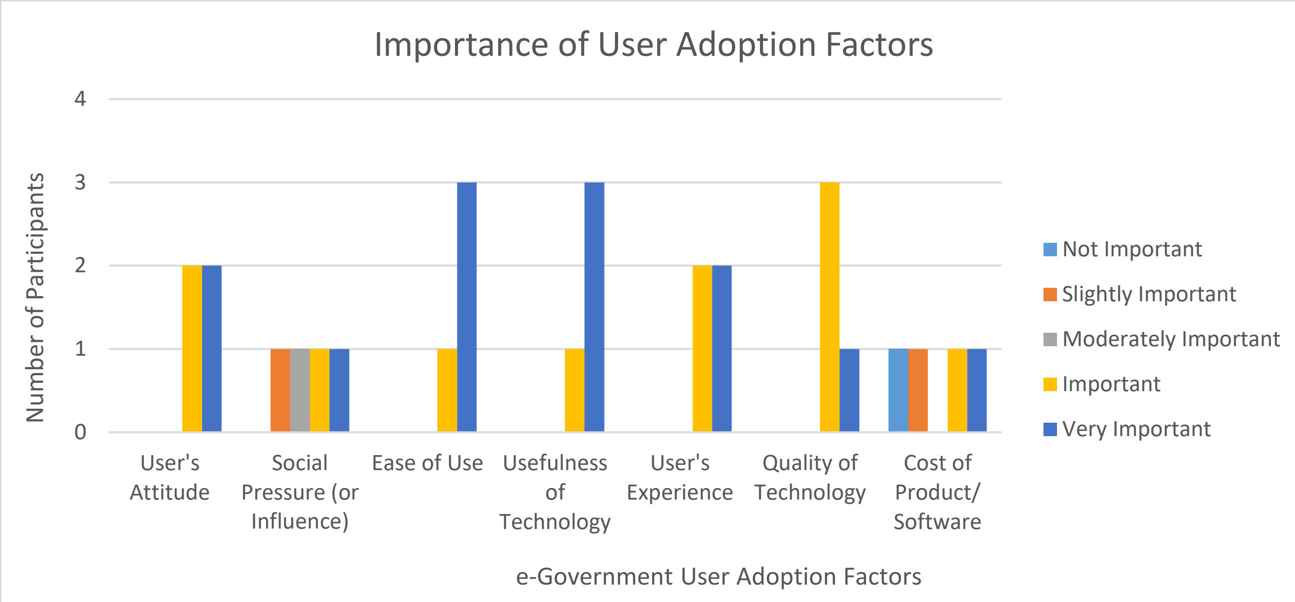

Figure 7.7: e-Government Adoption Factors

7.3.4. User Engagement Guidelines

This section will present the findings from the questions on the User Engagement Guidelines. This section answers research question 2 (*Which of the Agile Systems Development practices are fundamental for user engagement in the development phase?*); and research question 4 (*How can Agile user engagement guidelines be applied in the e-Government context?*). The Agile-informed User Engagement Guidelines presented in **section 5.7.1 in Chapter 5** were examined in this section of the questionnaire. The results of which are revealed below.

To determine whether the use of an Agile approach is appropriate for use in an e-Government context (for improving user adoption), the participants were presented with the six (6) proposed User Engagement Guidelines, and asked to answer on the following areas:

- The guideline has a positive impact on user adoption.
- The guideline is a fundamental user engagement practice.
- The guideline is an important Agile Systems Development practice.
- The guideline is typically implemented in the development of e-Government systems.
- The guideline is difficult to implement in the development of e-Government systems.

Guideline 1: Requirements Gathering

Guideline 1 speaks to the Requirements Gathering phase of the project – where the project team solicits the system requirements or initial input from target users and stakeholders of the system. Participants were asked to specify the applicability of implementing this guideline in the development of e-Government projects.

As illustrated in **figure 7.8** below, one can see that the participants generally believe that Guideline 1 is an important Agile methodology practice: which is fundamental for effective user engagement; and that the implementation of this has a positive impact on user adoption.

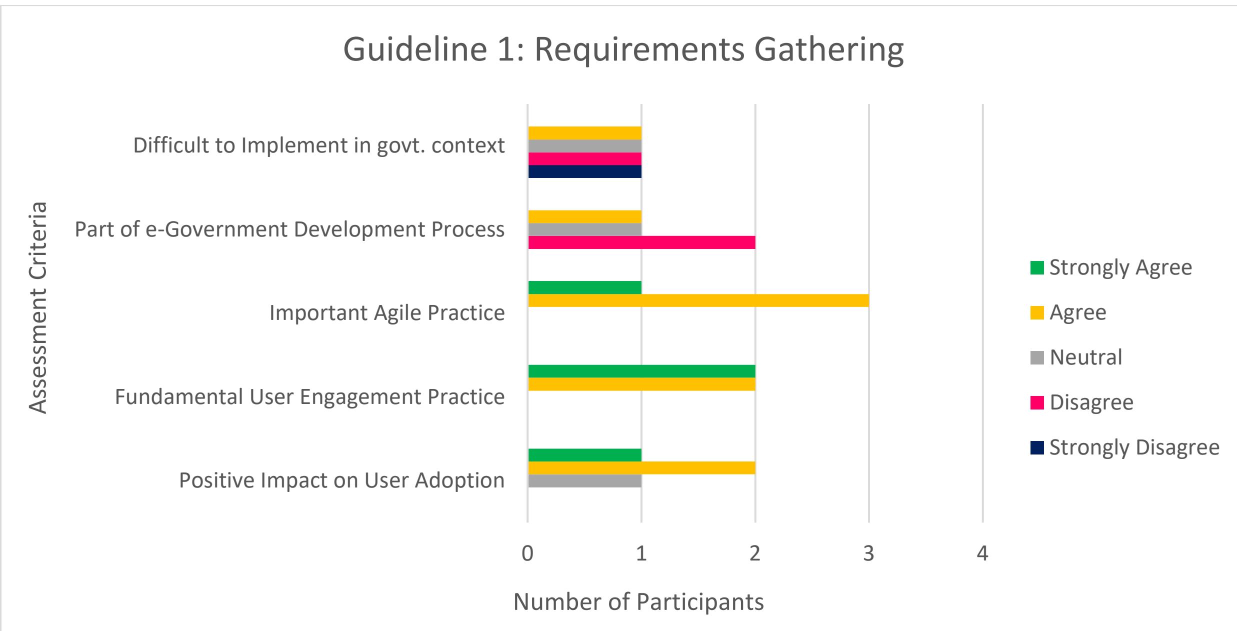

Figure 7.8: Guideline 1 Questionnaire Results

Some of the participants expressed that gathering requirements from the target users of the system was not something that was typically done in the e-Government systems development process.

Guideline 2: Product Prototypes

Guideline 2 looks at the ability of the project team to develop and present various iterations (prototypes or demos) of the product to the user throughout the development process.

The questions associated with this guideline sought to determine whether the participants (who are project team members) believed that user engagement could take the form of involving target users throughout the development of the system by presenting a prototype or demo of the product, iteratively.

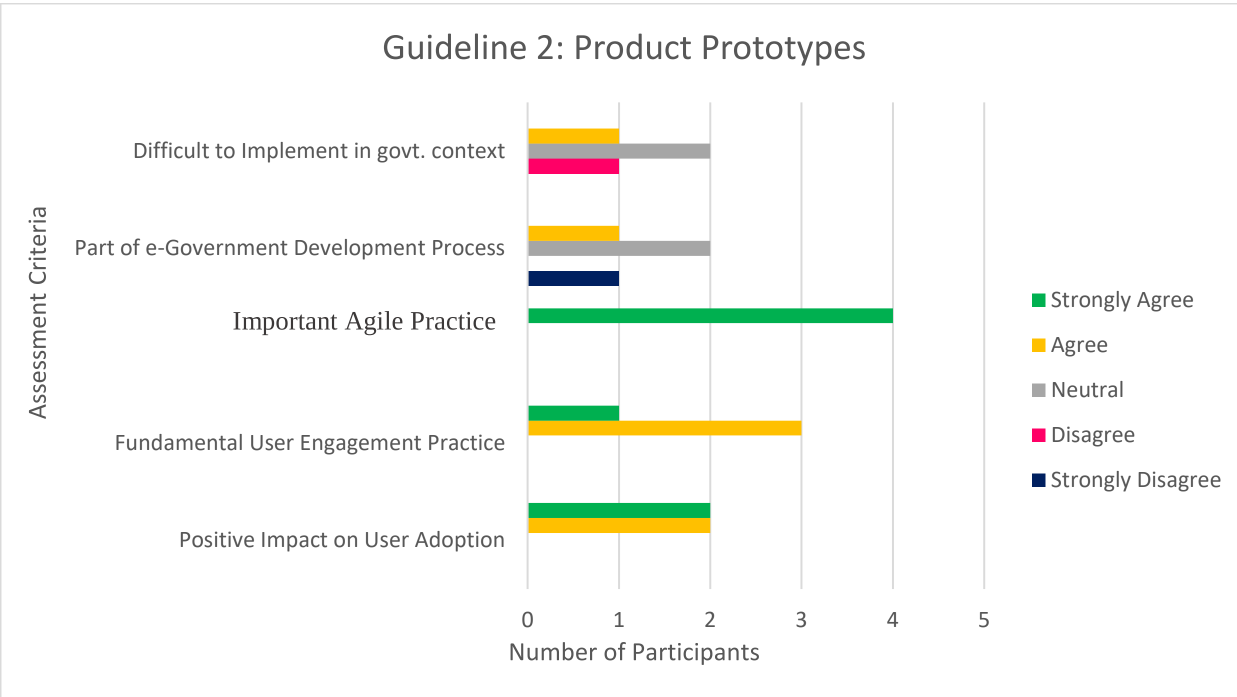

Figure 7.9: Guideline 2 Questionnaire Results

Figure 7.9 above, is an illustration of the responses of the participants for guideline 2. Similar to guideline 1 above, the participants all felt strongly that implementing this guideline is paramount to observing the Agile principles. In addition, the participants also indicated that this guideline plays a fundamental role in ensuring effective user engagement, and that this guideline has the potential to positively impact e-Government user adoption.

Guideline 3: Product Testing

The Product Testing guideline entails allowing the users to test (formal and informal) the prototype of the product as a means to determine their satisfaction and buy-in with the e-Government system being developed.

Figure 7.10 below indicates that the participants agree that guideline 3 is a significant Agile Systems Development methodology practice, which has a positive impact on user adoption.

Some of the participants also expressed that this guideline is a fundamental technique to engage with users on an e-Government project. Only one (1) participant indicated that implementing this guideline in the e-Government context is difficult, while two (2) others disagreed.

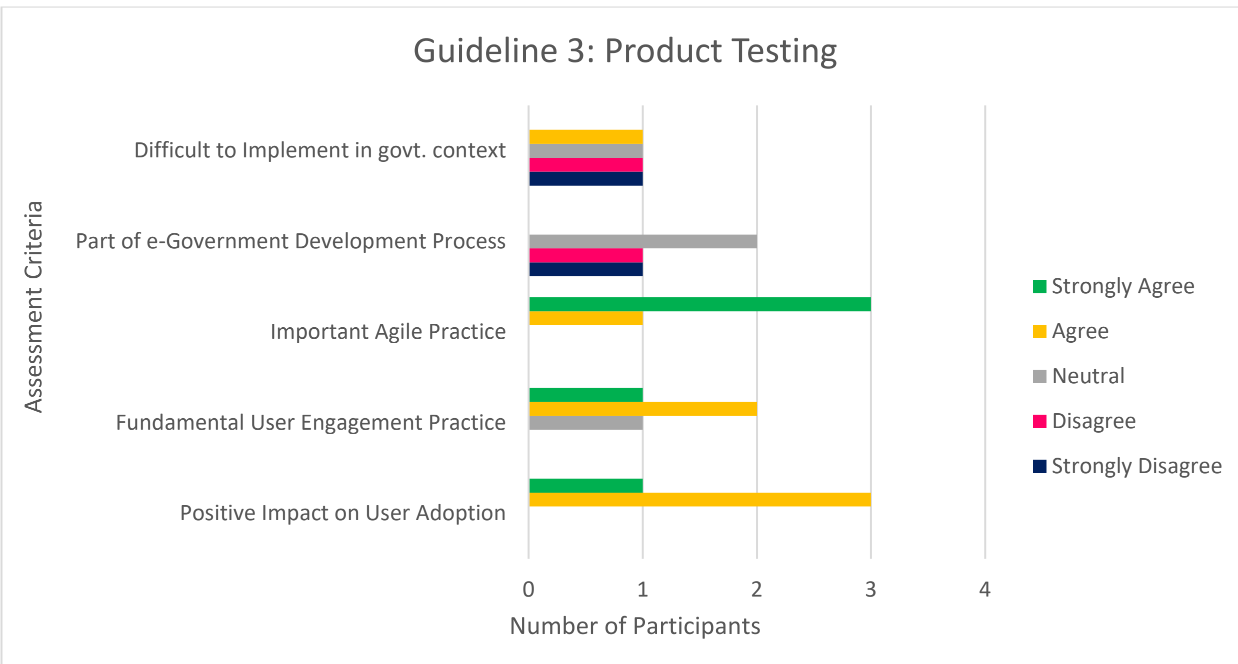

Figure 7.10: Guideline 3 Questionnaire Results

Guideline 4: Product Feedback

This guideline entails constantly soliciting user feedback from the stakeholders after each work cycle (sprint). The significance of this guideline is to ensure that the stakeholders are satisfied with the product, and to identify and minimize any resistance as early as possible.

To this guideline, the participants strongly expressed that soliciting feedback is a fundamental user engagement technique, which has a positive impact on the user adoption of the e-Government system, as illustrated in **figure 7.11** below.

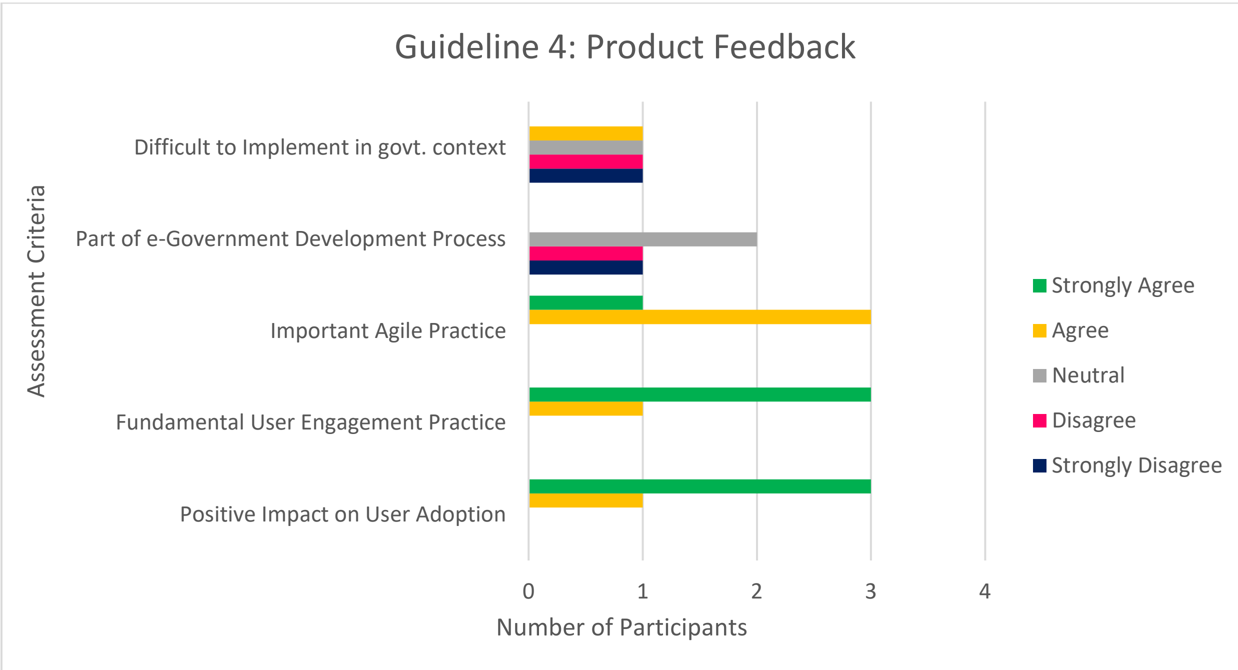

Figure 7.11: Guideline 4 Questionnaire Results

The results in **figure 7.11** above also indicate that the participants believed that soliciting product feedback is a key practice, as according to the Agile methodology.

Guideline 5: Changing Requirements

Guideline 5 addresses the ability for the project stakeholders to request changes to the system requirements during the development process. These changes typically arise after the stakeholders have seen the prototypes of the system and seek to refine their requirements for the system to meet their expectations.

The research participants strongly expressed that this guideline is fundamental to effective user engagement, as illustrated in **figure 7.12** below. They also expressed that this guideline is a core

Agile practice, which has a positive impact on user adoption. Some of the participants indicated that this practice was already being followed in their e-Government projects.

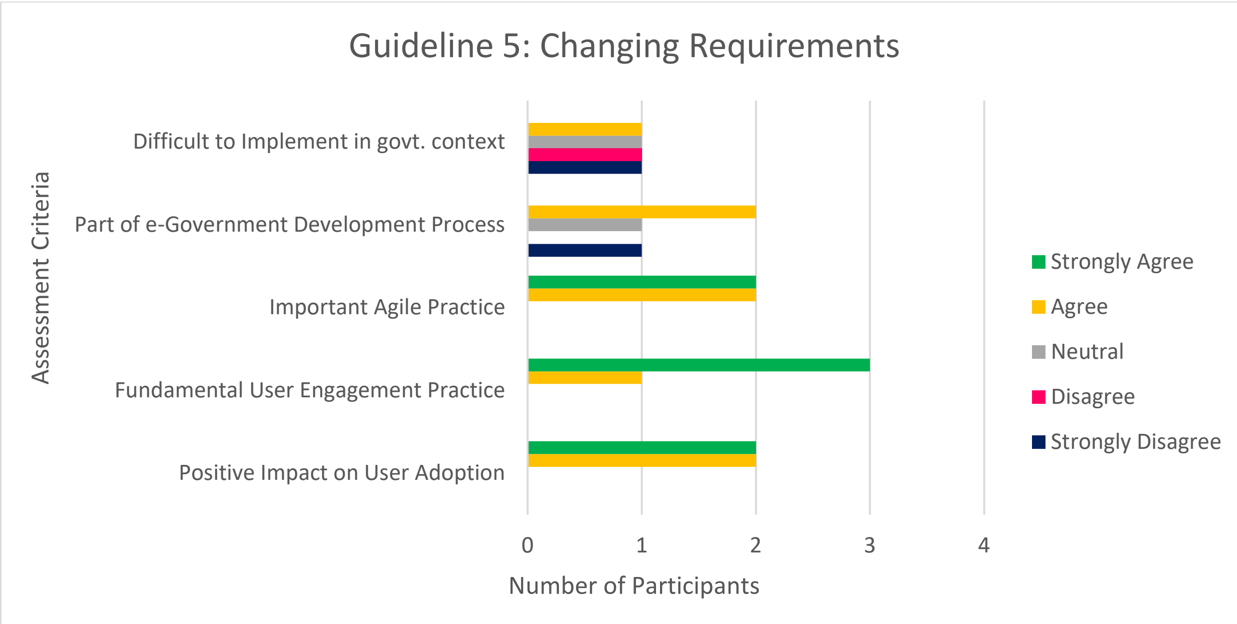

Figure 7.12: Guideline 5 Questionnaire Results

Guideline 6: Constant User Involvement

While guideline 6 is referred to as a guideline, it is more of a summary of all the previous five (5) guidelines – encapsulating the importance of engaging with users in the development of e-Government systems.

The participants were presented with this guideline to comment on the general principle of constant and regular communication between the project team and the stakeholders (users included).

The results in **figure 7.13** illustrate that the participants strongly agree that this guideline is the cornerstone of the Agile methodology. The participants also expressed that this is an effective means of engaging with the users – which has a positive impact on user adoption.

