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CLOUD COMPUTING ADOPTION BY SMES IN SUB-SAHARAN AFRICA

BY

DAHIRU ABUBAKAR ABUBAKAR

A thesis submitted to Robert Gordon University,
Aberdeen towards fulfilling the requirement for the
award of a degree of Doctor of Philosophy (PhD)

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List of Publications

Journals

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Dedication

I dedicate this piece of work to all those that lost their lives or were displaced from their homes due to the Boko Haram insurgency in North-East Nigeria, where I come from; and to all those who have contributed or have shown the 'will' to bringing the insurgency madness to an end.

As for the question of 'boko' [western education] in the North-East, this work is evidence that we will not relent in our efforts to acquire and ensure basic education for all. The strength of our collective will cannot be broken by the enemies of progress and development.

Abstract

This research contributes to the growing body of research on cloud computing and addresses the paucity of research on cloud computing adoption, as well as information systems (IS) and information communication technologies (ICTs) adoption in sub-Saharan Africa. The research addresses the current state of cloud computing adoption in addition to the issues that can encourage or preclude its use by SMEs in sub-Saharan Africa. Further, the research establishes the extent to which cloud computing adoption stimulates small and medium-sized enterprises (SMEs) in sub-Saharan Africa to contribute to development. A qualitative research methodology with an interpretive viewpoint is adopted for this research comprising of two major phases that involved a total of eighteen small and medium sized enterprises (SMEs) in Nigeria. A pilot exploratory study using grounded theory was conducted in the initial phase and the development and refinement of a conceptual framework for analysis and evaluation was carried out in the second phase. The framework is theoretically grounded in the integration of two distinct theoretical traditions, i.e. institutions theory and the capability approach. This is the first research study that employs such a combination to examine cloud computing adoption.

This research examines the expectations of cloud users against their fears together with other related influences to draw conclusions regarding the future of cloud computing usage in sub-Saharan Africa. The research found that SMEs considered issues like security, privacy and trust as playing a role in enabling adoption of cloud computing. This is in contrast with SMEs in the global north where these specific issues are discouraging adoption. The research recommends to policy makers and stakeholders interested in developing the cloud infrastructure in sub-Saharan Africa, that there is the need to be cautious in drafting policies (which are non-existent at present). This is in order not to draft policies and regulations with regard to cloud computing usage that will inhibit adoption.

Finally, this research presents an incremental model that is used to analyse how cloud service provision was introduced in sub-Saharan Africa. The novel three-stage maturity model identified the incremental approach to the delivery of cloud services in sub-Saharan Africa which started from (i) no local provision, (ii) cloud brokers promoting foreign cloud service provision and (iii) locally-available cloud service provision over a period of three to four years. This research envisages that, with further development of the cloud infrastructure especially in terms of internet connectivity, and improved awareness, more SMEs will adopt cloud computing as part of their IS/ICT strategy.

Chapter 1 – Introduction

1.0 Research Context and Rationale

The overall aim of this research is to contribute to the growing body of research on cloud computing and to address the paucity of research on information systems (IS) and information communication technologies (ICTs) adoption in sub-Saharan Africa. To date, research on cloud computing has primarily focused on the global north and pays more attention to aspects like architecture, potential applications and costs and benefits of the cloud (Saya, Pee, & Kankanhalli, 2010).

Cloud computing can provide remote access to computing resources via the internet. Its features include pay-per usage, flexibility and scalability. Cloud computing is already playing an important role in IT, commerce, finance, education, health and several other industries and sectors. However, existing research on cloud computing technology and adoption, like much of the information systems literature has largely been focused on the developed countries such as members of the Organization for Economic Cooperation and Development (OECD). For areas and regions where the ability to access computing resources and/or develop a robust IT infrastructure is difficult, like sub-Saharan Africa, cloud computing provides a good alternative. But there are key adoption issues that need to be examined to evaluate the viability of this technology.

IS and ICT researchers therefore, have key roles to play in the development of this critical technology especially with regard to adoption, as current literature pays more attention to aspects like architecture, potential applications and the costs and benefits of the cloud (Saya et al., 2010). Little

research has been conducted to explore the adoption of cloud computing in developing countries and most findings are marred by inconsistencies (Kshetri, 2011). The case is even worse in sub-Saharan Africa, where research studies in mainstream information system are almost non-existent (Datta, Byrd, Okoli, & Mbarika, 2005). Walsham & Sahay (2006) have also made the case for the need of future research on ICTs in developing countries to focus on expanding the geographical narrowness of the current research landscape especially by indigenous researchers. Not much progress or change has been achieved in this regard so far. In fact, according to the World Bank, only three percent of articles published in research journals are on Africa (World Bank, 2014). As such, whilst other researchers tend to focus on OECD countries and other aspects of the cloud, it is the interest of this researcher to contribute to addressing the dearth of research on cloud computing adoption in developing countries, with specific interest in sub-Saharan Africa.