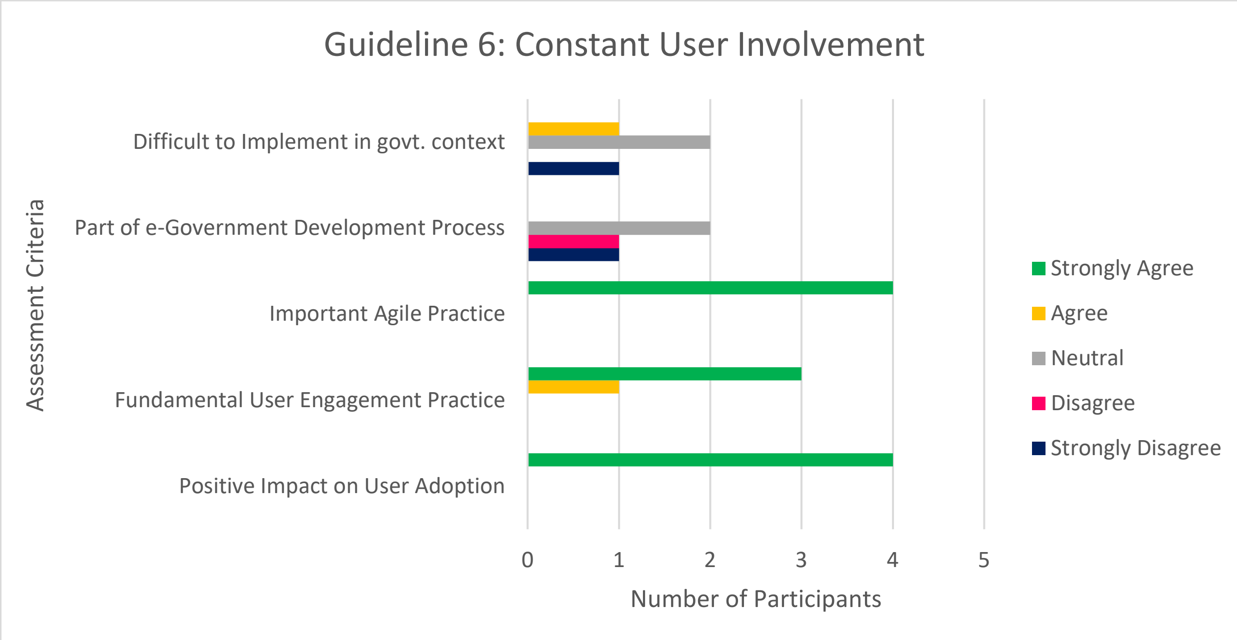

Figure 7.13: Guideline 6 Questionnaire Results

7.4. Conclusion

This chapter sought to present the findings from the two Mixed-Methods data collection procedures: semi-structured interviews (Qualitative data); and an online questionnaire (Quantitative data). In accordance with the Concurrent Mixed-Methods Design by Creswell and Creswell (2017), the presentation of both data types needs to be separate in the results phase of the research. Therefore, the data findings were presented separately, starting with the results obtained from each of the four (4) case studies. This was followed by the results from the Quantitative data collection procedure. These results were arranged according to the sections in the interview and questionnaire schedule.

In accordance with Yin's (1994) Case Study Method, the following chapter will examine these findings – in relation to the research objective and questions – through the interpretation of the findings presented in this chapter.

CHAPTER 8: DISCUSSION

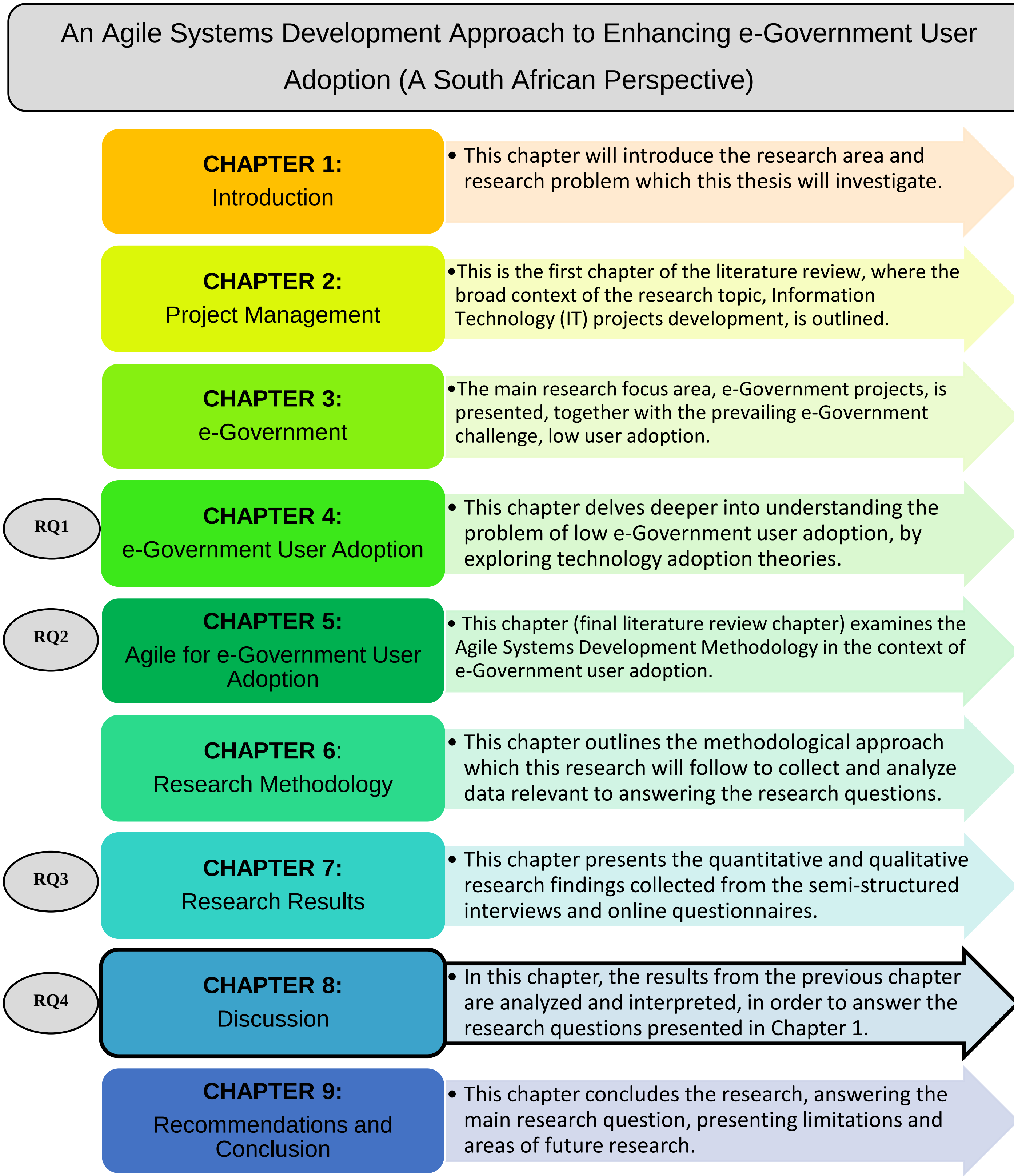

Figure 8.1: Chapter 8 Thesis Structure

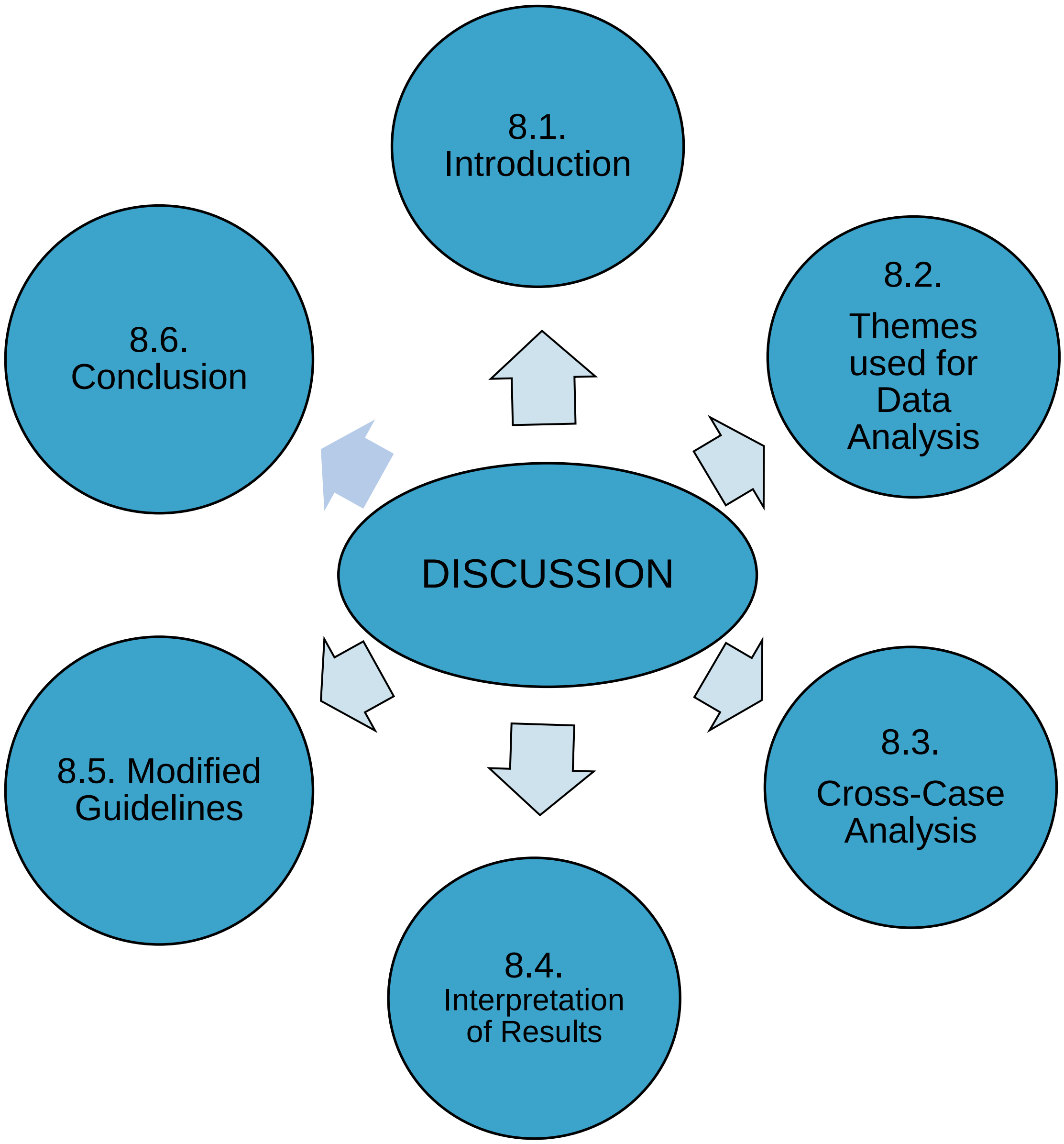

Figure 8.2: Chapter 8 Outline

***Abstract**: In this chapter, the results from the previous chapter are analysed and interpreted. The research questions, from Chapter 1, are answered in this chapter, through the interpretation of the research findings. This paves the way for the latter sections of this chapter, where the proposed guidelines are refined and research recommendations put forward.*

8.1. Introduction

As stated in the Introduction Chapter (**Chapter 1**), the purpose of this research is, *to contribute towards improving the user adoption of e-Government systems in South Africa, by recommending the use of Agile Systems Development Informed User Engagement Guidelines*.

With that said, this chapter will interpret the research findings from the previous chapter (**Chapter 7**), in pursuit of answering the research questions from **Chapter 1**. In analyzing this data, the researcher made use of a thematic chart, which assisted in grouping the data gathered according to themes which link to the different research questions.

According to Yin's (1994) Case Study Method illustrated in section 7.2, the next step after writing individual case reports is to carry out a cross-case analysis – where the cases are compared and contrasted against each other. This is then used as the Qualitative data which is triangulated with the Quantitative data and literature review findings.

To conclude the interpretation of findings, this chapter will apply these findings to modify the proposed guidelines, to represent the data collected, as stipulated by Yin's (1994) Case Study Method.

8.2. Themes used for Data Analysis

The data collected using the online questionnaire and in-depth interviews will be analyzed using coding and thematic analysis respectively: and thus consists of the application of a case chart – where the participants' responses were mapped against the respective themes and cases.

8.2.1. Thematic Chart

This section seeks to demonstrate each theme (and sub-themes) used in analyzing the data, and to indicate how each theme relates to the research question. The themes have been arranged in a diagram (**figure 8.3** below) to illustrate the correlation between the themes and the four (4) research questions. Each of the themes were informed by (i) the purpose of the questionnaires; (ii) the interview schedule, as well as (iii) the research questions. The correlation between the themes, sub-themes and the research questions is illustrated in **figure 8.3** below.

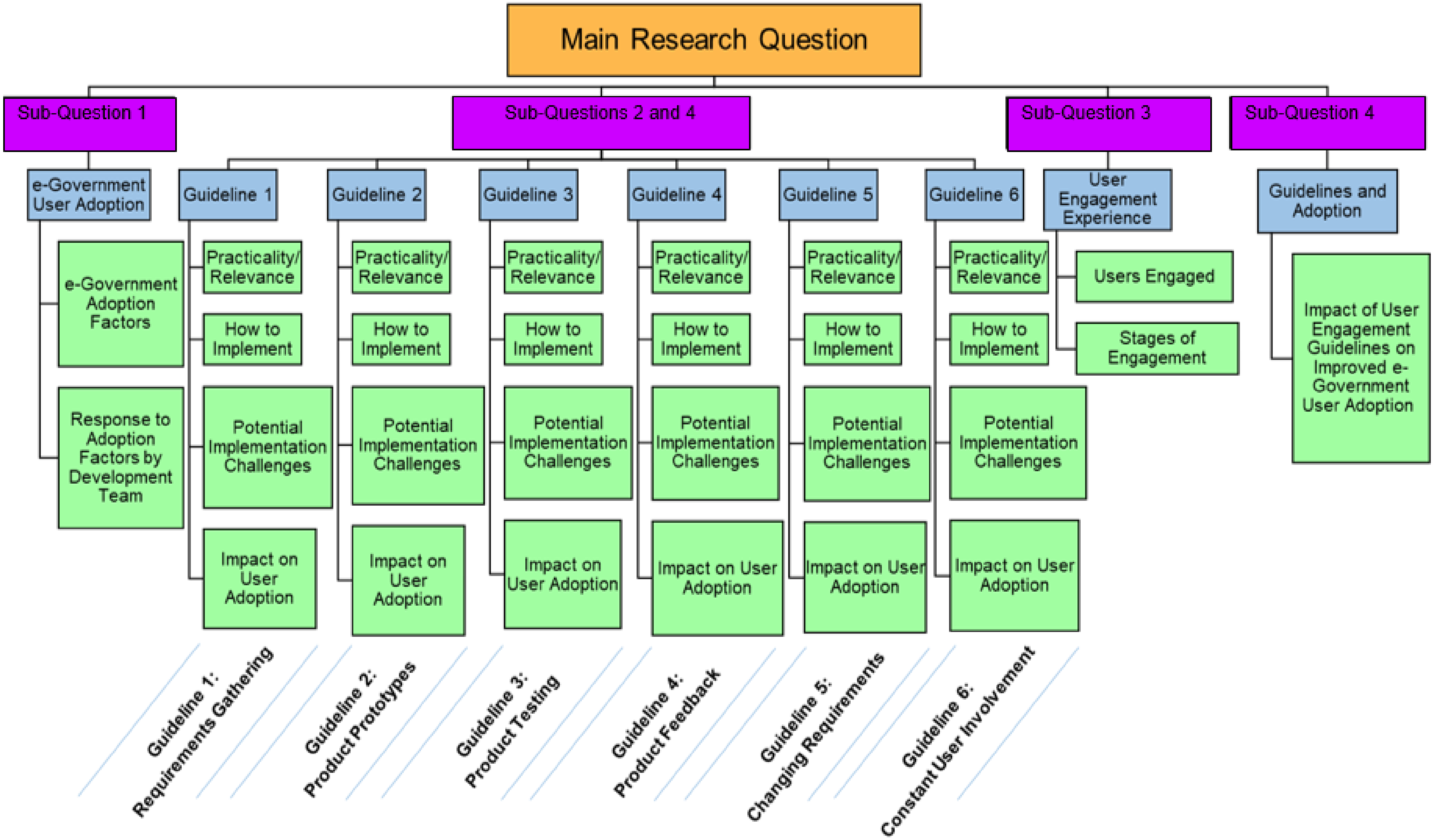

Figure 8.3: Data Analysis Thematic Chart

8.3. Cross-case Analysis

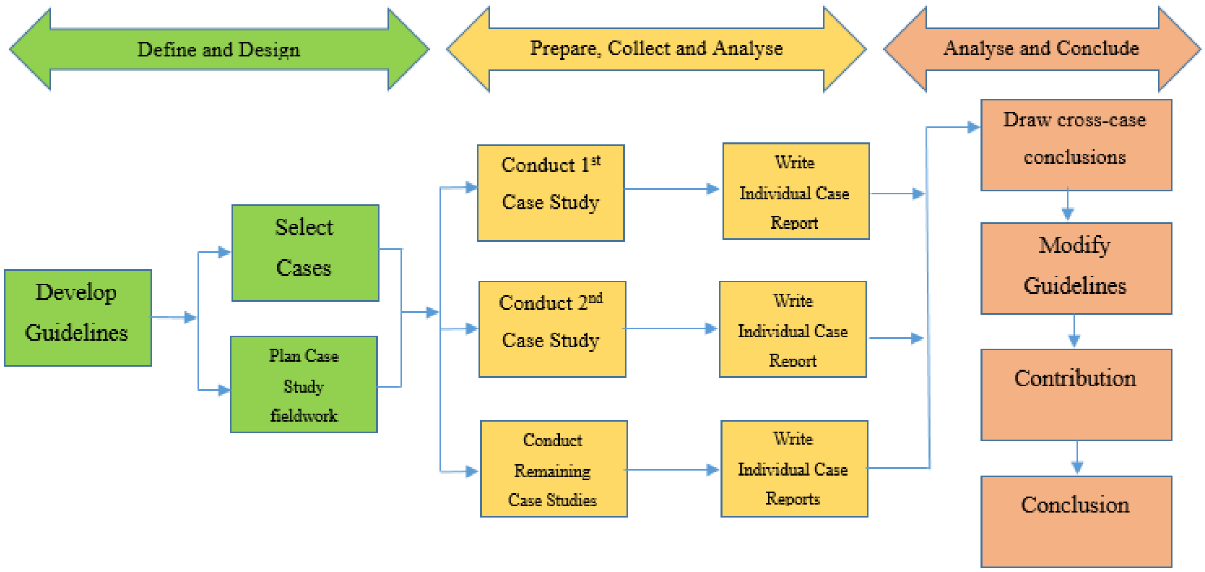

Figure 8.4: Case Study Method (adapted from Yin, 1994)

Cross-case analysis is a technique employed to identify similarities and differences between the cases examined (Yin, 1994).

Referring back to Yin's (1994) Case Study Method diagram illustrated in **figure 8.4** above, one can see that the final stage of Case Study research is to analyze and conclude. In this phase, the researcher must draw cross-case conclusions; then modify the theory (in this case, modify the guidelines); present the research contribution; and, then, conclude (Yin, 1994). Therefore, this section will conduct the cross-case analysis, comparing and contrasting the four (4) e-Government case studies examined.

Section 7.2. of the previous chapter presented the findings from each of the case studies, and each case study was concluded with a summary table of findings. **Table 8.1** below is a consolidated version of each case summary, according to the themes. Each of the themes, together with the findings (as illustrated in table 8.1) will be explained in the proceeding sub-sections (**section 8.3.1** to **8.3.8**).

Table 8.1: Case Study Findings Summarized

	THEMES							
	e-Govt. User Engagement Current Practices	**e-Govt. Adoption Factors**	**Guideline 1 (Req. Gathering)**	**Guideline 2 (Product Prototypes)**	**Guideline 3 (Product Testing)**	**Guideline 4 (Product Feedback)**	**Guideline 5 (Changing Req.)**	**Guidelines and Adoption**
CASE 1	· Agile (not Waterfall) · User engagement informed by Implementation Manual · Initiate user engagement by meeting with key stakeholders.	· Ability to use the new system · Type of technology · Management motioning and micromanaging.	· Present SRS document to stakeholders for approval · Challenge: Disparity between different stakeholder's requirements · Adoption: Guideline enables team to understand client needs	· Weekly modelling and demonstrating system to users · Adoption: Ensures client buy-in (adoption).	· Developers test system before demonstration · Rigorous testing after completion of system · End user testing after final product testing.	· User feedback solicited after they use system · Users comment on the system.	· Guideline 4 and 5 seen as related · Success determined by ability to quickly build in new requirements into system · Stakeholders get sense of ownership and buy-in.	· Guidelines are a better way of working · With traditional approach, project takes too long and client is not involved · Can now constantly engage with client on all levels · Constant communication is important (lack of results in failed projects).
CASE 2	· Agile approach (similar to guidelines). · Meeting with stakeholders to flesh out requirements.	· System compulsory for all. · Introduce system as early as possible. · Usefulness and user friendliness, · Platform required to use system.	· Meet stakeholders to collect req. · Analyst documents req. · Challenge: Ensuring all stakeholders are available. · Adoption: System cannot be built without input from users.	· Stakeholders view demo every 2 weeks, and provide comments. · Challenge: Ensuring stakeholders present and submit issues during demo. · Adoption: Iterative user involvement consists of regular demo's	· Users testing after deployment · Challenge: Managing user expectations (what can and can't be fixed). · Adoption: Allowing users to test if system meets req.	· Product owner and team prioritize feedback and add to backlog. · Challenge: Managing users' expectations - not all feedback is used · Adoption: Allows user to re-emphasize req.	· Req. changes signed-off by govt. official. · New or changing req. replace existing req. · Challenge: Govt. is Waterfall (don't understand adaptability of Agile).	· Guidelines very practical and relevant to e-govt. context (cornerstone of good Dev). · Recommendation: Keep stakeholders constantly engaged to minimize resistance early. · Recommendation: e-Govt. team to follow guidelines even if not followed perfectly.

	e-Govt. User Engagement Current Practices	e-Govt. Adoption Factors	Guideline 1 (Req. Gathering)	Guideline 2 (Product Prototypes)	Guideline 3 (Product Testing)	Guideline 4 (Product Feedback)	Guideline 5 (Changing Req.)	Guidelines and Adoption
CASE 3	· Initiated by req. gathering from stakeholders	· Dissatisfaction with old system;	· Analyst presents req.	· Not Agile	· Not Agile approach.	· Not Agile approach.	· Not Agile approach.	· Guidelines have potential to improve user adoption (when adoption voluntary);
	· Analyst documents req.	· Quality and ease of use	· Challenge: Not receiving req. from all stakeholder groups.	· No system demo.	· Testing by outsourced company.	· Challenge: Users provide feedback at project completion - feedback irrelevant.	· Waterfall-Agile hybrid approach - feedback deferred to later project phase.	· Guidelines give users a voice to present input and feedback.
		· Agility of the system (able to respond to changing req.).	· Challenge: Management don't include users.	· Users see system during training.			· Challenge: System faults only fixed in the future phases.	· Recommendation: Sys. dev. guide with guidelines to direct e-govt. project teams.
			· Adoption: Failure to include users results in resistance and non-adoption.	· Challenge: Hierarchy structure of govt. means engagement takes place with management.				
CASE 4	· Not Agile approach	· Engaging with exec's.	· Management present high-level req. (Middle mgt. and users present low-level req.)	· Demo after building every 5 modules (of 25 module system)	· Waterfall testing (at end of dev.)	· Probing users for feedback	· Req. Management framework	· Guidelines have potential to improve user adoption, but one dimensional.
	· Req. gathering and UAT	· Exec's project sign-off	· Analyst develops SRS document and presents for sign-off.	· Challenge: All stakeholders available for demo.	· SAT and UAT	· Challenge: Resistance from new users who don't understand new system.	· Senior management prioritize new req.	· Recommendation: should be able to be used by project team and the client.
	· Some Agile approach in smaller e-govt. projects.	· Training for users.	· Challenge: Documents sign-off process delays project (Waterfall)	· Adoption: Client see how system solves problem.	· Challenge: Testing with different groups of users.		· Adoption: Not ignoring users' ideas.	· Govt. still very Waterfall - new approach should include document sign-off.

8.3.1. e-Government User Engagement Current Practices

As indicated in **table 8.1** above, the current user engagement practices in all of the e-Government projects examined consisted of first consulting with the stakeholders to establish the project requirements. The user engagement practices from the first two (2) cases was informed by the Agile Systems Development approach; while the other two cases (Case 3 and 4) were not particularly informed by the Agile methodology. However, an Agile approach was only used in Case 4 for the development of smaller e-Government projects.

In addition to being led by the Agile approach, Case 1 also made use of an Implementation Manual, which specifies, in detail, how e-Government system development and user engagement should take place.

8.3.2. e-Government Adoption Factors

When the participants were asked to indicate the factors that they believed to be influential to the adoption of e-Government systems, all indicated usability-related factors. These factors are listed in column 2 of **table 8.1** as:

- Ease of Use.
- User Friendliness.
- Ability to Use.
- Usefulness.
- Training to use the system.

Additionally, three (3) of the four (4) cases expressed that the technology required to operate the system is another factor that encourages or deters users from using an e-Government system. The participants listed factors such as:

- Type of technology.
- Platform required to use system.
- Quality of the system.

While the above-mentioned adoption factors are rather similar to e-Government adoption factors, according to the adoption models in ***section 4.3** of **Chapter 4***; these e-Government cases presented management-related adoption factors – which were not previously identified in the adoption models. Here, it is apparent that internal users of e-Government systems make use of the system because they have been instructed to do so, irrespective of engagement or their satisfaction. These factors were the following:

- Management monitoring and micromanaging.
- System made compulsory for all.
- New system due to dissatisfaction with old system.
- Constantly engaging senior management, and obtaining their approval.

Case 2 and 3 made reference to some characteristics of the Agile approach, by stating that the adoption of an e-Government system, if voluntary, relies on introducing the system to users as early in the development process, and enabling the users to inform changes to the system as a way to minimize resistance as early as possible.

8.3.3. Guideline 1: Requirements Gathering

The Requirements Gathering process was followed in a similar manner in all the cases. This guideline consisted of an Analyst from the project team meeting with stakeholders to collect the system requirements. This Analyst would then document these requirements into a Requirements Document, and present them back to the stakeholders for approval.

Table 8.1 states that he e-Government project team in Case 4 made use of their own Requirements Management Framework to guide the Requirements Gathering phase.

Some of the challenges of implementing this guideline entailed:

- Ensuring that all stakeholder groups were available to provide their requirements, as this could result in resistance from stakeholder groups that were not consulted (Case 2 and 3).
- Case 3 also indicated that management (client) would typically not include the users in this phase.
- Merging the input from all the different stakeholder groups, who each have different priorities (Case 1).
- The Waterfall approach which requires document sign-off before anything can take place, thus delaying development (Case 4).

Case 1, 2 and 3 all agree on the importance of including the user in this phase to better understand their needs; and that the failure to implement this guideline may result in resistance and non-adoption.

8.3.4. Guideline 2: Product Prototyping

In accordance with the Agile Systems Development Methodology, Case 1 and Case 2 ensured that the system was demonstrated to the stakeholders at the end of each work cycle (one to two weeks). However, Case 3 on the other hand, did not make use of the Agile approach, and thus had no system demonstrations during the development process. Case 4 made use of a hybrid approach, where system demonstrations (prototyping) took place after developing every 5 modules (of a 25 module system).

Case 2 and 4 shared the same challenge when trying to implement this guideline, which is to ensure that all stakeholders are present during the system prototyping sessions; and that everyone presents their feedback accordingly.

Similar to the challenge faced in Guideline 1, Case 3's challenge in implementing this guideline is that the hierarchical nature of government requires that engagement take place with management, rather than users. In this Waterfall structure, the users are only exposed to the system during training, once the development of the system is complete.

Case 1, 2 and 4 all agree that the benefit of implementing this guideline is that the users are able to view the system incrementally, and to see how it addresses their requirements. This ensures user buy-in at an early stage in the project.

8.3.5. Guideline 3: Product Testing

In Case 1, 2 and 4, the users were permitted to test the system once the final system was completed and deployed. Case 2 indicated that this guideline has a positive impact on user adoption, as it enabled users to test whether the system meets their requirements.

No testing took place in Case 3 – as the testing was outsourced to an external company, outside the project team. Case 3 did not make use of an Agile approach.

As users were given an opportunity to test the system, the challenge which was experienced by Case 2 and 4 when implementing this guideline was minimizing user resistance. The project teams had to minimize resistance from users who were new to the project, and seeing the system for the first time; as well as managing users' expectations of what can and cannot be fixed – while keeping them interested and satisfied.

8.3.6. Guideline 4: Product Feedback

Case 1, 2 and 4 implemented this guideline in the development of their e-Government projects. This entailed soliciting user feedback after the users viewed the system. Case 3 did not make use of the Agile practices of soliciting user feedback iteratively.

The challenge faced when implementing this guideline was managing users' expectations. Similar to the previous guideline, not all the feedback received by the project team is used, and some users may be completely new to the team, and thus not agree with the entire system.

The Waterfall approach used in Case 3 was challenged in that its user feedback was only solicited at the end of the project – which meant that this feedback could not be incorporated into the development of the e-Government system. This is elaborated in **section 7.2.3** in **Chapter 7**.

With regards to improving user adoption, Case 2 expressed that this guideline allows users to reiterate their requirements, so as to ensure that the final system meets their needs, and is satisfactory.

8.3.7. Guideline 5: Changing Requirements

As apparent in the findings of Case 1, the success of an Agile approach is determined by how well the team responds to changes to the system. The ability for the stakeholders to present changes gives the stakeholder a sense of ownership of the system, which results in positive adoption (Case 1 and 4).

In Case 2 and 4, the new or changed requirements are reviewed and prioritized by the team and the client (management). Subsequently, the client (government official or management) is required to sign-off and approve these requirements.

As mentioned in the previous guidelines above, Case 3 did not make use of an Agile approach, which enables users to change system requirements. Instead, a Waterfall-Agile hybrid approach was used, where users' new or changing requirements were not prioritized and placed in the following sprints (couple of weeks); but were rather deferred to later phases in the project (couple of years). **Section 7.2.3** explains the difficulty of making use of this approach.

Case 2 also mentioned to the Waterfall nature of government, stating that this approach does not accommodate change very well – and that the project team (which worked in an Agile manner) would have to replace existing requirements with the new or changing requirement, in order to remain within the project scope.

A Requirements Management Framework developed by the department in Case 4 was used in this project to guide the project team on how to handle new or changing requirements.

8.3.8. Guidelines and Adoption

When asked whether the guidelines are relevant – and have the potential to improve e-Government user adoption; all the cases were in agreement that the guidelines are practical, relevant and a better way of developing e-Government systems (with engaging stakeholders): and that the guidelines represent the cornerstone of good systems development practices.

Table 8.1. indicates that Cases 1, 2 and 3 emphasized the importance of the guidelines for ensuring constant and effective communication with stakeholders; and that these guidelines ensure that the users have a voice in the development process: thus minimizing any resistance to adopt.

Case 2 recommended that the guidelines should be used by all e-Government project teams, even if they are not followed perfectly.

Case 3 recommended that the construction of a Systems Development model, containing the guidelines, would be beneficial in guiding e-Government project teams, as such a guide does not currently exist.

Case 4 partly criticized the guidelines, stating that they needed to become multi-dimensional for use by e-Government project teams, as well as government stakeholders, in order to promote the understanding of user engagement during the development process for improving adoption.

8.4. Interpretation of Results

8.4.1. Data Triangulation

Data triangulation is achieved when three (3) or more data sources all corroborate and present the same findings (Miles, Huberman and Saldana, 2014). It is a process of finding a matching pattern between the different data sources: in a similar manner as which a detective would use to confirm or refute the validity of a case (Miles, Huberman and Saldana, 2014). **Figure 8.5** below is an illustration of the data triangulation process. This will be referred to again later in the following chapter to determine whether the findings from the literature reviewed, qualitative and quantitative data collected match – in order to answer the research question.

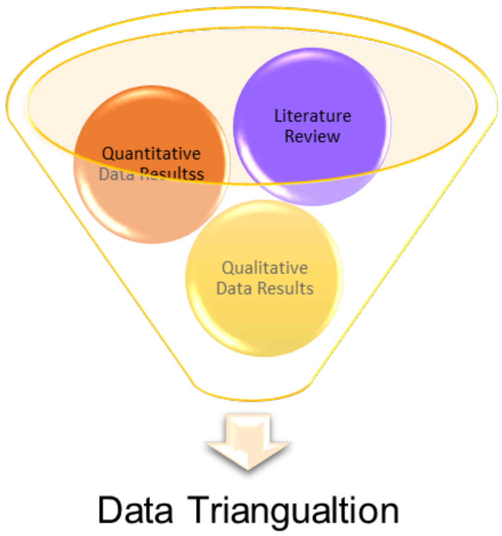

Figure 8.5: Data Triangulation

Data triangulation enables the researcher to identify a link between the different data sources, and draw an appropriate conclusion (Miles, Huberman and Saldana, 2014). However, in some cases, the data sources may not be in agreement, and may display inconsistencies; in which case the researcher may be required to reexamine "the integrity of the data collection methods and even the data themselves" (Miles, Huberman and Saldana, 2014, p.299).

With that said, the following sub-sections will interpret and present the qualitative and quantitative findings, together with the literature review findings, against the respective research questions as outlined in **figure 8.5** above – in order to determine whether the results from these data sources are consistent and in agreement.

8.4.2. e-Government Adoption Factors

Research Question 1: *What are the key factors that influence e-Government user adoption?*

The core element which drives this research is the focus on the adoption of e-Government systems as a success factor of e-Government projects. In order to understand how e-Government adoption can be guaranteed or improved, one would first need to identify the factors that influence a user's decision to adopt an e-Government system. Once these factors are known and understood, then only can one propose remedial measures that have the potential to ensure positive e-Government user adoption.

According to the literature reviewed in **Chapter 4**, the most common factors (summarized in **table 4.1**) which influence a user's decision to adopt an e-Government system are:

- **Perceived Ease of Use**: *"The degree to which a person believes that using a particular system [or technology] would be free from effort*" (Davis, 1989, p.320).
- **Perceived Usefulness**: *"The degree to which a person believes that using a particular system [or technology] would enhance his or her job performance"* (Davis, 1989, p.320)
- **Experience**: *"An opportunity to use a target technology (training and post-training)" (*Venkatesh, Thong and Xu, 2012*, p.161).*
- **User's attitude toward a behavior**: *Attitude towards using a technology.*
- **Social Influence**: *"The degree to which an individual perceives that most people who are important to him think he should or should not use the system"* (Venkatesh and Bala, 2008).
- **Quality of technology**: *"Quality of information and services provided by government"* (Lu and Nguyen, 2016).

The findings from the data collection processes (as illustrated in **figure 7.7** in chapter 7, and **table 8.1** above) confirm the adoption factors identified from the literature. The adoption factors which were presented by the participants from the different e-Government projects are mainly usability-related factors, such as: Ease of Use; User friendliness; Ability to use; Usefulness; Training provided; and technology factors such as: Quality of the system; Type of technology; and Platform required to use the system.

The participants were also requested to rate the importance of the adoption factors identified in the literature, according to what they perceived to be relevant in their e-Government projects, as illustrated in **figure 7.7** in **Chapter 7**. Ease of use; Usefulness; and Quality of technology were ranked as important determinants of e-Government user adoption by most of the participants.

The literature-identified factors (see **table 4.1** in **Chapter 4**) as well as the e-Government adoption factors – which emerged from the data collection – are very similar (as illustrated below in **table 8.2**), indicating that the findings from the data collection process corroborate with the literature on e-Government user adoption (and technology adoption theories).

Table 8.2: Adoption Factors Triangulation

LITERATURE REVIEW FINDINGS	DATA COLLECTION FINDINGS
Perceived Ease of Use	User Friendliness Ability to Use Ease of Use
Perceived Usefulness	Usefulness
Experience	Training to use the system
Quality of Technology	Type of technology Platform required to use system Quality of the system
Social Influence	Instructions from superiors
User's Attitude Toward a Behavior	User’s Attitude

While only two projects indicated on the online questionnaire (see **figure 7.7**) that Social Influence is a significant e-Government adoption factor; all participants indicated (during interviews – see **table 8.1** above) that their projects were led by a government official or senior management – who made certain that everyone utilized the e-Government system being developed. One participant mentioned that one can “start throwing names of their [users’] seniors and they start to listen”, in the event of a user’s resistance to adopt.

Therefore, as the literature indicates, the belief or perception that one’s superior is using the system or has instructed for the use of a system, will influence the adoption of that specific e-Government system.

User's attitude (an adoption factor identified in the literature) was also ranked highly by the participants (as illustrated in **figure 7.7** above), with all of them indicating that a user's attitude is a significant e-Government adoption determinant. Participant 4 explains how the user's attitude and dissatisfaction can result in non-adoption, citing that "they [users] will say 'no you gave us something we don't want".

Therefore, to answer research question 1, it can be concluded that *the key factors that influence e-Government user adoption*, according to the literature reviewed and the cases examined, are:

i. Perceived Ease of Use
ii. Perceived Usefulness
iii. Experience
iv. Quality of Technology
v. Social Influence
vi. User's Attitude Toward a Behavior.

8.4.3. Agile Systems Development Practices

Research Question 2: *Which of the Agile systems development practices are fundamental for user engagement in the development phase?*

This research question sought to determine whether the Agile Systems Development approach can be applied in the e-Government context to improve user adoption, by taking advantage of the user engagement qualities of the Agile approach.

In order to answer this question effectively, the researcher had to identify the quintessential Agile practices and principles, then determine whether these practices can be applied in the development of e-Government system. **Section 5.3** of **Chapter 5** explored the most common Agile Systems (or Software) Development Methodologies, presenting the processes, steps or practices of each of these methodologies. This was succeeded by an analysis of the Agile Manifesto and principles in ***section 5.4*** – which form the cornerstone of the Agile methodology, stipulating the defining qualities of an Agile approach.

Subsequent to analyzing the various Agile methodologies; Agile principles; and key characteristics of Agile Systems Development (**section 5.5** in **Chapter 5**), a set of proposed guidelines were constructed – summarizing the findings from the previous sections (see **section 5.7.1**). These guidelines are those referred to, by the researcher, as the Agile-informed User

Engagement Guidelines, in this thesis. Essentially, the guidelines are the core (or most prominent) defining practices of the Agile Systems Development methodology. A total of six (6) guidelines were identified, however, the sixth guideline is seen as an all-encompassing guideline, containing the other five (5) guidelines. The guidelines are referred to throughout this research, as the proposed solution to improving e-Government user adoption in South Africa.

These guidelines were presented to the research participants from the different South African e-Government projects to obtain data so as to confirm or refute whether each guideline: (i) is an important Agile practice; and (ii) is fundamental for user engagement, in developing e-Government systems.

Literature tells us that the Agile approach ensures user satisfaction, through constant user involvement and the regular delivery of working software to the client (Barlow *et al*., 2011; Glaiel, 2012; Stoica *et al*., 2013; Verma and Gupta, 2014; Vithana *et al*., 2015). The connection between the use of Agile practices and e-Government user adoption was demonstrated diagrammatically in **figure 5.7** in **Chapter 5**.

Additionally, the Agile approach makes provision for user testing and feedback as a means to iteratively refine the product to meet users' specifications (Kautz, 2011; Glaiel, 2012; Venkatesh, 2012; Iyawa *et al*., 2016),

The guidelines (Agile practices fundamental for fostering user adoption) identified from the literature were as follows:

- **Guideline 1: Requirements Gathering** (Soliciting system requirements or initial input from the target users of the system).
- **Guideline 2: Product Prototypes** (Developing and presenting various iterations or prototypes of the product to the user, throughout the development process).
- **Guideline 3: Product Testing** (Allowing the user to test each iteration or prototype of the product).
- **Guideline 4: Product Feedback** (Constant user feedback is solicited after each work cycle).
- **Guideline 5: Changing Requirements** (The ability for project stakeholders to request changes to the system requirements, within the development process).

- **Guideline 6: Constant User Involvement** (The project team and stakeholders should work together and communicate regularly throughout the project).