Sub-Saharan Africa is the region in Africa that lies south of the Sahara. It is home to 33 of the world's 48 least developed countries (Datta et al., 2005). Whilst ICT has the potential to improve socio-economic development in the region, few studies have shown the direct impact of ICTs to development in general (Heeks, 2010a). This may be as a result of the various schools of thought as to what the actual meaning of development is in the first place. Most information and communication technology for development (ICT4D) or information systems (IS) researchers and/or academics, view development as structural societal change where diverse socio-economic change is a key component (Tribe & Sumner, 2008). Other schools of thought, for example, international development donor agencies, view development as related to the

achievement of the millennium development goals and to the reduction of poverty. Others yet, view development as a discourse that can be used to shape 'reality' and power relations. These three distinct views and indeed other views as argued by Tribe and Sumner (2008), tend to emphasize a common theme, which is that, development encompasses 'change' in a variety of aspects of the human condition. For the purposes of this research, the notion of development as positive 'change' at an individualistic, societal and institutional level is held.

According to Heeks (2010a) however, whatever the notion of development or particular understanding of development that is held, ICTs are making a contribution. The United Nations Development Programme (2001) has also argued in favour of the potentials of technologies for improving performance in state institutions and other aspects of the economy citing how technology has been used not only for its rewards but also as tools for development. Consequently, several sub-Saharan African countries, like Nigeria for instance, have adopted an information and communication technology for development (ICT4D) strategic action plan for implementing an existing national information technology (IT) policy, that seeks to make IT a driver for sustainable development (NITDA & UNECA, 2008). Similarly, one of Rwanda's government main focuses is to make ICT a driver of economic growth.

At the onset of this research, cloud computing was still in its infancy stage, though seen to have the potential to cause a paradigmatic shift in the way computing is done. Cloud computing services promised potential benefits that would see computing on-demand and at a reduced cost, with increased availability and reliability. Thus, the idea of finding out how cloud computing

can diffuse and make an impact especially in developing countries in sub-Saharan Africa despite failures of other innovations to achieve the same previously became fascinating to the researcher. Furthermore, whilst predicting the potential benefits of cloud computing adoption might be easy, critical analysis and evaluation of issues that can influence its adoption is necessary. Equally necessary is the readiness of the key actors involved especially in the region under consideration (sub-Saharan Africa) where basic infrastructure for the cloud is still being developed, and society and norms can have an effect. Consider for instance, how other ICTs used before the advent of the cloud all had their unique adoption issues and stories of successes and failures in their diffusion and/or implementation.

Whilst there were no actual studies found to have been conducted to examine the use of cloud computing in any kind of organization (large or small) or to show its direct impact in the developing countries in sub-Saharan Africa, a few studies have been conducted to show the impact of other ICTs and a few more have examined issues related to their adoption in the same region. Jagun, Heeks, & Whalley (2008) for instance, have conducted an in-depth case study on the impact of mobile telephony in the supply chain of the cloth-weaving sector in Nigeria in which they found evidence for the benefits of such usage. Using Sen's capability approach, Ibrahim-Dasuki, Abbott, & Kashefi (2012) have evaluated the impact of ICT investments on development citing the failure of the Nigerian pre-paid electricity billing system to fully achieve its potential. In other regions however, some research has been conducted on how organizations (SMEs) proceed with cloud computing

adoption (e.g. Alshamaila, Papagiannidis, & Li, 2013; Carcary, Doherty, Conway, & McLaughlin, 2014; Werfs, Baxter, Allison, & Sommerville, 2013).