The interview responses from the participants, as summarized in **table 8.1** above reflect that constant communication with the client or user, and constant stakeholder engagement are mandatory Agile user engagement practices (Guideline 6 – Constant User Involvement). The participant from Case 1 expressed that a lack of such communication is the cause of failed e-Government projects. The participant from Case 2 added that engaging the stakeholders throughout the entire development of the e-Government system may assist with minimizing any resistance as early as possible. The participants also indicated that the ability to give users a voice to express their input, feedback, and guide the development, is a fundamental Agile practice for ensuring user engagement in the development of e-Government systems (Guidelines 1, 4 and 5).

The findings from the Quantitative data, illustrated in **figures 7.8 – 7.13** in the previous chapter, indicate that all the participants concur that all six (6) guidelines are relevant Agile Systems Development practices. The participants all strongly agreed that iteratively prototyping (demonstrating) the product to the client (Guideline 2), and ensuring the user is involved throughout the development process (Guideline 6) are important Agile practices. The quantitative data (collected using online forms) also display that most of the participants strongly believe that soliciting product feedback from the users (Guideline 4), enabling stakeholders to make changes to the project requirements (Guideline 5), and constantly involving the user in the development process (Guideline 6) are fundamental Agile practices for ensuring user engagement during e-Government systems development.

It can be deduced from these findings that all of the literature-identified Agile practices (guidelines 1 – 6) are relevant – with some (Guideline 3 – Product Testing) being less essential than others. This means that product testing is not necessarily an activity where users are involved in each iteration of the project. This also explains why iterative product testing (or iterative user testing) is not included in the Agile principles, and instead user testing only takes place at the end of a project.

On the contrary, while Guideline 2, the cornerstone of the Agile approach, was identified as a fundamental for user engagement, the participants strongly expressed Guidelines 4, 5 and 6 as core Agile practices which encourage user engagement during the development of e-Government systems.

Therefore, to answer research question 2: *Which of the Agile systems development practices are fundamental for user engagement in the development phase?* it is be concluded that the Agile practices that can be used to enhance user engagement throughout the development of e-Government systems are all the guidelines identified in the literature, with less emphasis on Guideline 3, and more emphasis on Guidelines 4 - 6.

8.4.4. e-Government User Engagement Practices

Research Question 3: *How do e-Government project teams currently engage users in the development of e-Government systems, to ensure user adoption or buy-in?*

The purpose of this question was to determine whether there are current practices (Agile user engagement practices in particular) used by e-Government teams to ensure the adoption of the systems being developed.

The investigation of this research question entailed reviewing existing literature on what other authors had to say regarding user engagement practices during the development of e-Government systems; interviewing e-Government project team members about their user engagement processes; as well as collecting data to determine whether various e-Government projects made use of the Agile guidelines to ensure user adoption.

In **section 4.4** of **Chapter 4** Holgersson (2014) asserts that e-Government adoption can be achieved through the application of user participation techniques, such as Agile development, during development. Holgersson (2014) further states that currently, government agencies make use of an inside-out approach: whereby the users and their needs are not considered during the development phase. Weerawarana *et al*. (2012) points towards the use of an Agile e-Government approach, which ensures stakeholder engagement and the ability to satisfy client needs. However, according to the research by Ditibane (2014) only a sparse amount of e-Government projects adopt an Agile development approach – with most projects implementing the traditional Waterfall approach (which does not encourage constant user engagement throughout the e-Government development process, and often leads to project failure). **Section 5.7** of **Chapter 5** also presents the insights of various authors (Lohan *et al*., 2011; Sharma *et al*., 2012; Iyawa *et al*., 2016) purporting that Agile methodologies can be employed to improve user engagement. The employment of user engagement practices can mitigate low user adoption of e-Government systems, and ensure project success (Heeks, 2003).

The interviewed participants, representing e-Government project teams from various e-Government projects in South Africa, expressed the practices used in their respective projects (summarized in the first column of **table 8.1** above).

Two (2) of the four (4) projects reviewed followed an Agile approach, while the other two made use of a traditional Waterfall approach (or hybrid of Waterfall and Agile) – recalling how, as stated in literature, some projects still make use of the Waterfall approach. This also meant that the projects which followed a Waterfall approach (Cases 3 and 4), typically engaged stakeholders in the early stages of the projects, to gather project requirements, and towards the end of the project, for user acceptance testing.

On the other hand, Cases 1 and 2, employed an Agile development approach, which means that their user engagement practices were similar to those outlined in the six (6) proposed User Engagement Guidelines. This is in line with the literature, which states that some e-Government projects in South Africa make use of user participation techniques, to minimize resistance and ensure user buy-in. These projects engaged users throughout the development of the e-Government systems, starting with consulting users for the project requirements, right through to allowing users to change requirements in the course of the development. In addition to being led by the Agile methodology, Case 1 also made use of their own in-house implementation manual, which details the role of the project team in engaging users during the development process. These techniques were followed by the teams to ensure that the users are kept informed and satisfied with the final product.

While only two projects (out of the four) made use of a purely Agile approach, all the participants expressed that they engaged users throughout the project, for the purpose of improving user adoption and buy-in.

Figure 7.5 in **Chapter 7** illustrates the findings from the questionnaire, which sought to determine the stages at which various users are engaged throughout the development of e-Government systems. According to this diagram (**figure 7.5**), the Product Owner (client or user representative) is the stakeholder who is most engaged in all project development stages (requirements gathering; building; prototyping; testing; feedback; changing requirements; final release). **Figure 7.6** indicated the frequency of such engagement.

The participants were also asked to indicate whether they make use of each guideline in their current e-Government projects to determine whether these project teams engage users during development so as to improve the chances of user adoption and buy-in. **Figures 7.8** to **7.13** in **Chapter 7** illustrate the results from the participants' responses. **Figure 7.8** shows that in two of the e-Government projects, the target users are not consulted for system requirements or their input in the requirements gathering phase. **Figure 7.9** indicates that in one project users are completely not involved in the viewing or testing the product prototype.

In all the projects, the end users are not typically involved in the testing, feedback, or changing requirements of the project. However, while this may be the case, the participants indicated that different levels of internal stakeholders are involved in the various stages of the project.

The exact process of engaging users (applying user engagement guidelines) will be elaborated in the following section, where each project stipulated how each guideline was observed, or how it can be implemented in the development of e-Government projects.

8.4.5. User Engagement Guideline in e-Government Context

Research Question 4: *How can Agile user engagement guidelines be applied in the e-Government context?*

The analysis and response to this final research question will be broken down according to the six (6) guidelines, with each guideline's applicability and process of implementation presented separately; starting with the application of guideline 1 in the e-Government context.

This question sought to determine whether the proposed User Engagement Guidelines are practical and applicable in an e-Government context. Therefore, this section will first present what the literature states about how each guideline is implemented, in theory; then present the findings from the e-Government project teams – which indicate how these guidelines were implemented in reality. Finally, the participants indicated the difficulty level of implementing each guideline: they believe each guideline has a positive impact on user adoption.

Guideline 1: Requirements Gathering

According to the literature presented on Agile methodologies (**section 5.3** of **Chapter 5**), theory Requirements Gathering entails soliciting input from end-users, customers, team and other stakeholders at the start of the project (Glaiel, 2012), to allow the project team to have a clearer understanding of the business problem (Pressman, 2010).

The data results reflect that all the e-Government projects team members interviewed followed a similar process to the one expressed in the literature. In the e-Government context, the Business Analyst from the project team is tasked with collecting input from various stakeholders, then documenting the stakeholder requirements onto a requirements specification document. This document is presented back to the stakeholders for approval and sign-off. In Case 4, we see that the high-level system requirements (business problem and project scope) are presented by the senior management (client), while the low-level system requirements (functionality) are presented by middle management and the target users.

The potential challenges of trying to implement this guideline in the e-Government context is in ensuring that all stakeholder groups are present or represented in providing requirements. The quantitative data findings in **figure 7.8** reflect that one participant agreed that implementing this guideline is difficult, while the rest of the participants disagreed or remained impartial. Another challenge was that in projects which follow a traditional Waterfall approach, the users are not included in this process. For instance, the participant from Case 3 expressed that management would not allow for users to take part in requirements gathering.

The participants also expressed that the implementation of this guidelines has a positive impact on user adoption, as illustrated in **figure 7.8**. They elaborated that engaging users in the requirements gathering phase allows the project team to have an understanding of user needs: as excluding users from this stage can lead to resistance and non-adoption, as one cannot build a system for users without their input.

Guideline 2: Product Prototyping

Agile systems development is built on the premise of frequently delivering working software to the users (Cockburn, 2005; Turk and Rumpe, 2005; Misra *et al*., 2009; Barlow *et al*., 2011; Stoica *et al*., 2013; Verma and Gupta. 2014; Vithana *et al*., 2015; El Hameed *et al*., 2016), as mentioned in **section 5.4** and **5.7** of **Chapter 5**. In theory, product prototyping requires the project team to "deliver the software increment to the customer so that functionality that has been implemented can be demonstrated and evaluated by the customer" (Pressman, 2010, p.84).

The SCRUM Agile methodology (explained in **section 5.3.1** of **Chapter 5**) states that the project team works in three to four week long development cycles (sprints) – where they are required to produce working software or a deliverable to present to the users at the end of each sprint (Glaiel, 2012). The Extreme Programming (XP); Feature Driven Development (FDD); Dynamic Systems Development Method (DSDM) Agile methodologies, together with the Agile principles also emphasize the importance of frequent product releases (prototyping) (Barlow *et al*., 2011; Glaiel, 2012; Verma and Gupta, 2014).

When comparing the theory to the research findings, from the data collection, we can appreciate that two (2) of the e-Government projects examined indicated that a similar approach to product prototyping was used, as explained in the literature. For instance, in Case 1, the project team ensured that the system was demonstrated to the users on a weekly basis, to allow the user to comment on the system. In a similar manner, the project team in Case 2 presented the iterative development of the system to stakeholders every two weeks, after the completion of each sprint. The participant from Case 2 mentioned that product prototyping entailed "trying to get everyone in the room so that would be the development team, all the [developers], all the testers, and then the product owner and all the doctors". The process of prototyping the system consisted of a project team member demonstrating the system to the stakeholders; indicating the progress of the project; and then giving the stakeholders an opportunity to comment. Cases 3 and 4 used a different approach to the Agile approach of prototyping. These projects only presented the system to the users at the end of each project phase, when the users were receiving training on the system.

Data reflects that conducting a product or system demonstration iteratively, ensures constant user involvement and subsequently, user buy-in. **Figure 7.10** in the previous chapter supports this notion and illustrates that all the participants expressed that this guideline has a positive impact on user adoption.

The challenge of implementing this guideline in an e-Government project context is that of guaranteeing the availability of all stakeholders, in order to demonstrate the system in one session. In government projects that are still very Waterfall-oriented, the challenge could be that of involving other stakeholder groups, in addition management, as alluded to in Case 3. The challenge of ensuring the presence of all stakeholders is not perceived to be severely disadvantageous, as is the challenge expressed by Case 3 in **table 8.1** above. This explains the data results in **figure 7.10**, which illustrate that only one participant perceives the implementation of this guideline to be difficult.

Therefore, it can be concluded that in general, e-Government project teams are aware of the significance of product prototyping and its impact on improving user adoption and buy-in. However, only two of these projects made use of an Agile approach in prototyping, which resulted in user buy-in and constant user involvement. The challenges of implementing this guideline were mainly to do with securing stakeholder presence. As a result, this guideline is practical and can be implemented in the e-Government context in accordance to the Agile method of prototyping, detailed in preceding paragraphs.

Guideline 3: Product Testing

This guideline sought to discover whether user involvement could take place in the testing process of the development of e-Government systems. The literature reviewed (section **5.3** of **Chapter 5**) stipulates that users do not typically take part in iterative product testing (testing the system after each sprint). The user reviews the system iteratively (Glaiel, 2012), during the prototyping or demo sessions. While iterative testing is essential in systems development, through unit, integration and system tests; the Agile approach asserts that users take part in user acceptance testing, to determine whether the system works as it should (testing features and functionality) (Pressman, 2010; Glaiel, 2012).

Following the literature study, e-Government project team members were asked to indicate whether user testing can be incorporated in the e-Government systems development methodology. Case 1 and 2 participants expressed that iterative product testing is only conducted by the project team, while user acceptance testing (UAT) takes place at the end of the project, after the system has been deployed. Case 3 did not involve users in any stage of the system testing, while Case 4 conducted all testing (UAT and Systems Acceptance Testing) at the end of the project. This indicates that this guideline is only applicable at the end of e-Government projects, and not necessarily throughout the project, according to the Agile practices.

Data from participants states that enabling user testing results in user satisfaction, through giving users the opportunity to test whether the system meets their requirements. The findings from the quantitative data collection support this, as illustrated in **figure 7.9** (from **Chapter 7**), indicating that all participants believe that this guideline has a positive impact on e-Government user adoption.

The challenge of implementing this guideline, as cited by the participants, is that of managing user expectations. However, the quantitative data indicates that only one participant perceives this guideline to be difficult to implement, in an e-Government context.

Therefore, based on the literature and data collection findings, it can be concluded that, this guideline can be amended or rephrased to state that user involvement during the testing phase, can occur at the end of the project, during user acceptance testing; rather than after each iteration.

Guideline 4: Product Feedback

Literature informs us (in **section 5.3.2**) that through the Extreme Programming (XP) Agile methodology, the project team makes use of an on-site customer to provide input and feedback on the system being developed regularly (Glaiel, 2012). The Dynamic Systems Development Methodology (DSDM) (in **section 5.3.4**) also demonstrates that product feedback is collected from on-site users – who are presented with the product prototype beforehand (Glaiel, 2012). User feedback can also take place together with testing (User Acceptance Testing) (Barlow *et al*., 2011; Kautz, 2011; Venkatesh, 2012; Iyawa *et al*., 2016). In larger projects, where it is not possible to solicit feedback from all users, the project team may make use of a product owner (user or stakeholder representative who has direct contact with the users), to provide system feedback (Barlow *et al*., 2011).

The Quantitative data findings (summarized in **table 8.1** above), collected through the in-depth interviews with representatives from various e-Government projects, reflect that in practice this guideline is typically implemented together with the product testing – as indicated by the literature. Some of the interview participants also expressed that a product owner was used as an intermediary, to probe users to comment on whether the product meets their expectations; and, subsequently, presenting the user feedback to the project team.

To triangulate the data findings, a brief quantitative data collection process was conducted with the same participants – in order to express whether they perceived the implementation of this guideline during the development of e-Government systems to be difficult; and whether this guideline can positively influence the user adoption of e-Government systems.

As illustrated in **figure 7.11** in the previous chapter, all the participants expressed that the use of such a guideline during the development process can positively influence the user adoption of e-Government systems. This is strengthened by the comments which the participants made during the interviews – stating that this guideline allows users to reveal their satisfaction (or lack of), to re-emphasize their needs and what is important to them, and to ensure a satisfactory product.

Concerning the perceived difficulty of implementing such a guideline in an e-Government context, only one participant indicated that this guideline may not be easily integrated in an e-

Government systems development context. During the interview, this particular participant pointed towards the fact that in their Waterfall-oriented project, users do not typically have the opportunity to present feedback, as they only interact with the system once the project is complete. The rest of the participants, who did not indicate any difficulty of implementing this guideline, all made use of the Agile approach of Product Feedback.

Guideline 5: Changing Requirements

Arguably, one of the defining qualities of the Agile methodology is that of embracing changing requirements at any stage of the project – as stipulated in the Agile Manifesto (see **section 5.4**). With that said, implementation of this guideline during the system development process demonstrates that a project is indeed following an Agile Systems Development Methodology.

According to the SCRUM methodology (in **section 5.3.1**), the system requirements are reviewed and refined before the following sprint (2-week work cycle) (Glaiel, 2012). According to the revised Agile principles by Williams (2012), changing requirements should be presented and considered at the beginning of each sprint.

The interviewed participants mentioned that the success criteria for implementing this guideline effectively is to respond quickly to the stakeholder's changing requirements; and including these into the project without needing to redesign the system, or release a new system. The participants also emphasized (summarized in **table 8.1** above) the importance of securing senior management or government officials sign-off on all changing requirements in an e-Government context. New requirements can only be accepted if they replace existing requirements, as the project team is mandated to stay within the designated scope and budget. In the more rigid (Waterfall-like) e-Government projects, such as Case 3, changes to, or new requirements are not considered beyond the start of each sprint, but are rather deferred to the following phase of the project – which may be a few months or even years. On the other hand, projects that are more advanced in the use of an Agile methodology may make use of an in-house developed Requirements Management Framework, as done in Case 4.

In the Quantitative questionnaire, all the participants expressed that the implementation of this guideline can positively influence the user adoption of e-Government systems. The qualitative interviews sought to delve deeper into these findings so to discover why the participants felt this way. In the interviews, the participants stated that allowing changing requirements throughout the project gives the users a sense of ownership of the system, resulting in user buy-in.

While this guideline holds the potential to improve user adoption (as illustrated in **figure 7.12** of the previous chapter), one participant indicated that implementing such a guideline in the e-Government context will most likely be challenging: the rest of the participants did not share similar sentiments. Upon further investigation, through the in-depth interviews, the participants mentioned that in the characteristically Waterfall environment of government, changing requirements (or changes to the project) is not understood or welcomed by government officials, as they believe that this will delay the project or increase project costs. However, this challenge can be overcome through prioritizing and replacing existing requirements with new ones – while managing stakeholder expectations, as done in Case 2 (see **section 7.2.2**).

Guideline 6: Constant User Involvement

The final guideline of the Agile User Engagement Guideline – which refers to the significance of constantly involving users throughout the e-Government systems development cycle – was initially listed as one of the six (6) guidelines proposed by the author (see **section 5.7.1**). However, as the research progressed and data collection took place, the researcher realized that this guideline might in fact be a common feature expressed in all the previous guidelines: or an overarching guideline – with the previous five (5) as components. In other words, the researcher initially viewed guideline 6 as yet another guideline, like the others; and as the investigation proceeded, the researcher developed a different view and understanding of the role of guideline 6, i.e. as the main unique proposition of the Agile development approach with the other five (5) guidelines as steps towards achieving this goal.

It is important to make reference back to the beginning of this research, where the researcher presented the Agile approach as a potential solution for improving user adoption. As in business, the Agile approach has been commended for its ability to ensure customer satisfaction through constant engagement. Therefore, this research sought to indicate that the use of such an Agile approach (that of constant user engagement) can similarly result in user satisfaction, whence adoption in the e-Government context.

While the above discovery occurred after the data collection process, the findings continue to substantiate the relevance of this guideline. For instance, **figure 7.13** in the previous chapter illustrates that all the participants strongly agreed that implementation of this guideline can positively influence the user adoption of e-Government systems.

8.4.6. Connection between Guidelines and User Adoption

To conclude the data collection, the final section of the qualitative interviews conducted with the Agile practitioners (working on e-Government projects) sought to interrogate the overall perceptions of the participants towards the guidelines. Through this section (section D in **Appendix G**), the researcher wanted to determine whether the participants believed that the implementation of the overall guidelines during the development of e-Government systems can truly improve e-Government user adoption.

As a result, the findings indicate (summarized in **table 8.1** above) that all the participants (representing different e-Government projects) believed that the implementation of these guidelines can indeed improve e-Government user adoption, provided that adoption is voluntary.

The participants were also asked to provide any recommendations or changes to the guidelines, which they felt would be best represent a practical e-Government project. The participants stressed the importance of constantly communicating and engaging with stakeholders throughout the project as a way to minimize resistance and ensure buy-in. The participants also recommended that this guideline be used by e-Government project teams – even if they are not followed perfectly. Another participants suggested that this guideline be consolidated into a standard Agile e-Government systems development model to guide all e-Government project teams during development. In addition to this, another participant recommended that the guidelines be tailored towards different stakeholder groups, and not only the project team, to enable other stakeholders to understand the development process.

8.5. Modified Guidelines

According to Yin’s (1994) Case Study Method, illustrated above in **figure 8.4**, one of the final steps after analyzing and interpreting the data is to make a contribution to the initial theory (Agile-informed User Engagement Guidelines) and modify it according to the research findings results.

With that said, this section will present a modified version of the proposed guidelines, according to the feedback obtained during the data collection process from the different South African e-Government projects.

In **section 5.7**, the researcher expressed how the use of an Agile approach can positively influence e-Government user adoption. This was demonstrated using the Agile-informed User

Engagement Guidelines, obtained from the literature. Here, the assertion made indicated that there are six (6) Agile practices that facilitate user engagement; and with the use of these practices during the development of e-Government system, user adoption can be attained.

These proposed guidelines were presented as the potential solution to combat low e-Government user adoption in South African e-Government projects, and thus contribute to ensuring the success of e-Government projects in South Africa.

8.5.1. Pre-Tested (Initial) Guidelines

The initial proposed guidelines, before the data collection procedure, as listed in **table 5.4** in **Chapter 5**, are as follows:

- **Guideline 1 (Requirements Elicitation):** The system requirements, or input should be elicited from the project end-users, customers, team and other stakeholders.
- **Guideline 2 (Product Prototyping):** Valuable product is developed and delivered to the customer in small components, known as prototypes. These prototypes are delivered at regular intervals throughout the system development. The project team should ensure that they present the client with prototypes of the system between a few weeks, to a couple of months.
- **Guideline 3 (Product Testing):** Each product / system iteration is tested and reviewed by the client and refined in the following work cycles (sprints), to determine whether the system works as it should.
- **Guideline 4 (Product Feedback):** Constant user feedback is solicited after each work cycle (sprint), to ensure that the system meets the needs of the users.
- **Guideline 5 (Changing Requirements):** The project team should welcome changing requirements, from the customer, throughout the system development process.
- **Guideline 6 (Constant User Involvement / Customer Collaboration):** The project team needs to involve the end-users and customers, throughout the system development process. Business people and developers must work together and communicate daily throughout the project.

8.5.2. Post-Tested (Final) Guidelines

Based on the findings obtained through consulting with the Agile e-Government practitioners (research participants), the following modifications will be made to the guidelines:

Guideline 1 (Requirements Gathering)

This guideline will remain unchanged, as all the participants expressed that they follow this guideline as prescribed by the Agile approach (proposed guideline above).

The participants indicated the importance of this guideline, stating that engaging users in the requirements gathering phase allows the project team to have an understanding of user needs; and excluding users from this stage can lead to resistance, and non-adoption. Consequently, guideline 1 will remain, as the participants emphasized its significance for user adoption through user engagement – and as a fundamental Agile practice necessary for the e-Government system development context.

Guideline 1 remains as follows: *the system requirements or input should be elicited from the project end-users, customers, team and other stakeholders.*

Guideline 2 (Product Prototyping)

While in theory product prototyping in Agile, should take place at least every two weeks (at the end of each sprint), the data findings reflect that each of the e-Government cases examined implemented this guideline differently. Some projects demonstrated the system prototype after each sprint, allowing users to interact with the system; other projects only presented the system after each project phase – when the users were receiving formal training. Therefore, this implies that in some projects prototyping and testing is seen as two phases that are linked – as users are given an opportunity to test the system during the demo session.

With that said, the modification to this guideline will consist of merging guideline 2 (prototyping) and guideline 3 (testing) into one group: indicating that these are related, or that they can happen in the same phase. However, this guideline will remain unchanged.

Guideline 2 will remain as follows: *Valuable product is developed and delivered to the customer in small components, known as prototypes. These prototypes are delivered at regular intervals throughout the system development. The project team should ensure that they present the client with prototypes of the system between a few weeks, to a couple of months.*

Guideline 3 (Product Testing)

The research findings indicate that users are not typically involved in iterative product testing as formal user acceptance testing takes place at the end of the development. However, users are given the opportunity – during the product demonstration – to briefly examine and comment on the system. Therefore, this guideline is merged with guideline 2, as informal 'testing' takes place with the product prototyping.

This guideline will be changed to state that informal user acceptance testing (UAT) should take place during product demonstrations, and formal (thorough) UAT testing should take place at the end of the development phase.

Guideline 3 will be changed to state the following: *Each product / system iteration is **informally examined** and reviewed by the client and refined in the following work cycles (sprints), to determine whether the system works as it should. **Formal User Acceptance Testing (UAT) takes place upon completion of the system**.*

Figure 8.5 below illustrates that guideline 2 and 3 are grouped together, due to the above explanation.

Guideline 4 (Product Feedback)

As the initial guideline 4 stated above, product feedback is solicited from the users. However, data collection reflects that in larger projects, where a large user group exists, the project team can make use of a Product Owner (stakeholder representative) as an intermediary, to present user feedback.

Thus, this guideline will be modified to state that *constant user feedback is solicited **from a Product Owner** after each work cycle (sprint), to ensure that the system meets the needs of the users.*

The participants agreed that this phase comes after the demo and testing of the product, as illustrated below in **figure 8.5**.

Guideline 5 (Changing Requirements)

The findings indicate that implementing this guideline will entail responding swiftly to the user's feedback, and incorporating the changes without the need to redesign the system. The participants also indicated that for the e-Government context, new requirements can only be accommodated if they are to replace existing requirements.

Accordingly, this guideline should read, *the project team should welcome changing requirements, from the customer throughout the system development process.* ***These changes may be accepted only if they are to replace existing requirements.***

This guideline can be seen as one with, or related to, the previous guideline (feedback). This is because the new or changed requirements are collected from the feedback provided by the users. Therefore, as illustrated in **figure 8.5** below, guideline 4 (product feedback) and 5 (changing requirements) are grouped into one phase of the Agile user engagement approach.

Guideline 6 (Constant User Involvement)

As mentioned in **section 8.4.5** above, after interpreting, the data it emerged that this guideline may in fact be the leading guideline: which encompasses the other five (5) guidelines.

This guideline will remain unchanged, stating that, *the project team needs to involve the end-users and customers, throughout the system development process. Business people and developers must work together and communicate daily throughout the project.*

Table 8.3 below is a summary of the modified guidelines.

Table 8.3: Pre- and Post-Tested Guidelines.

	Pre-Tested Guideline	**Post-Tested Guideline**
Guideline 1: Requirements Gathering	The system requirements, or input should be elicited from the project end-users, customers, team and other stakeholders.	The system requirements or input should be elicited from the project end-users, customers, team and other stakeholders.
Guideline 2: Product Prototyping	Valuable product is developed and delivered to the customer in small components, known as prototypes. These prototypes are delivered at regular intervals throughout the system development. The project team should ensure that they present the client with prototypes of the system between a few weeks, to a couple of months.	Valuable product is developed and delivered to the customer in small components, known as prototypes. These prototypes are delivered at regular intervals throughout the system development. The project team should ensure that they present the client with prototypes of the system between a few weeks, to a couple of months.
Guideline 3: Product Testing	Each product / system iteration is tested and reviewed by the client and refined in the following work cycles (sprints), to determine whether the system works as it should.	Each product / system iteration is **informally examined** and reviewed by the client and refined in the following work cycles (sprints), to determine whether the system works as it should. **Formal User Acceptance Testing (UAT) takes place upon completion of the system**.
Guideline 4: Product Feedback	Constant user feedback is solicited after each work cycle (sprint), to ensure that the system meets the needs of the users.	Constant user feedback is solicited **from a Product Owner** after each work cycle (sprint), to ensure that the system meets the needs of the users.
Guideline 5: Changing Requirements	The project team should welcome changing requirements, from the	The project team should welcome changing requirements, from the customer, throughout the system development

	customer, throughout the system development process.	process. **These changes may be accepted only if they are to replace existing requirements.**
Guideline 6: Constant User Involvement	The project team needs to involve the end-users and customers, throughout the system development process. Business people and developers must work together and communicate daily throughout the project.	The project team needs to involve the end-users and customers, throughout the system development process. Business people and developers must work together and communicate daily throughout the project.

As mentioned in guideline 6, users (stakeholders) ought to be involved throughout the project. This explains why the previous five (5) guidelines are seen as components of this guideline, as implementing all five (5) guidelines results in constant user involvement (user engagement). **Figure 8.6** below illustrates this relationship.

The guidelines are presented diagrammatically in **figure 8.6** to illustrate that they all work together in pursuit of user engagement using an Agile approach. The guidelines are depicted as being like a set of gears, with the movement of one gear resulting in the movement of the other gears.

These gears rest within the context of Constant User Involvement.

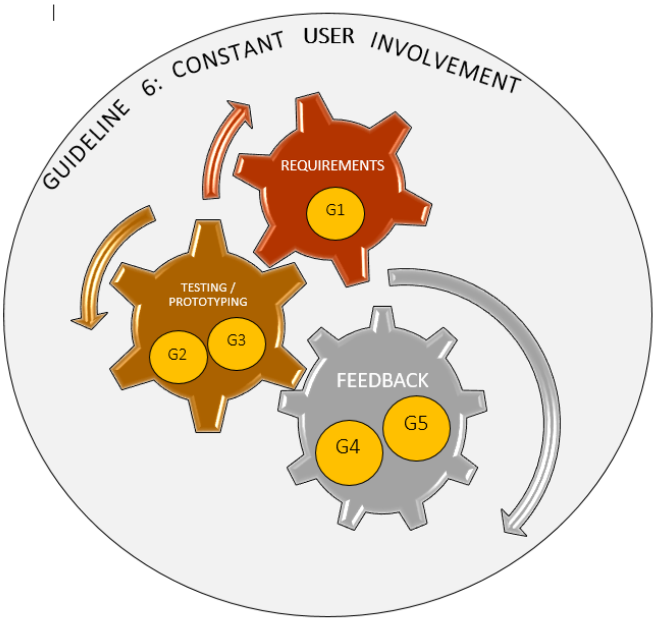

Figure 8.6: Interconnectedness of Guidelines

8.6. Conclusion

In this chapter, the research findings from the literature review (**Chapters 2 – 5**), Quantitative data collection, presented in **section 7.3** in the previous chapter, and Qualitative data collection process, presented in **sections 7.2** and **8.3**, were compared, contrasted, and interpreted, as stipulated by Triangulation Mixed-Methods Design (Adapted from Creswell and Creswell, 2017) – illustrated in **figure 7.3** (**Chapter 7**). The findings from the aforementioned data sources were triangulated for the purpose of validity.

The four research questions that lead this investigation, initially presented in **section 1.5.2** of **Chapter 1**, were reiterated, and the findings used to answer each one of those questions in pursuit to achieve the research goal and conclude the study.

CHAPTER 9: RECOMMENDATIONS AND CONCLUSION

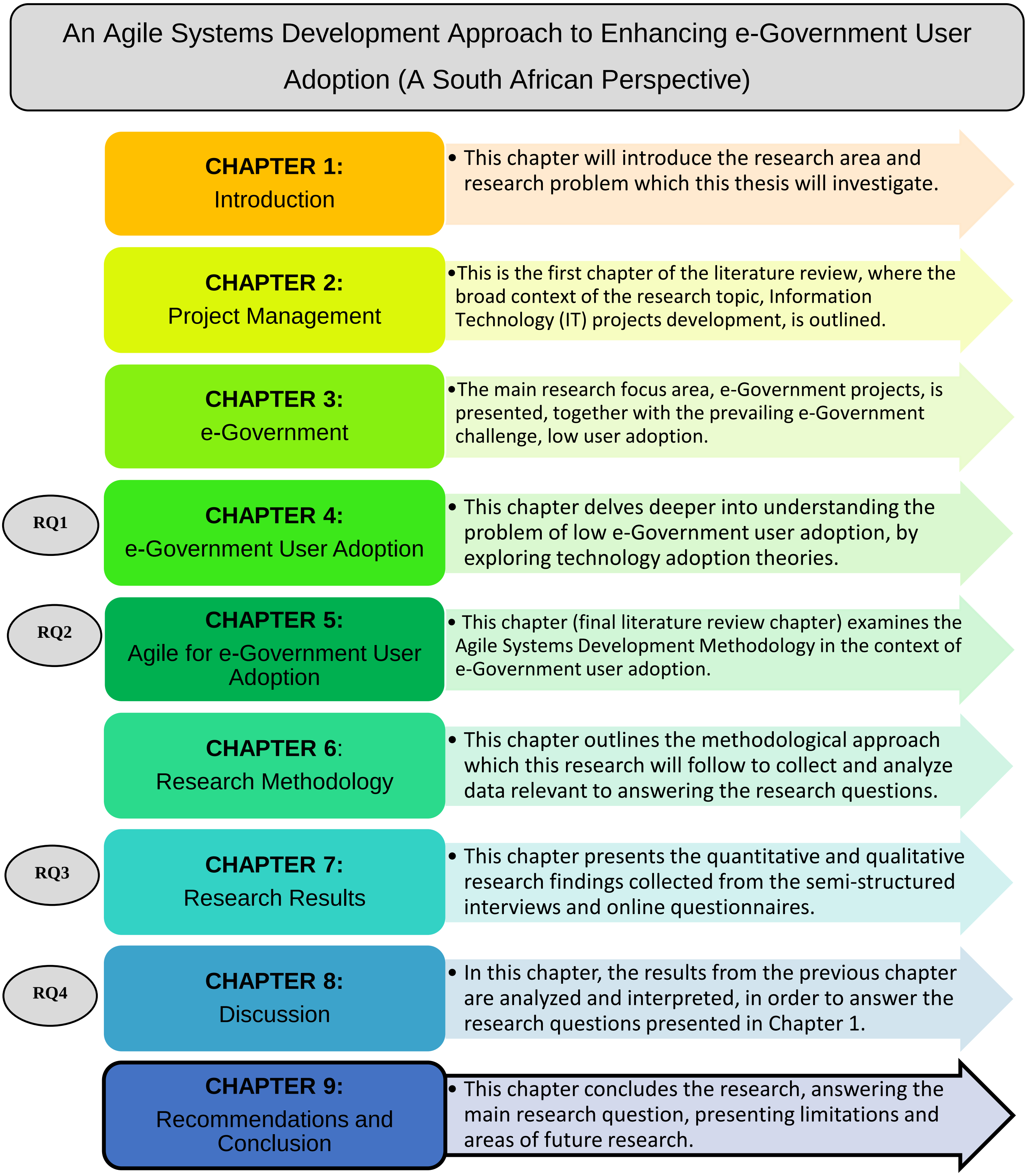

Figure 9.1: Chapter 9 Thesis Structure

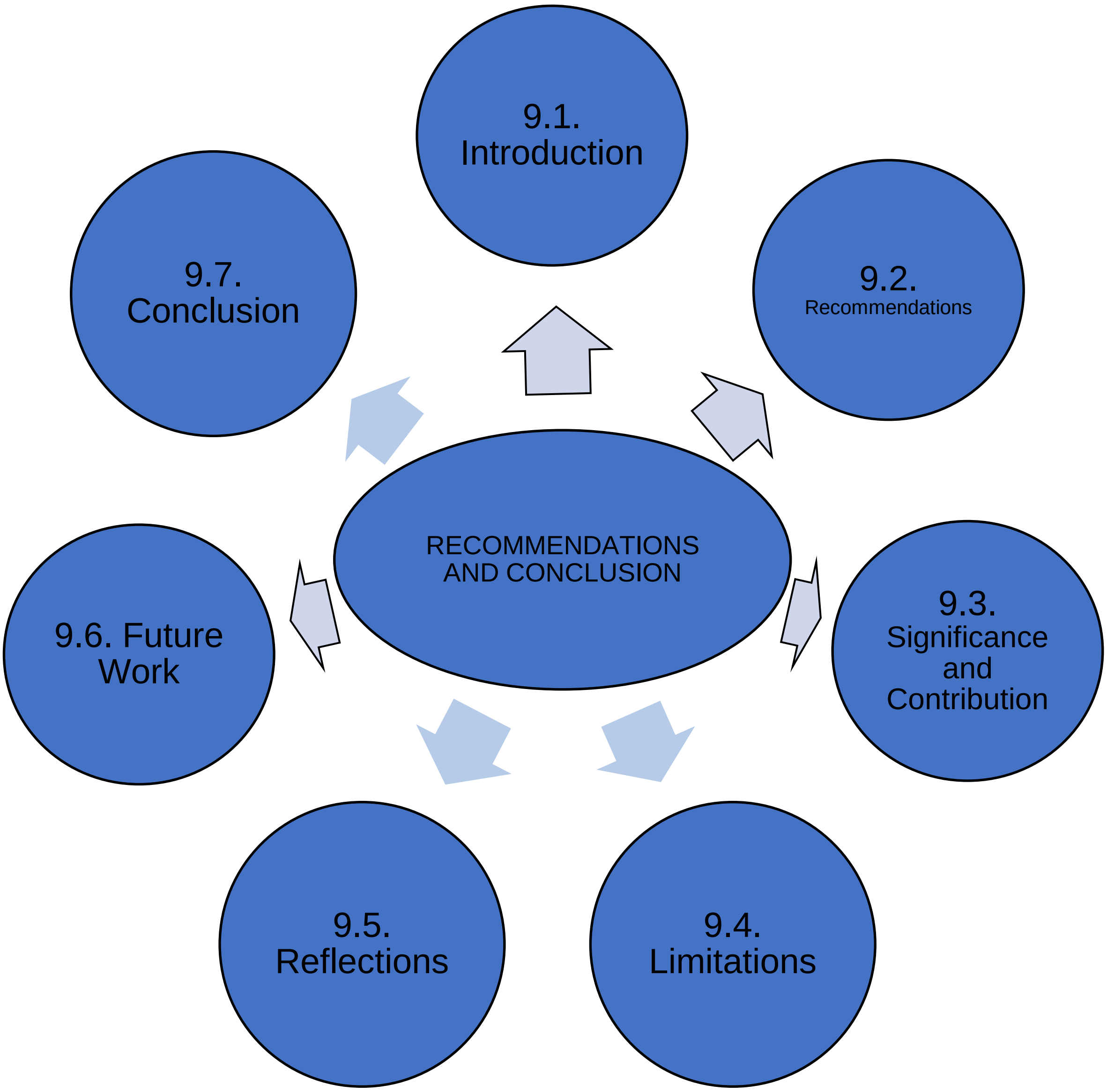

Figure 9.2: Chapter 9 Outline

***Abstract**: This chapter will conclude the research into the Agile Systems Development approach for improving e-government user adoption. The conclusion will present a set of recommendations regarding the use of an Agile System Development approach for enhancing e-Government user adoption. To complete this thesis, the research questions will be revisited, and answered, to accomplish the research objective stated in the first chapter.*

9.1. Introduction

After the study of existing literature, collection and analysis of Quantitative and Qualitative data, and triangulation of data to answer the research questions posed in the Chapter 1; this chapter will strive to complete this thesis by providing a set of recommendations and reflections.

9.2. Recommendations

As the research questions have been answered (in Chapter 8), and the proposed Agile-informed User Engagement Guidelines modified, the final step is to provide recommendations to e-Government project teams regarding the use of an Agile approach for improving e-Government user adoption.

The research question that steered the enquiry into the investigation on e-Government project failure (with a focus on user adoption) is as follows:

How can an Agile Systems Development approach enhance e-Government user engagement, in support of greater user adoption?

The following set of recommendations are to inform South African e-Government project teams on how to incorporate Agile practices in pursuit of greater user engagement: and, thus, user adoption. These recommendations are informed by the feedback obtained from the research participants interviewed, as well as from literature studies.

Part A below presents the recommendations relating to the User Engagement guidelines, while part B presents the general recommendations.

(A) User Engagement Guidelines:

e-Government project teams need to make use of the Agile-informed User Engagement Guidelines for thorough user engagement so as to minimize resistance and ensure user buy-in or adoption.

1. Guideline 1: Obtain project input from all stakeholder groups.
2. Guideline 2: Ensure that the e-Government system is demonstrated to stakeholders incrementally (at the end of each work cycle / sprint) during the development process.
3. Guideline 3: Give users the opportunity to test the e-Government system so to ensure that it meets their requirements.
4. Guideline 4: Probe users for feedback on the e-Government system after each demonstration.
5. Guideline 5: Accept changes to the project requirements throughout the development of the e-Government system.
6. Guideline 6: Communicate with users (and stakeholders) throughout the project, and ensure that they are constantly involved in the project.