The importance of SMEs as a medium for studying diffusion and the impact of innovation cannot be overemphasized. In Nigeria for instance, SMEs employ an average of 50% of the working population and contribute to about 50% of Nigeria's industrial output (Jones, Beynon-Davies, Apulu, Latham, & Moreton, 2011). With the expected potential of cloud computing having significant implications on enterprises, especially SMEs, more research to explore and investigate adoption processes and to interpret these implications is necessary. This research sets out to do just that by investigating the influential factors that excite (enable) or inhibit the adoption of cloud computing; and by developing a framework that can be used to analyse and evaluate the technology for what it is, and further determine its wider implications to research information systems and practice. In doing so, this researcher will provide a valuable and unique perspective to the challenges which the sub-Saharan African region is facing in terms of developing its ICT infrastructure and contribute to the development of research and practice in ICT adoption, diffusion and policy.

Thus, through the use of a socio-technical framework that maximises selected development impact factors, the research analyses the factors that can influence the decision to adopt cloud computing and its effect on development. By examining the adoption of cloud computing in eighteen small and medium sized enterprises (SMEs) in Nigeria, the research gauges the expectations of cloud users against their fears together with other related

influences to draw important conclusions regarding the future of cloud computing in sub-Saharan Africa.

1.1 Research Questions, Aim and Objectives

Through the use of a socio-technical framework that maximises selected development impact factors, this research aims to analyse and evaluate Software-as-a-Service (SaaS) cloud hosted applications and services used by small and medium-sized enterprises (SMEs) in sub-Saharan Africa. The following questions are investigated and answered:

1. What is the current state of cloud computing adoption in sub-Saharan Africa?
2. What are the factors that encourage or preclude the use of cloud computing by SMEs in sub-Saharan Africa?
3. To what extent does cloud computing adoption in SMEs impact on development?

The following objectives were also set in order to achieve this aim:

1. Determine cloud computing adoption issues for sub-Saharan Africa SMEs.
2. Develop a framework using selected theoretical underpinnings from the IS and ICT research field.
3. Apply the framework to analyse the issues that shape (influence) the adoption of SaaS cloud applications and services.
4. Evaluate the framework by investigating the use of cloud hosted SaaS by SMEs in a selected sub-Saharan African country.

5. Critically examine the issues that influence the adoption and diffusion of cloud computing by SMEs and the potential impact on development.
6. Scrutinize the application and implications of the framework to the research community, and to policy makers and entrepreneurs interested in developing cloud IT infrastructure especially in sub-Saharan Africa.

1.2 Research Contributions

This research makes several contributions. Firstly, as far as the researcher knows, this is the first and largest empirical study that examines SME cloud adoption in sub-Saharan Africa. This is achieved through the use of a socio-technical framework that was developed and is described in chapter three. The research found that SMEs considered issues like security, privacy and trust as playing a role in enabling adoption of cloud computing. This is in contrast with SMEs in the global north where these specific issues are discouraging adoption. The research also shows that although SMEs come from different sectors, they share a lot of similarities in their fears and expectations. The research further recommends to policy makers and stakeholders interested in developing the cloud infrastructure in sub-Saharan Africa, that there is the need to be cautious in drafting policies (which are non-existent at present). This is in order not to draft policies and regulations with regard to cloud computing usage that will inhibit adoption.

Finally, this research presents an incremental model that is used to analyse how cloud service provision was introduced in sub-Saharan Africa. The three-stage maturity model identified the incremental approach to the delivery of cloud services in sub-Saharan Africa which started from (i) no local provision, (ii) cloud brokers promoting foreign cloud service provision and (iii)

locally-available cloud service provision over a period of three to four years. This research envisages that, with further development of the cloud infrastructure especially in terms of internet connectivity, and improved awareness, more SMEs will adopt cloud computing as part of their IS/ICT strategy

1.3 Organization of Thesis

This thesis consists of seven chapters. Chapter one introduces this research thesis together with the scope of the research and contributions. The main aims in conducting this research and how this thesis is organized is also provided in chapter one.

Chapter two is the related work section of this thesis. The background to cloud computing and the aspect of cloud computing this research is considering is examined together with the literature on cloud computing adoption. Chapter two also draws from and analyses the literature on adoption and diffusion of IS/ICTs, the literature on IS/ICT in developing countries and their impacts, as well as the theories used in studying them.

Chapter three presents and discusses the conceptual framework selected for this study, i.e. a combined institutions and capabilities framework drawn from the related theories on IS/ICT adoption reviewed in chapter two. In order to highlight the underpinning theories and literature that informs why and how the framework is chosen, the chapter starts with a review of the theoretical underpinnings of institutions theory and its applications in the IS domain. This is then followed by a review of the capability approach also with its application in the IS field. A justification for choosing the framework and how the two approaches can complement each other is also presented.