(B) General recommendations

7. In larger, more complex, e-Government projects – a hybrid approach can be adopted, where the Agile practices are embedded within the structured Traditional development methodology.
8. e-Government project teams should try and implement the Agile-informed User Engagement Guideline even if these are not implemented perfectly.
9. During the development of e-Government systems, project teams should engage users so to ensure that the ensuing adoption factors are considered and addressed: Perceived Ease of Use; Perceived Usefulness; User’s Experience (with the technology); User’s Attitude (towards this technology); Quality of Technology; and Social Influence.
10. Consult with the users of the system in all stages of the project, or a Product Owner, in the event that users cannot be reached.
11. In order to remain within the project scope, new or changing requirements may only be accepted provided they will replace existing project requirements.

9.3. Significance and Contribution

As suggested in Chapter 1, this research seeks to challenge the status quo (or current approach used to develop e-Government systems in South Africa) and foster e-Government user adoption. Research has indicated that a number of e-Government projects make use of a Traditional Waterfall methodology in developing e-Government systems . However, research also indicates that this structured, rigid approach does not encourage constant user engagement and changes to the project. e-Government systems that are developed using the Traditional development approaches tend to result in project failure.

The quintessence of this study was to assess whether the use of Agile methodologies has the potential to influence user adoption of e-Government systems. This was reinforced by the analysis of government agencies that employ, as well as those that do not employ, Agile practices.

This thesis sought to suggest the use of an Agile systems development approach due to its user-centered focus – which promotes user satisfaction, flexibility to project changes, and, ultimately, fosters user adoption.

Therefore the contribution that this thesis makes is the Agile-informed User Engagement Guidelines – which may be used as a guide for South African e-Government project teams to develop e-Government systems with the end-user in mind.

9.4. Limitations

While this thesis sought to present a thorough investigation into understanding e-Government user adoption, and the Agile system development approach; certain themes could not be explored further due to resource constraints.

Due to the difficulty of obtaining access into government departments, this thesis was limited in that only four (4) e-Government projects were available to take part in this study. Data saturation could have been reached with the investigation of additional e-Government projects and participants.

The researcher would have also liked to consult the users from the e-Government projects examined so to collect their thoughts and perceptions regarding user engagement as a contributory factor to user adoption. However, this will be an area for future research into this study.

9.5. Reflections

This research area was encouraged by my pursuit to conduct research that would benefit society. I have noticed through my studies that people who are not technologically savvy find it very difficult to interact with technology applications to complete their work. It then occurred to me that, as Technologists, that we often neglect to thoroughly consult with the end-users when developing new technologies, or new government systems.

As a result, we encounter government officials and citizens who are frustrated or despondent with the new applications, and opt to continue using the previous paper-based, analogue system.

Therefore, I had hoped that delving into this research area will allow me to highlight the importance of involving the end-users when developing government systems – as they are the owners and funders of the e-Government systems being developed.

9.6. Future Work

Possible future work to extend and supplement this study may include:

- Conducting a similar study on more e-Government projects.
- Consulting different stakeholders (end-users, for instance) in the data collection process, to obtain a more holistic understanding of user adoption.
- Implementing the proposed guidelines in an e-Government project and assessing whether user adoption is achieved.
- Extending proposed guidelines to apply to other stakeholder groups, rather than just project team.
- Developing a ‘ready-to-use’ model or framework of the guidelines, with comprehensive steps, for e-Government project teams.

9.7. Conclusion

To conclude this study on the use of Agile practices to enhance e-Government user adoption, the assertion can be made that while there exists multiple factors which contribute to the success of e-Government projects, user adoption is arguable one of the key factors that determine e-Government success.

In assessing e-Government user adoption, it became apparent that there also exist multiple factors that influence a user's decision to adopt an e-Government system. These factors were then divided into pre- and post-implementation adoption factors – so as to indicate that there are measures that can be taken to ensure user adoption before the e-Government system is deployed for use.

This thesis focused on addressing e-Government user adoption at the pre-implementation stage, by proposing that e-Government project teams shift away from a purely traditional Waterfall development approach and towards a more user-centric Agile system development approach. The Agile approach is known for producing systems that result in user satisfaction, and user adoption.

Therefore, this thesis put forward a set of Agile-informed User Engagement Guidelines which can be used as a guide for e-Government project teams: entailing how and when users (stakeholders) should be engaged during the development of e-Government systems. The use of these guidelines can assist e-Government project teams to minimise user resistance, and ensure user buy-in and adoption of the new e-Government system.

It can be concluded that the failure of e-Government projects, which is most prevalent in developing countries, can be remedied – in part – by improving the user adoption of the e-Government systems developed. Such adoption can be enhanced using Agile system development practices, as detailed in the proposed guidelines, rather than the traditional Waterfall approach to development.

LIST OF REFERENCES

Abdullahaa, M.S., Al-Naimatb, A.M., Osmanc, W.R.S. and Ahmedd, F.K., 2012. Comparison of popular e-Government implementation models. *Computer Science*, 1, p.821-826.

Adams, P., Farrell, M., Dalgarno, B. and Oczkowski, E., 2017. Household Adoption of Technology: The Case of High-Speed Broadband Adoption in Australia. *Technology in Society*, 49, p.37-47.

Afyonluoğlu, M., Aydin, A., Sevil, S.G., Yüksel, E. and Güngör, M.K., 2014. An e-Government project management approach with e-transformation perspective. *International Journal of eBusiness and eGovernment Studies*, 6(1), p.21-33.

Aggoune, S., Imache, R., Mezghiche, M. and Khadraoui, A., 2012. A Components Oriented Method for Evaluation of e-Government Information Systems Agility. *International Journal of Digital Society (IJDS)*, 3(4), p.703-713.

Agile Manifesto, 2001. *Manifesto for Agile Software Development*. [online] Available at: http: / /Agilemanifesto.org [Accessed 5 January 2017].

Ahmed, S., 2004. Threats to e-Government Initiatives, and How to Reduce Failure Risks. *Applied Computing and Informatics-Saudi Computer Journal*, 3(1), p.26-37.

Aizstrauta, D., Ginters, E. and Eroles, M.A.P., 2015. Applying theory of diffusion of innovations to evaluate technology acceptance and sustainability. *Procedia Computer Science*, 43, p.69-77.

Ajzen, I., 1985. From intentions to actions: A theory of planned behavior. In: *Action control* (p. 11-39). Berlin Heidelberg: Springer.

Ajzen, I., 1991. The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), p.179-211.

AL Athmay, A.A.A., Fantazy, K. and Kumar, V., 2016. E-Government adoption and user's satisfaction: an empirical investigation. *EuroMed Journal of Business*, 11(1), p.57-83.

Alghamdi, S. and Beloff, N., 2014. Towards a comprehensive model for e-Government adoption and utilisation analysis: The case of Saudi Arabia. In: Computer Science and

Information Systems (FedCSIS), *2014 Federated Conference*. Warsaw, September 2014. Warsaw: ACSIS.

Almarabeh, T. and AbuAli, A., 2010. A general framework for e-Government: definition maturity challenges, opportunities, and success. *European Journal of Scientific Research*, 39(1), p.29-42.

Alomari, M., Woods, P. and Sandhu, K., 2012. Predictors for e-Government adoption in Jordan: Deployment of an empirical evaluation based on a citizen-centric approach. *Information Technology & People*, *25*(2), p.207-234.

Alshehri, M.A., 2012. *Using the UTAUT Model to Determine Factors Affecting Acceptance and Use of E-Government Services in the Kingdom of Saudi Arabia*. PhD. Griffith University.

Alsufayri, K., 2014. *Universalising electronic government services: facing the digital divide challenge*. PhD. Auckland University of Technology.

Andrade, A.D., 2009. Interpretive research aiming at theory building: Adopting and adapting the case study design. *The Qualitative Report*, 14(1), p.42.

Anthopoulos, L., Reddick, C.G., Giannakidou, I. and Mavridis, N., 2016. Why e-Government projects fail? An analysis of the Healthcare.gov website. *Government Information Quarterly*, *33*(1), p.161-173.

Barlow, J.B., Giboney, J., Keith, M.J., Wilson, D., Schuetzler, R., Lowry, P.B. and Vance, A., 2011. Overview and guidance on Agile development in large organizations. *Communications of the Association for Information Systems*, 29(2), p.25-44.

Baxter, P. and Jack, S., 2008. Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, 13(4), p.544-559.

Bentahar, O. and Cameron, R., 2015. Design and Implementation of a Mixed Method Research Study in Project Management. *Electronic Journal of Business Research Methods*, 13(1), p.3-15.

Bradley, E.H., Curry, L.A. and Devers, K.J., 2007. Qualitative data analysis for health services research: developing taxonomy, themes, and theory. *Health Services Research*, 42(4), p.1758-1772.

Carter, L. and Bélanger, F., 2005. The utilization of e-government services: citizen trust, innovation and acceptance factors. *Information Systems Journal*, 15(1), p.5-25.

Carter, L., Weerakkody, V., Phillips, B. and Dwivedi, Y.K., 2016. Citizen adoption of e-Government Services: Exploring citizen perceptions of online services in the United States and United Kingdom. *Information Systems Management*, 33(2), p.124-140.

Cheung, R. and Vogel, D., 2013. Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & Education*, 63, p.160-175.

Chiyangwa, T.B. and Alexander, P.T., 2016. Rapidly co-evolving technology adoption and diffusion models. *Telematics and Informatics*, 33(1), p.56-76.

Chiyangwa, T.B. and Mnkandla, E., 2017. Modelling the critical success factors of Agile software development projects in South Africa. *SA Journal of Information Management*, 19(1), p.1-8.

Clark, A.M., 1998. The qualitative-quantitative debate: moving from positivism and confrontation to post-positivism and reconciliation. *Journal of Advanced Nursing*, 27(6), p.1242-1249.

Cohen, L., Manion, L. and Morrison, K., 2007. Research Methods in Education. *British Journal of Educational Studies*, 55(4), p.469-470.

Colomo-Palacios, R., Casado-Lumbreras, C., Soto-Acosta, P., García-Peñalvo, F.J. and Tovar, E., 2014. Project managers in global software development teams: a study of the effects on productivity and performance. *Software Quality Journal*, 22(1), p.3-19.

Creswell, J.W. and Clark, V.L.P., 2007. *Designing and Conducting Mixed-Methods Research*. California: Sage Publications.

Creswell, J.W. and Creswell, J.D., 2017. *Research Design: Qualitative, Quantitative, and Mixed-Methods Approaches*. California: Sage Publications.

Creswell, J.W., 2014. *Research design: Qualitative, Quantitative, And Mixed-Methods Approaches*. 4th ed. California: Sage Publications.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), p.319-340.

De Guinea, A.O., Webster, J. and Staples, D.S., 2012. A meta-analysis of the consequences of virtualness on team functioning. *Information & Management*, 49(6), p.301-308.

Denzin, N.K. and Lincoln, Y.S., 1998. *The landscape of qualitative research: Theory and issues*. California: Sage Publications.

Despa, M.L., 2014. Comparative study on software development methodologies. *Database Systems Journal*, 5(3), p.37-56.

DiCicco-Bloom, B. and Crabtree, B.F., 2006. The qualitative research interview. *Medical Education*, 40(4), p.314-321.

Ditibane, L.T., 2014. *The use of systems development methodologies in the development of e-Government systems*. PhD. North-West University.

Driscoll, D.L., Apiah-Yeboah, A., Salib, P. and Rupert, D.J., 2007. Merging qualitative and quantitative data in Mixed-Methods research: How to and why not. *Ecological and Environmental Anthropology (University of Georgia)*, 3(1), p.19-28.

Eisenhardt, K.M., 1989. Building theories from case study research. *Academy of Management Review*, 14(4), p.532-550.

El El Hameed, T.A., Latif, M.A.E. and Kholief, S., 2016. Identify and Classify Critical Success Factor of Agile Software Development Methodology Using Mind Map, *(IJACSA) International Journal of Advanced Computer Science and Applications*, 7(5), p.83-92.

Estler, H.C., Nordio, M., Furia, C.A., Meyer, B. and Schneider, J., 2014. Agile vs. structured distributed software development: A case study. *Empirical Software Engineering*, 19(5), p.1197-1224.

Fang, Z., 2002. E-Government in Digital Era: Concept, Practice, Development. *International Journal of the Computer, The Internet and Management*, 10(2), p.1-22.

Fath-Allah, A., Cheikhi, L., Al-Qutaish, R.E. and Idri, A., 2014. E-Government maturity models: A comparative study. *International Journal of Software Engineering & Applications*, 5(3), p.71.

Gale, N.K., Heath, G., Cameron, E., Rashid, S. and Redwood, S., 2013. Using the Framework Method for the Analysis of Qualitative Data in Multi-Disciplinary Health Research. *BMC Medical Research Methodology,* 13(1), p.117.

Gelbrich, K. and Sattler, B., 2014. Anxiety, Crowding, and Time Pressure in Public Self-Service Technology Acceptance. *Journal of Services Marketing*, 28(1), p.82-94.

Ghaffari, M. and Emsley, M.W., 2015. Current Status and Future Potential of the Research on Critical Chain Project Management. *Surveys in Operations Research and Management Science*, 20(2), p.43-54.

Glaiel, F., 2012. *Agile Project Dynamics: A Strategic Project Management Approach to the Study of Large-Scale Software Development Using System Dynamics*. PhD. Massachusetts Institute of Technology.

Goel, S., Dwivedi, R. and Sherry, A.M., 2013. Critical Factors for Successful Implementation of E-Governance Programs: A Case Study of HUDA. *Global Journal of Flexible Systems Management*, 13(4), p.233-244.

Gordin, P.C., 2006. *An Instrumental Case Study of the Phenomenon of Collaboration in the Process of Improving Community College Developmental Reading and Writing Instruction.* PhD. University of South Florida.

Hamel, J., Dufour, S. and Fortin, D., 1993. *Case Study Methods: Qualitative Research Methods*. California: Sage Publications.

Hasan, M.M., 2015. E-Government Success and Failure: A Case Study of Bangladesh Police. *Daffodil International University Journal of Science and Technology*, 10(1), p.61-67.

Heeks, R., 2003. Most eGovernment-for-Development Projects Fail: How Can Risks Be Reduced? *iGovernment Working Paper Series*, 14, p.1-17.

Hilton, C.E., 2017. The Importance of Pretesting Questionnaires: A Field Research Example of Cognitive Pretesting the Exercise Referral Quality of Life Scale (ER-QLS). *International Journal of Social Research Methodology*, 20(1), p.21-34.

Holgersson, J., 2014. *User Participation in Public e-service Development: Guidelines for Including External Users*. PhD. University of Skövde.

Hulgan, J., 2015. User Adoption Metrics that Matter. [online] Available at: http: / /www.seilevel.com /requirements /user-adoption-metrics-that-matter [Accessed 12 July 2017].

IGI Global, 2017. What is Technology Adoption? [online] Available at: https: / /www.igi-global.com /dictionary /technology-adoption /29488 [Accessed 12 July 2017].

IGI Global, 2017. What is User Engagement? [online] Available at: https: / /www.igi-global.com /dictionary /user-engagement /55465 [Accessed 12 July 2017].

Isaias, P. and Issa, T., 2015. *High Level Models and Methodologies for Information Systems*. New York: Springer.

Iyawa, G.E., Herselman, M.E. and Coleman, A., 2016. Customer Interaction in Software Development: A Comparison of Software Methodologies Deployed in Namibian Software Firms. *The Electronic Journal of Information Systems in Developing Countries (EJISDC)*, 77(1), p.1-13.

Jayashree, S. and Marthandan, G., 2010. Government to E-Government to E-society. *Journal of Applied Sciences*, 10(19), p.2205-2210.

Johansson, R., 2003. *Case Study Methodology*. Stockholm, September 22-24. Stockholm: International Association of People-Environment Studies.

Johnson, J. and Mulder, H., 2016. *CHAOS Chronicles, Focusing on Failures and Possible Improvements in IT Projects*. In: *The 20th World Multi-Conference on Systemics, Cybernetics and Informatics*. Orlando, Florida, 5-8 July 2016. Florida: WMSCI.

Joo, J. and Sang, Y., 2013. Exploring Koreans' smartphone usage: An integrated model of the technology acceptance model and uses and gratifications theory. *Computers in Human Behavior*, 29(6), p.2512-2518.

Joseph, N., Marnewick, C. and Santana, M.J., Agile Software Development and IT Project Performance in South Africa: A Positive Relationship? *International Association for Management of Technology (IAMOT)*, p.338-358.

Jugdev, K., Perkins, D., Fortune, J., White, D. and Walker, D., 2013. An exploratory study of project success with tools, software and methods. *International Journal of Managing Projects in Business*, 6(3), p.534-551.

Kaaya, J., 2004. Implementing e-Government services in East Africa: Assessing status through content analysis of government websites. *Electronic Journal of E-Government*, 2(1), p.39-54.

Karaman, E. and Kurt, M., 2015. Comparison of project management methodologies: PRINCE2 versus PMBOK for IT projects. *Int. Journal of Applied Sciences and Engineering Research*, 4(4), p.572-579.

Kautz, K., 2011. Investigating the design process: participatory design in Agile software development. *Information Technology & People*, 24(3), p.217-235.

Khan, G.F., Moon, J., Rhee, C. and Rho, J.J., 2010. E-Government skills identification and development: toward a staged-based user-centric approach for developing countries. *Asia Pacific Journal of Information Systems*, 20(1), p.1-31.

Klein, H.K. and Myers, M.D., 1999. A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, p.67-93.

Kumar, V., Mukerji, B., Butt, I. and Persaud, A., 2007. Factors for successful e-Government adoption: A conceptual framework. *Electronic Journal of E-Government*, 5(1).

Kurfalı, M., Arifoğlu, A., Tokdemir, G. and Paçin, Y., 2017. Adoption of e-Government services in Turkey. *Computers in Human Behavior*, 66, p.168-178.

Lacerda, R.T., Ensslin, L. and Ensslin, S.R., 2011. A performance measurement view of IT project management. *International Journal of Productivity and Performance Management*, 60(2), p.132-151.

Lacey, A. and Luff, D., 2009. Qualitative data analysis: the NIHR research design service for Yorkshire and the Humber. *National Institute for Health Research*, [e-journal]. Available at: http: / /rds-eastmidlands. nihr. ac.uk /resources /doc_download /8-qualitative-data-analysis.html [Accessed 16 October 2017].

Lallmahomed, M.Z., Lallmahomed, N. and Lallmahomed, G.M., 2017. Factors influencing the adoption of e-Government services in Mauritius. *Telematics and Informatics*, 34(4), p.57-72.

Langston, S.F., 2012. *A qualitative instrumental case study investigating the interrelatedness of adult learning theory, targeted professional development, and the creation of* *professional learning communities during the implementation of an elementary school improvement model*. PhD. University of Missouri-Columbia.

Lau, A.S., 2011. Hospital-based nurses' perceptions of the adoption of Web 2.0 tools for knowledge sharing, learning, social interaction and the production of collective intelligence. *Journal of Medical Internet Research*, 13(4).

Leach, L.P., 1999. Critical chain project management improves project performance. *Project Management Journal*, 30, p.39-51.

Lee, A.S. and Baskerville, R.L., 2003. Generalizing generalizability in information systems research. *Information Systems Research*, 14(3), p.221-243.

Lin, F., Fofanah, S.S. and Liang, D., 2011. Assessing citizen adoption of e-Government initiatives in Gambia: A validation of the technology acceptance model in information systems success. *Government Information Quarterly*, 28(2), p.271-279.

Lin, P.M.D., 2015. *Development Policy Making and Participatory Democracy: A Case Study of the E-tolls Controversy*. Masters. University of the Witwatersrand.

Lu, N.L. and Nguyen, V.T., 2016. Online Tax Filing—E-Government Service Adoption Case of Vietnam. *Modern Economy*, 7(12), p.1498.

Makene, B., 2009. *The role of e-Government in effective service delivery: a case study of Tanzania electric supply company limited (TANESCO)*. PhD. University of the Western Cape.

Martinic, A., Fertalj, K. and Kalpic, D., 2012. Methodological framework for virtual team project management. *International Journal of Innovation, Management and Technology*, 3(6), p.702.

Mellouli, M., 2014. Electronic government projects: study of Tunisian case. In: *International Conference on Innovation & Engineering Management*, p.115-117.

Melzner, J., Heinze, J. and Fritsch, T., 2014. Mobile health applications in workplace health promotion: an integrated conceptual adoption framework. *Procedia Technology*, 16, p.1374-1382.

Microsoft Dynamics, 2013. What is user adoption and why is it so important? [online] Available at: https: / /community.dynamics.com /crm /b /c5insightblog /archive /2013 /03 /14 /what-is-user-adoption-and-why-is-it-so-important [Accessed 19 July 2017].

Miles, M.B., Huberman, A.M. and Saldana, J., 2014. *Qualitative data analysis: A method sourcebook*. California: Sage Publications.

Miller, G.G., 2001. The characteristics of Agile software processes. *The Computer Society*, p.1-3.

Mir, F.A. and Pinnington, A.H., 2014. Exploring the value of project management: linking project management performance and project success. *International Journal of Project Management*, 32(2), p.202-217.

Moore, G.C. and Benbasat, I., 1991. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3), p.192-222.

Mutula, S.M. and Mostert, J., 2010. Challenges and opportunities of e-Government in South Africa. *The Electronic Library*, 28(1), p.38-53.

Myers, M.D. and Newman, M., 2007. The qualitative interview in IS research: Examining the craft. *Information and Organization*, 17(1), p.2-26.

Myers, M.D., 1997. Qualitative research in information systems. *Management Information Systems Quarterly*, 21(2), p.241-242.

Ndou, V.D., 2004. E–Government for developing countries: opportunities and challenges. *The Electronic Journal of Information Systems in Developing Countries*, 18(1), p.1-24.

Newton, P., 2015. *Managing a Project Team. Project Skills*. [pdf] Available at: www.free-management-ebooks.com /dldebk-pdf /fme-project-team.pdf [Accessed 07 February 2017].

Niglas, K., 2010. The multidimensional model of research methodology: an integrated set of continua. In: *SAGE Handbook of Mixed-Methods in Social & Behavioral Research*. 2nd ed. London: Sage Publications.

Nkohkwo, Q.N.A. and Islam, M.S., 2013. Challenges to the Successful Implementation of e-Government Initiatives in Sub-Saharan Africa: A Literature Review. *Electronic Journal of e-Government*, 11(1).

Nkone, M.S., 2013. *The relationship between systems development methodologies and Information Technology project success*. PhD. North-West University.

Ntsham, X., 2014. *Information flows in the social development grant process: a user experience perspective*. PhD. Cape Peninsula University of Technology.

Ntulo, G. and Otike, J., 2013. *E–Government: Its Role, Importance and Challenges*. Kenya, Moi University, p.1-16.

Olateju, O.I., Abdul-Azeez, I.A. and Alamutu, S.A., 2011. Project Management Practice in Nigerian Public Sector-An Empirical Study. *Australian Journal of Business and Management Research*, 1(8), p.1-7.

Orlikowski, W.J. and Baroudi, J.J., 1991. Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research*, 2(1), p.1-28.

OUTA, 2016. Why we oppose e-tolling. [online] Available at: https: / /www.outa.co.za /about-outa /why-we-oppose-e-tolling / [Accessed 30 March 2017].

Ovwigho, O., 2013. A framework for measuring adoption of innovations: Improved cassava varieties in Delta State Nigeria. *Extension Farming Systems Journal*, 9(1), p.171.

Ozkan, S. and Kanat, I.E., 2011. e-Government adoption model based on theory of planned behavior: Empirical validation. *Government Information Quarterly*, 28(4), p.503-513.

Pai, P. and Arnott, D.C., 2013. User adoption of social networking sites: Eliciting uses and gratifications through a means–end approach. *Computers in Human Behavior*, 29(3), p.1039-1053.

Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N. and Hoagwood, K., 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), p.533-544.

Patanakul, P., Iewwongcharoen, B. and Milosevic, D., 2010. An empirical study on the use of project management tools and techniques across project life-cycle and their impact on project success. *Journal of General Management*, 35(3), p.41-66.

Patel, P., 2009. *Introduction to quantitative methods*. In: Empirical Law Seminar. October.

Pillay, K.N., 2012. *e-Government in South Africa: Predictors to failure and success.* Masters. University of the Witwatersrand.

Plewa, C., Troshani, I., Francis, A. and Rampersad, G., 2012. Technology adoption and performance impact in innovation domains. *Industrial Management & Data Systems*, 112(5), p.748-765.

Plonka, L., Sharp, H., Gregory, P. and Taylor, K., 2014. UX design in Agile: a DSDM case study. In: *International Conference on Agile Software Development*, May 2014. Cham: Springer.

Pressman, R.S., 2010. *Software Engineering: A Practitioner's Approach*. New York: McGraw-Hill Education.

Pretorius, M.C. and Calitz, A.P., 2014. A methodology to institutionalise user experience in provincial government. *South African Computer Journal*, 55(1), p.25-39.

Project Management Institute, 2013. *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*. 5th ed. Pennsylvania: Project Management Institute.

Purvanova, R.K., 2014. Virtual versus Face-to-Face Teams: What Have we Really Learned? In: *Academy of Management Proceedings*. January 2013. Academy of Management.

Rahmanian, M., 2014. A comparative study on hybrid IT project management. *International Journal of Computer and Information Technology*, 3(05), p.1096-1099.

Rajagopalan and Mathew, S. and Mathew, S.K., 2016. Choice of Agile Methodologies in Software Development: A Vendor Perspective. *Journal of International Technology and Information Management*, 25(1), p.3.

Rana, N.P., Dwivedi, Y.K. and Williams, M.D., 2013. Analyzing challenges, barriers and CSF of egov adoption. *Transforming Government: People, Process and Policy*, 7(2), p.177-198.

Rana, N.P., Dwivedi, Y.K., Williams, M.D. and Weerakkody, V., 2015. Investigating success of an e-Government initiative: validation of an integrated IS success model. *Information Systems Frontiers*, 17(1), p.127-142.

Raslan, A.T. and El-Licy, F.A., 2012. An Agile-Based Framework for Development of E-Government Projects. *IJICIS*, 12(1), p.57-70.

Ray, S., 2011. Identifying barriers to e-Government services for citizens in developing countries: an exploratory study. *International Journal of Electronic Government Research*, 7(3), p.79-97.

Rhodes University, 2014. Rhodes University Ethical Standards Committee Handbook. [pdf] Available at: https: / /www.ru.ac.za /media /rhodesuniversity /content /ethics /RUESC_Handbook_%202014-11-21_v%201.01.pdf [Accessed 04 October 2017].

Rodrigues, G., Sarabdeen, J. and Balasubramanian, S., 2016. Factors that influence consumer adoption of e-Government services in the UAE: A UTAUT model perspective. *Journal of Internet Commerce*, 15(1), p.18-39.

Rorissa, A. and Demissie, D., 2010. An analysis of African e-Government service websites. *Government Information Quarterly*, 27(2), p.161-169.

Rosacker, K.M. and Rosacker, R.E., 2010. Information technology project management within public sector organizations. *Journal of Enterprise Information Management*, 23(5), p.587-594.

Rowlands, B.H., 2005. Grounded in practice: Using interpretive research to build theory. *The Electronic Journal of Business Research Methodology*, 3(1), p.81-92.

Rowley, J., 2002. Using case studies in research. *Management Research News*, 25(1), p.16-27.

Ryan, S. and O’Connor, R.V., 2013. Acquiring and sharing tacit knowledge in software development teams: An empirical study. *Information and Software Technology*, 55(9), p.1614-1624.

Saad, S., Ibrahim, A., Asma, O., Khan, M.S. and Akhter, J., 2013. PRINCE2 Methodology: An Innovative Way for Improving Performance of Malaysian Automotive Industry. *The Journal of Technology Management and Technopreneurship*, 1(1), p.101-116.

SANRAL, 2017. A Users guide to tolling. SANRAL.

Schwalbe, K., 2014. *Information Technology Project Management*. 7th ed. United States: Cengage Learning.

Scotland, J., 2012. Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching*, 5(9), p.9-16.

Serrador, P. and Pinto, J.K., 2015. Does Agile work? A quantitative analysis of Agile project success. *International Journal of Project Management*, 33(5), p.1040-1051.

Shah, S., Khan, A.Z. and Khalil, M.S., 2011. Project management practices in e-Government projects: A case study of electronic government directorate (EGD) in Pakistan. *International Journal of Business and Social Science*, 2(7), p.235-243.

Shareef, M.A., Kumar, V., Kumar, U. and Dwivedi, Y.K., 2011. e-Government Adoption Model (GAM): Differing service maturity levels. *Government Information Quarterly*, 28(1), p.17-35.

Sharma, G, Bao, X, Qian, W., (2012). Empirical Investigation on Adoption of E-governance Services in Developing Countries and Ethical Issues. *International Journal of Advanced Research in Computer Science and Software Engineering*, 2(12), p.19-27.

Siau, K. and Long, Y., 2005. Synthesizing e-Government stage models–a meta-synthesis based on meta-ethnography approach. *Industrial Management & Data Systems*, 105(4), p.443-458.

South African Department of Communications, n.d. *e-Services, including e-Government*. South African Department of Communications.

Stoica, M., Mircea, M. and Ghilic-Micu, B., 2013. Software development: Agile vs. traditional. *Informatica Economica*, 17(4), p.64.

Straub, E.T., 2009. Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research*, 79(2), p.625-649.

Thakur, S. and Singh, S., 2012. A study of some e-Government activities in South Africa. In: *Sustainable e-Government and e-Business Innovations (E-LEADERSHIP)*. October 2012. E-Leadership Conference.

Thorne, S., 2000. Data analysis in qualitative research. *Evidence-Based Nursing*, 3(3), p.68-70.

Toll Free GP, 2011. 10 Reasons to stop the toll roads. [online] Available at: http: / /tollfreegp.co.za /mobi_large.html [Accessed 13 March 2017].

Tsang, E.W., 2014. Case studies and generalization in information systems research: A critical realist perspective. *The Journal of Strategic Information Systems*, 23(2), p.174-186.

Turk, D., France, R. and Rumpe, B., 2014. Assumptions underlying Agile software development processes. *Journal of Database Management*, 16(4), p.62-87.

United Nations, 2016. *UN E-Government Survey 2016*. [online] Available at: https: / /publicadministration.un.org /egovkb /en-us /Reports /UN-E-Government-Survey-2016 [Accessed 27 May 2017].

Van Teijlingen, E. and Hundley, V., 2002. The importance of pilot studies. *Nursing Standard*, 16(40), p.33-36.

Venkatesh, V. and Bala, H., 2008. Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences*, 39(2), p.273-315.

Venkatesh, V. and Davis, F.D., 2000. A Theoretical Extension of the Technology Acceptance Model: four Longitudinal Field Studies. *Management Science*, 46(2), p.186-204.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D., 2003. User acceptance of information technology: Toward a unified view. *MIS Quarterly*, p.425-478.

Venkatesh, V., Thong, J.Y. and Xu, X., 2012. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), p.157-178.

Verma, D. and Gupta, V., Agile Methodologies for Different Industries. *International Journal of Research in Engineering &Advanced Technology*, 2(1), p.1-9.

Vinekar, V., Slinkman, C.W. and Nerur, S., 2006. Can Agile and traditional systems development approaches coexist? An ambidextrous view. *Information Systems Management*, 23(3), p.31-42.

Visser, W. and Twinomurinzi, H., 2009. E-Government & Public Service Delivery: Enabling ICT to put "People First"–A Case Study from South Africa. *Journal of Systemics, Cybernetics & Informatics*, 6(6), p.36-41.

Vithana, V.N., Fernando, S.G.S. and Kapurubandara, M., 2015. Success Factors for Agile Software Development â [euro]" A Case Study from Sri Lanka. *International Journal of Computer Applications*, 113(17).

Vlaanderen, K., Jansen, S., Brinkkemper, S. and Jaspers, E., 2011. The Agile requirements refinery: Applying SCRUM principles to software product management. *Information and Software Technology*, 53(1), p.58-70.

Wahid, F., 2011. Explaining history of egovernment implementation in developing countries: an analytical framework. *International Federation of Information Processing (IFIP)*, p.38-49.

Walsham, G., 1995. Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4(2), p.74-81.

Walsham, G., 2006. Doing interpretive research. *European Journal of Information Systems*, 15(3), p.320-330.

Weerawarana, S.M., Thudugala, K. and Deshapriya, W., 2012. An Agile Approach towards eGovernment Solution Procurement and Implementation: An Experience from Sri Lanka. *Journal of e-Government Studies and Best Practices*, 2012, p.1-11.

Western Cape Government, 2012. *E-Government Strategy 2012-2019*. Western Cape Government.

Williams, L., 2012. What Agile teams think of Agile principles. *Communications of the ACM*, 55(4), p.71-76.

Winley, G.K., 2015. Determinants of the success of information technology project management in Thailand. *The Electronic Journal of Information Systems in Developing Countries*, 71(5), p.1-35.

Wolfe, L., 2013. *Choosing the right software development plan for the project: Linear, iterative, Agile, or a blend. Masters*. The College of St. Scholastica, Duluth, Minnesota.

World Bank, 2015. E-Government. [online] Available at: http: / /www.worldbank.org /en /topic /ict /brief /e-Government [Accessed 13 March 2017].

Yin, R., 1993. *Applications of case study research*. California: Sage Publishing.

Yin, R., 1994. *Case Study research: Design and Methods*. California: Sage Publishing.

Yin, R., 2003. *Case Study Research: Design and Methods*. California: Sage Publishing.

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APPENDICES

APPENDIX A: Informed Consent Form

RHODES UNIVERSITY

INFORMED CONSENT FORM

Department of Information Systems

Research Project Title:	An Agile Systems Development approach to enhancing e-Government user adoption (A South African perspective).
Principal Investigator(s):	Ms. Odifentse Mapula-e Lehasa

Participation Information

Please ensure that you read the Research Information document, prior to agreeing to the following:

- I understand the purpose of the research study and my involvement in it.
- I understand the risks of participating in this research study.
- I understand the benefits of participating in this research study.
- I understand that I may withdraw from the research study at any stage without any penalty.
- I understand that participation in this study is done on a voluntary basis.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that all data collected relating to my organisation will be anonymised and will be represented as such in the research findings and any further publications.
- I understand that I will receive no payment for participating in this study.

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Information Explanation
The above information was explained to me by Odifentse Lehasa
The above information was explained to me in English and I am in command of this language.

Voluntary Consent	
I, , hereby voluntarily consent to participate in the above-mentioned research.	
Signature:	Date: / / 2017

Investigator Declaration	
I, Odifentse Lehasa, declare that I have explained all the participant information to the participant and have truthfully answered all questions ask me by the participant.	
Signature:	Date: 03 / 10 / 2017

APPENDIX B: Invitation to Participate Letter

Department of Information Systems
Hamilton building, Prince Alfred Street, Grahamstown, 6139,
South Africa
PO Box 94, Grahamstown, 6140, South Africa
t: +27 (0) 46 603 8244
f: +27 (0) 46 603 7608
e: informationsystems@ru.ac.za
www.ru.ac.za

03 October 2017

Dear Participant,

Re: Invitation to participate in research study

You are invited to participate in a research study titled "An Agile Systems Development approach to enhancing e-Government user adoption (A South African perspective)". The aim of this research is to determine whether e-Government user adoption can be improved through user engagement guidelines informed by the Agile systems development methodology. Your participation and cooperation is important so that the results of the research are accurately portrayed.

The research will be undertaken through (i) an online questionnaire, and (ii) an interview conducted in an online virtual environment, at a time convenient to you. The data to be collected from this research will be your perceptions of the proposed user engagement guidelines, and whether or not you believe that these guidelines (if implemented) can contribute to greater e-Government user adoption. Your identity and that of your organization will be treated with complete confidentiality. The collection of this data will require about 15 minutes (for the online questionnaire) and 20 minutes (for the interview) of your time to complete.

You will be provided with all the necessary information to assist you to understand the study and explain what would be expected of you (the participant). These guidelines would include the risks, benefits, and your rights as a study subject. Furthermore, it is important that you are aware that this study has been approved by a Research Ethics Committee of the university.

Participation in this research is completely voluntary and this letter of invitation does not obligate you to take part in this research study. To participate, you will be required to provide written consent that will include your signature, date and initials to verify that you understand

and agree to the conditions. Please note that you have the right to withdraw at any time during the study.

Thank you for your time and I hope that you will find our request favourable.

Yours sincerely,

Ms. Odifentse Lehasa
Research Student

Mr. Chris Upfold
Supervisor

APPENDIX C: Research Information

PROJECT TEAM MEMBER – RESEARCH INFORMATION

Firstly, thank you kindly for agreeing to participate in this research project.

The purpose of this document is to provide you with additional information regarding the ethical implications of this research project. Please read through this document to acquaint yourself with the purpose of this research and to indicate your consent to participate, by signing at the end.

Research Title:

An Agile Systems Development approach to enhancing e-Government user adoption (A South African perspective).

Name of Researchers:

Ms. Odifentse Mapula-e Lehasa and Mr. Chris Upfold.

Purpose of the Research:

This research seeks to contribute towards improving the user adoption of e-Government systems, through the development of Agile systems development informed User Engagement guidelines.

Purpose of your Participation:

Your participation will entail answering questions about your perceptions, opinions and experiences of engaging users during the development of an e-Government system, and whether you believe that the use of the proposed guidelines can positively influence user adoption.

Data Collection Procedure:

The data collection procedure will consist of completing a 10 to 15-minute online questionnaire, which will be followed by a 20-minute online interview, to discuss the topics from the questionnaire. The interview will be conducted in a virtual classroom, which is a browser based online platform, similar to Skype.

Benefits and Concerns:

Taking part in this research study will enable the participant to increase their knowledge and understanding of the research area. The findings of this research will be available to the participant, and can be applied within the e-Government project, or future projects, to ensure user adoption.

While the nature of this study is not considered to be controversial, participation in this research study is voluntary, and you may withdraw at any point or choose not to answer certain questions.

Privacy and Confidentiality of Data:

The identity of the participants and organizations will be kept anonymous when presenting the research findings, to ensure privacy and confidentiality.

All data collected from the study will be stored in a protected electronic format, only accessible to the researcher and supervisor.

Publication:

The overall findings of the research may be published by the researcher, in the form of an academic article. However, confidentiality and anonymity of the participant and the organization will be respected at all times.

Ethical Approval:

This research has been approved by the Rhodes University Ethics Committee.

Should you have any comments of questions regarding the ethics of this study, please contact the sub-committee via email (informationsystems@ru.ac.za) or telephone (046-603-8244).

Contact Information:

Should you have any questions or comments regarding the research study, you can contact the researcher or the researcher's supervisor.

Researcher

Odifentse Lehasa

Masters student in the Department of Information Systems, Rhodes University

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Research Supervisor

Chris Upfold

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APPENDIX D: PILOT (Quantitative) Online Questionnaire

Researcher: Ms. Odifentse M. Lehasa (odifentselehasa@gmail.com; 072-384-6868)

Research Title: An Agile systems development approach to enhancing e-Government user adoption

Purpose: This research seeks to contribute towards improving the user adoption of e-Government systems, through the development of User Engagement guidelines informed by the Agile systems development methodology.

The purpose of this questionnaire is to gain an understanding of your experiences and opinions of user engagement (as an e-Government project team member), and how this may influence e-Government user adoption. This will be followed by a semi-structured interview with which will investigate the topics below in more depth.

Consent:

This research project has been approved by the Rhodes University Ethics Committee on the basis that:

- Your participation is completely voluntary
- Your identity and data will be anonymised in the research findings and discussions
- You may withdraw from the process at any stage
- You would have signed the Invitation to Participate clearance letter prior to completing this questionnaire.

SECTION A: DEMOGRAPHICS

1. Full Name:

2. Organization:

3. The role you have played as an e-Government project team member relates to:
   a. Product Owner
   b. Scrum Master
   c. Project Manager
   d. Developer
   e. Analyst
   f. Tester

4. The number of years of experience in the role selected in question 3, above?
   a. 1 – 2
   b. 3 – 5
   c. 6 – 10
   d. More than 10 years of experience.

5. How would you rate the maturity of your organization in terms of Agile Systems Development experience?
   a. New to Agile Systems Development
   b. Little Agile Systems Development experience
   c. Moderate Agile Systems Development experience
   d. Major Agile Systems Development experience

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

SECTION B: STAKEHOLDER ENGAGEMENT

Note to respondent: The following questions relate to the research thesis **sub-question C (***How do e-Government project teams currently engage end users in the development of e-Government systems, to ensure user adoption or buy-in?)*

The following eight (8) questions relate to the project stage during which stakeholder engagement takes place.

Based on your experience:	Requirements Gathering	Product Building	Product Prototype Release	Product Testing	Obtaining Product Feedback	Changing System Requirements	Final Product Release
6. When should **Customer (Product Owner)** engagement take place?							
7. When should **Development Team** engagement take place?							
8. When should **Internal User** engagement take place?							
9. When should **External User (Citizen User)** engagement take place?							

	At the beginning of the project	Daily	Weekly	After each iteration	At the end of the project

10. How often do you meet with your **Customer (Product Owner)**?					
11. How often do you meet with your **Development Team**?					
12. How often do you meet with your **Internal User**?					
13. How often do you meet with your **External User (Citizen User)**?					

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

SECTION C: USER ADOPTION

Note to respondent: The following question relates to the research thesis **sub-question A** (*What are the key factors that influence e-Government user adoption?*)

Based on your perceptions, rate the importance of the following factors for e-Government user adoption:	Not Important	Slightly Important	Moderately Important	Important	Very Important
14. A user's attitude					
15. Social pressure (or influence)					
16. The ease of use of the technology					
17. The usefulness of the technology					
18. The user's experience of using the technology					
19. The quality of the technology					

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

SECTION D: USER ENGAGEMENT GUIDELINES

Note to respondent: The following questions relate directly to the proposed User Engagement Guidelines, as well as the research thesis **sub-questions B** (*Which of the Agile systems development practices are fundamental for user engagement in the development phase?)* and

sub-question D (*How can Agile user engagement guidelines be applied in the e-Government context?)*

GUIDELINE 1: Soliciting system requirements or initial input from the target users of the system.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
20. This guideline has a positive impact on user adoption?					
21. This guideline is a fundamental user engagement practice?					
22. This guideline is an important Agile systems development practice?					
23. This guideline is typically incorporated in the development of e-Government systems?					
24. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 2: Developing and presenting various iterations (prototypes) of the product to the user, throughout the development process.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
25. This guideline has a positive impact on user adoption?					
26. This guideline is a fundamental user engagement practice?					
27. This guideline is an important Agile systems development practice?					
28. This guideline is typically incorporated in the development of e-Government systems?					
29. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 3: Allowing the user to test each iteration (prototype) of the product.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30. This guideline has a positive impact on user adoption?					
31. This guideline is a fundamental user engagement practice?					
32. This guideline is an important Agile systems development practice?					
33. This guideline is typically incorporated in the development of e-Government systems?					
34. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 4: Constant user feedback is solicited after each work cycle.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
35. This guideline has a positive impact on user adoption?					
36. This guideline is a fundamental user engagement practice?					
37. This guideline is an important Agile systems development practice?					
38. This guideline is typically incorporated in the development of e-Government systems?					
39. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 5: The ability for project stakeholders to request changes to the system requirements, within the development process.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
40. This guideline has a positive impact on user adoption?					
41. This guideline is a fundamental user engagement practice?					
42. This guideline is an important Agile systems development practice?					
43. This guideline is typically incorporated in the development of e-Government systems?					
44. This guideline is difficult to implement in the development of e-Government systems?					

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GUIDELINE 6: The project team and stakeholders should work together and communicate regularly throughout the project.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
45. This guideline has a positive impact on user adoption?					
46. This guideline is a fundamental user engagement practice?					
47. This guideline is an important Agile systems development practice?					
48. This guideline is typically incorporated in the development of e-Government systems?					
49. This guideline is difficult to implement in the development of e-Government systems?					

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

Thank you for participating.

End of Questionnaire

APPENDIX E: PILOT (Qualitative) Semi-Structure Interview Schedule

Researcher: Ms. Odifentse M. Lehasa (odifentselehasa@gmail.com; 072-384-6868)

Research Title: An Agile systems development approach to enhancing e-Government user adoption

Purpose: This research seeks to contribute towards improving the user adoption of e-Government systems, through the development of Agile systems development informed User Engagement guidelines.

The purpose of this questionnaire is to go into depth with regards to the proposed user engagement guidelines, and whether they can influence e-Government user adoption. This semi-structured interview takes place after the completion of the questionnaire, which was sent to the participant, in order to obtain a brief idea of the participant's experience of user engagement in the e-Government context.

SECTION A: BACKGROUND AND EXPERIENCE

Research Question C: *How do e-Government project teams currently engage end users in the development of e-Government systems, to ensure user adoption or buy-in?*

1. Can you tell me about your e-Government systems development experience?
    a. How long have you worked in the government systems development context?
    b. How many projects have you been involved in?
    c. What type of projects were these (internal or external e-Government systems)?
2. Can you briefly provide an overview of your most recent e-Government project?
    a. Who was the target user of this system?
    b. What is the purpose of the system?
    c. What was your role on this project?
    d. How have the target users responded to this system?

3. What is your experience with user engagement during the development of e-Government systems?
    a. Which users do you engage with during the development?
    b. How often do you engage with these users?
    c. What does your engagement process entail?
    d. Who or what guides your user engagement process?
4. Do you believe that you have sufficiently engaged with end users in developing e-Government systems?
    a. What is your definition of "sufficiently engaging with end users"?
    b. Would you say that the end users were generally satisfied with their involvement in the development of the system?

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

SECTION B: USER ADOPTION

Research Question A: *What are the key factors that influence e-Government user adoption?*

5. What are some of the factors that you have observed, which influence user adoption of e-Government systems?
    a. Which factors?
    b. How does the development team respond to these factors?

6. In your e-Government projects, have the following factors been influential to the user adoption of the e-Government system?
    a. A user's attitude
    b. Social pressure (or influence)
    c. The ease of use of the technology
    d. The usefulness of the technology
    e. The user's experience of using the technology
    f. The quality of the technology
7. If yes to the above points, how have you responded to these factors as they emerged in your project?

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

SECTION C: USER ENGAGEMENT GUIDELINES

Research Questions B: *Which of the Agile systems development practices are fundamental for user engagement in the development phase?*

Research Question D: *How can Agile user engagement guidelines be applied in the e-Government context?*

8. **Guideline 1: Requirements Gathering** (Soliciting system requirements or initial input from the target users of the system).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?

b. If answered yes to the above question, how would you incorporate this practice into the development process?
    i. When in the development process?
    ii. Who would be involved?
    iii. What tasks need to happen before (preceding stage) this task can take place?
c. What do you see as the potential challenges to implementing this guideline?
d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

9. **Guideline 2: Product Prototypes** (Developing and presenting various iterations (prototypes) of the product to the user, throughout the development process).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?
    b. If answered yes to the above question, how would you incorporate this practice into the development process?
        i. When in the development process?
        ii. Who would be involved?
        iii. What tasks need to happen before (preceding stage) this task can take place?
    c. What do you see as the potential challenges to implementing this guideline?
    d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

10. **Guideline 3: Product Testing** (Allowing the user to test each iteration (prototype) of the product).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?

b. If answered yes to the above question, how would you incorporate this practice into the development process?
    i. When in the development process?
    ii. Who would be involved?
    iii. What tasks need to happen before (preceding stage) this task can take place?
c. What do you see as the potential challenges to implementing this guideline?
d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

11. **Guideline 4: Product Feedback** (Constant user feedback is solicited after each work cycle).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?
    b. If answered yes to the above question, how would you incorporate this practice into the development process?
        i. When in the development process?
        ii. Who would be involved?
        iii. What tasks need to happen before (preceding stage) this task can take place?
    c. What do you see as the potential challenges to implementing this guideline?
    d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?
12. **Guideline 5: Changing Requirements** (The ability for project stakeholders to request changes to the system requirements, within the development process).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?
    b. If answered yes to the above question, how would you incorporate this practice into the development process?

i. When in the development process?
ii. Who would be involved?
iii. What tasks need to happen before (preceding stage) this task can take place?

c. What do you see as the potential challenges to implementing this guideline?
d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

13. **Guideline 6: Constant User Involvement** (The project team and stakeholders should work together and communicate regularly throughout the project).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?
    b. If answered yes to the above question, how would you incorporate this practice into the development process?
        i. When in the development process?
        ii. Who would be involved?
        iii. What tasks need to happen before (preceding stage) this task can take place?
    c. What do you see as the potential challenges to implementing this guideline?
    d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

SECTION D: GUIDELINES AND ADOPTION

Research Question D: *How can Agile user engagement guidelines be applied in the e-Government context?*

14. Do you believe that the implementation of the above user engagement guidelines can improve e-Government user adoption?
15. What other user engagement practices would you recommend, during the development process, to improve e-Government user adoption?

Pilot Comments: Please identify any questions in this section that seem unclear and / or in need of refinement, stating what needs to be addressed).

END OF INTERVIEW

APPENDIX F: FINAL (Quantitative) Online Questionnaire

Researcher:
Ms. Odifentse M. Lehasa (odifentselehasa@gmail.com; 072-384-6868)

Research Title:
An Agile systems development approach to enhancing e-Government user adoption

Purpose:
This research seeks to contribute towards improving the user adoption of e-Government systems, through the development of User Engagement guidelines informed by the Agile systems development methodology.

The purpose of this questionnaire is to gain an understanding of your experiences and opinions of user engagement (as an e-Government project team member), and how this may influence e-Government user adoption. This will be followed by a semi-structured interview with which will investigate the topics below in more depth.

Consent:
This research project has been approved by the Rhodes University Ethics Committee on the basis that:
• Your participation is completely voluntary
• Your identity and data will be anonymised in the research findings and discussions
• You may withdraw from the process at any stage
• You would have ticked the participation box below, prior to completing this questionnaire.

Please ensure that you read the Research Information document, prior to agreeing to the following:
• I understand the purpose of the research study and my involvement in it.
• I understand the risks of participating in this research study.
• I understand the benefits of participating in this research study.
• I understand that I may withdraw from the research study at any stage without any penalty.
• I understand that participation in this study is done on a voluntary basis.
• I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
• I understand that all data collected relating to my organization will be anonymised and will be represented as such in
the research findings and any further publications.
• I understand that I will receive no payment for participating in this study.

I hereby voluntarily consent to participate in the above-mentioned research.

YES ☐

SECTION A: DEMOGRAPHICS

1. Full Name:

2. e-Government Project Organization:

3. The role you have played as an e-Government project team member relates to:
   a. Product Owner
   b. Scrum Master
   c. Project Manager
   d. Developer
   e. Analyst
   f. Tester
   g. Operations / DevOps
   h. Other

4. The number of years of experience in the role selected in question 3, above?
   a. 1 – 2
   b. 3 – 5
   c. 6 – 10
   d. More than 10 years of experience.

5. How would you rate the maturity of your organization in terms of Agile Systems Development experience?
   a. New to Agile Systems Development
   b. Little Agile Systems Development experience
   c. Moderate Agile Systems Development experience
   d. Major Agile Systems Development experience

SECTION B: STAKEHOLDER ENGAGEMENT

Note to respondent: The following questions relate to the research thesis **sub-question C** **(***How do e-Government project teams currently engage end users in the development of e-Government systems, to ensure user adoption or buy-in?)*

The following eight (8) questions relate to the project stage during which stakeholder engagement takes place.

Based on your experience:	Requirements Gathering	Product Building	Product Prototype Release	Product Testing	Obtaining Product Feedback	Changing System Requirements	Final Product Release
6. When should **Customer (Product Owner)** engagement take place?							
7. When should **Development Team** engagement take place?							
8. When should **Internal User** engagement take place?							
9. When should **External User (Citizen User)** engagement take place?							
10. When should **Operations / DevOps** engagement take place?							

Based on your experience:	At the beginning of the project	Daily	Weekly	After each iteration	At the end of the project
11. How often do you meet with your **Customer (Product Owner)**?					
12. How often do you meet with your **Development Team**?					
13. How often do you meet with your **Internal User**?					
14. How often do you meet with your **External User (Citizen User)**?					
15. How often do you meet with your **Operations / DevOps** personnel?					

SECTION C: USER ADOPTION

Note to respondent: The following question relates to the research thesis **sub-question A** (*What are the key factors that influence e-Government user adoption?*)

Based on your perceptions, rate the importance of the following factors for e-Government user adoption:	Not Important	Slightly Important	Moderately Important	Important	Very Important
16. A user's attitude					
17. Social pressure (or influence)					
18. The ease of use of the technology					
19. The usefulness of the technology					
20. The user's experience of using the technology					
21. The quality of the technology					
22. Cost of the product / software					

SECTION D: USER ENGAGEMENT GUIDELINES

Note to respondent: The following questions relate directly to the proposed User Engagement Guidelines, as well as the research thesis **sub-questions B** (*Which of the Agile systems development practices are fundamental for user engagement in the development phase?)* and

sub-question D (*How can Agile user engagement guidelines be applied in the e-Government context?)*

GUIDELINE 1: Soliciting system requirements or initial input from the target users of the system.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
23. This guideline has a positive impact on user adoption?					
24. This guideline is a fundamental user engagement practice?					
25. This guideline is an important Agile systems development practice?					
26. This guideline is typically incorporated in the development of e-Government systems?					
27. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 2: Developing and presenting various iterations (prototypes) of the product to the user, throughout the development process.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
28. This guideline has a positive impact on user adoption?					
29. This guideline is a fundamental user engagement practice?					
30. This guideline is an important Agile systems development practice?					
31. This guideline is typically incorporated in the development of e-Government systems?					
32. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 3: Allowing the user to test each iteration (prototype) of the product.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
33. This guideline has a positive impact on user adoption?					
34. This guideline is a fundamental user engagement practice?					
35. This guideline is an important Agile systems development practice?					
36. This guideline is typically incorporated in the development of e-Government systems?					
37. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 4: Constant user feedback is solicited after each work cycle.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
38. This guideline has a positive impact on user adoption?					
39. This guideline is a fundamental user engagement practice?					
40. This guideline is an important Agile systems development practice?					
41. This guideline is typically incorporated in the development of e-Government systems?					
42. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 5: The ability for project stakeholders to request changes to the system requirements, within the development process.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
43. This guideline has a positive impact on user adoption?					
44. This guideline is a fundamental user engagement practice?					
45. This guideline is an important Agile systems development practice?					
46. This guideline is typically incorporated in the development of e-Government systems?					
47. This guideline is difficult to implement in the development of e-Government systems?					

GUIDELINE 6: The project team and stakeholders should work together and communicate regularly throughout the project.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
48. This guideline has a positive impact on user adoption?					
49. This guideline is a fundamental user engagement practice?					
50. This guideline is an important Agile systems development practice?					
51. This guideline is typically incorporated in the development of e-Government systems?					

52. This guideline is difficult to implement in the development of e-Government systems?					

Thank you for participating.

End of Questionnaire

APPENDIX G: FINAL (Qualitative) Semi-Structure Interview Schedule

Researcher: Ms. Odifentse M. Lehasa (odifentselehasa@gmail.com; 072-384-6868)

Research Title: An Agile systems development approach to enhancing e-Government user adoption

Purpose: This research seeks to contribute towards improving the user adoption of e-Government systems, through the development of Agile systems development informed User Engagement guidelines.

The purpose of this questionnaire is to go into depth with regards to the proposed user engagement guidelines, and whether they can influence e-Government user adoption. This semi-structured interview takes place after the completion of the questionnaire, which was sent to the participant, in order to obtain a brief idea of the participant's experience of user engagement in the e-Government context.

SECTION A: BACKGROUND AND EXPERIENCE

Research Question C: *How do e-Government project teams currently engage end users in the development of e-Government systems, to ensure user adoption or buy-in?*

1. Can you tell me about your e-Government systems development experience?
    a. How long have you worked in the government systems development context?
    b. How many projects have you been involved in?
    c. What type of projects were these (internal or external e-Government systems)?
2. Can you briefly provide an overview of your most recent e-Government project?
    a. Who was the target user of this system?
    b. What is the purpose of the system?
    c. What was your role on this project?
    d. How have the target users responded to this system?
3. What is your experience with user engagement during the development of e-Government systems?
    a. Which users do you engage with during the development?
    b. How often do you engage with these users?
    c. What does your engagement process entail?
    d. Who or what guides your user engagement process?
4. Do you believe that you have sufficiently engaged with end users in developing e-Government systems?
    a. What is your definition of “sufficiently engaging with end users”?
    b. Would you say that the end users were generally satisfied with their involvement in the development of the system?

SECTION B: USER ADOPTION

Research Question A: *What are the key factors that influence e-Government user adoption?*

5. What are some of the factors that you have observed, which influence user adoption of e-Government systems?
    a. Which factors?
    b. How does the development team respond to these factors?
6. How did your e-Government project team respond to the following adoption factors during the development of the e-Government system?
    a. A user's attitude
    b. Social pressure (or influence)
    c. The ease of use of the technology
    d. The usefulness of the technology
    e. The user's experience of using the technology
    f. The quality of the technology

SECTION C: USER ENGAGEMENT GUIDELINES

Research Questions B: *Which of the Agile systems development practices are fundamental for user engagement in the development phase?*

Research Question D: *How can Agile user engagement guidelines be applied in the e-Government context?*

7. **Guideline 1: Requirements Gathering** (Soliciting system requirements or initial input from the target users of the system).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?
    b. If answered yes to the above question, how would you incorporate this practice into the development process?
        i. When in the development process?

ii. Who would be involved?

iii. What tasks need to happen before (preceding stage) this task can take place?

c. What do you see as the potential challenges to implementing this guideline?

d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

8. **Guideline 2: Product Prototypes** (Developing and presenting various iterations (prototypes) of the product to the user, throughout the development process).
   a. How practical is this guideline?
      i. Is it a relevant user engagement practice?
      ii. Can it be implemented in the e-Government systems development context?
   b. If answered yes to the above question, how would you incorporate this practice into the development process?
      i. When in the development process?
      ii. Who would be involved?
      iii. What tasks need to happen before (preceding stage) this task can take place?
   c. What do you see as the potential challenges to implementing this guideline?
   d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

9. **Guideline 3: Product Testing** (Allowing the user to test each iteration (prototype) of the product).
   a. How practical is this guideline?
      i. Is it a relevant user engagement practice?
      ii. Can it be implemented in the e-Government systems development context?
   b. If answered yes to the above question, how would you incorporate this practice into the development process?
      i. When in the development process?
      ii. Who would be involved?

iii. What tasks need to happen before (preceding stage) this task can take place?

c. What do you see as the potential challenges to implementing this guideline?

d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

10. **Guideline 4: Product Feedback** (Constant user feedback is solicited after each work cycle).

    a. How practical is this guideline?

        i. Is it a relevant user engagement practice?

        ii. Can it be implemented in the e-Government systems development context?

    b. If answered yes to the above question, how would you incorporate this practice into the development process?

        i. When in the development process?

        ii. Who would be involved?

        iii. What tasks need to happen before (preceding stage) this task can take place?

    c. What do you see as the potential challenges to implementing this guideline?

    d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

11. **Guideline 5: Changing Requirements** (The ability for project stakeholders to request changes to the system requirements, within the development process).

    a. How practical is this guideline?

        i. Is it a relevant user engagement practice?

        ii. Can it be implemented in the e-Government systems development context?

    b. If answered yes to the above question, how would you incorporate this practice into the development process?

        i. When in the development process?

        ii. Who would be involved?

        iii. What tasks need to happen before (preceding stage) this task can take place?

c. What do you see as the potential challenges to implementing this guideline?
d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

12. **Guideline 6: Constant User Involvement** (The project team and stakeholders should work together and communicate regularly throughout the project).
    a. How practical is this guideline?
        i. Is it a relevant user engagement practice?
        ii. Can it be implemented in the e-Government systems development context?
    b. If answered yes to the above question, how would you incorporate this practice into the development process?
        i. When in the development process?
        ii. Who would be involved?
        iii. What tasks need to happen before (preceding stage) this task can take place?
    c. What do you see as the potential challenges to implementing this guideline?
    d. In your opinion, can the failure to incorporate this guideline have a negative impact on the user adoption of the system?

SECTION D: GUIDELINES AND ADOPTION

Research Question D: *How can Agile user engagement guidelines be applied in the e-Government context?*

13. To what extent did the feedback obtained from user engagement influence the quality and user satisfaction of the final e-Government product?
14. Do you believe that the implementation of the above user engagement guidelines can improve e-Government user adoption?
15. What other user engagement practices would you recommend, during the development process, to improve e-Government user adoption?

END OF INTERVIEW

APPENDIX H: Research Ethics Approval