In chapter four, the research perspective and methodology considered for this research is discussed. As the research itself was conducted in two major phases, the chapter first examines the pilot/exploratory study that was conducted in the first phase to enable refinement of the data collection instrument and familiarization with the research phenomenon. This was then followed by the second phase, which involved a deductive synthesis grounded in the initial research carried out, which enabled the adoption and development of the proposed framework. Chapter four also provides the reader with the research perspective and philosophical assumptions underpinning this study, the research approach for the initial phase of the research and the motivation for choosing the approach, and the approach adopted for the second phase of the research. The data collection techniques, method of data analysis, limitations of the research and other ethical concerns that were taken into consideration while conducting the research are also presented in chapter four.

In chapter five, the outcomes of the initial phase of the research are critically examined. Firstly, through the emergence of categories from the grounded theory approach that was adopted in the initial phase, cloud computing adoption issues by SMEs in Nigeria, a sub-Saharan African country are identified. The chapter introduces the contributions of this research and draws from the authors peer reviewed paper that has been published in the electronic journal of information systems in developing countries and also presented at the 12th IFIP international conference on social implication of computers in developing countries (Dahiru, Bass, & Allison, 2013; Dahiru, Bass, & Allison, 2014a).

In the sixth chapter, an analysis using the research's selected framework is conducted and the exciters and inhibitors that influence cloud adoption by SMEs in sub Saharan Africa are identified through the lenses of the institutions and capabilities framework. Like chapter five, the sixth chapter consolidates the main contributions of this research and also draws from a paper published by this researcher and presented at the international conference on information society (i-Society 2014), an IEEE co-sponsored conference (Dahiru, Bass, & Allison, 2014b). Further, chapter six also provides unique findings regarding the approach to cloud hosted services and solutions provision in sub Saharan Africa. A conceptualized model describing the three development stages of cloud services provision identified in the process of the research is presented.

The final chapter highlights mainly, the research conclusion. It brings together all the chapters by critically examining the research's theoretical, methodological and practical contributions that address the research gaps identified. Chapter seven also captures how the research's selected framework is used for methodological triangulation, a further contribution of this research. It also provides recommendations for researchers interested in applying the framework as an analytical tool for investigating and interpreting IS/ICT adoption and ICT4D interventions. Finally, the chapter also presents areas or ways through which this research can be extended.

Chapter 2 – Literature Review

2.0 Introduction

Chapter one introduced cloud computing and its potential for providing an alternative way of accessing computing resources as well as the need for critically analysing the issues that can shape its adoption (especially in regions where developing IS/ICT infrastructure has been difficult and research is lacking). In this chapter, the background to cloud computing and the aspect of cloud computing which this research is considering is examined together with the literature on cloud computing adoption. Chapter two also draws from and analyses the literature on adoption and diffusion of IS/ICTs, the literature on IS/ICT in developing countries and their impacts, as well as theories used in studying them. Overall chapter two contributes to this thesis by:

- Justifying the necessity of examining emergent cloud computing adoption issues in terms of expectations, fears and other influences that shape adoption in sub-Saharan Africa where research is lacking.
- Evaluating the potential ways cloud computing adoption can make an impact in developing countries.
- Justifying the appropriateness of conducting new research with different theoretical and different methodological perspectives.

2.1 Background to Cloud Computing

Simply put, cloud computing is the delivery of software and technology as services over the internet by service providers. According to the National Institute of Standards and Technology, it is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable

computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell & Grance, 2011). In cloud computing, end-users do not require the knowledge of the physical locations or configurations of the systems that deliver relevant services to them. It also has other key features like the elasticity of the amount of computing resources to be used to suit the “on demand” delivery of computing resources characteristics (Voorsluys, Broberg, & Buyya, 2011). As such, users can have access to highly scalable and reliable computing services that are governed by service level agreements over the internet for a fee.

Armbrust et al. (2010) have summarized the key characteristics of cloud computing as: “(1) the illusion of infinite computing resources available on-demand; (2) the elimination of an up-front commitment by cloud users whereby resource allocation can be adjusted; and (3) the ability to pay for the use of computing resources when needed”. Cloud computing can also be used to provide a range of services which have been divided into various categories. The most common categories are infrastructure services, platform services and application services also referred to as software as a service. In essence, companies, whether providers or clients employ the use of these categories based on what they offer as the case may be. Figure 2.1 shows the layers that make up the cloud (Amrhein & Quint, 2009).

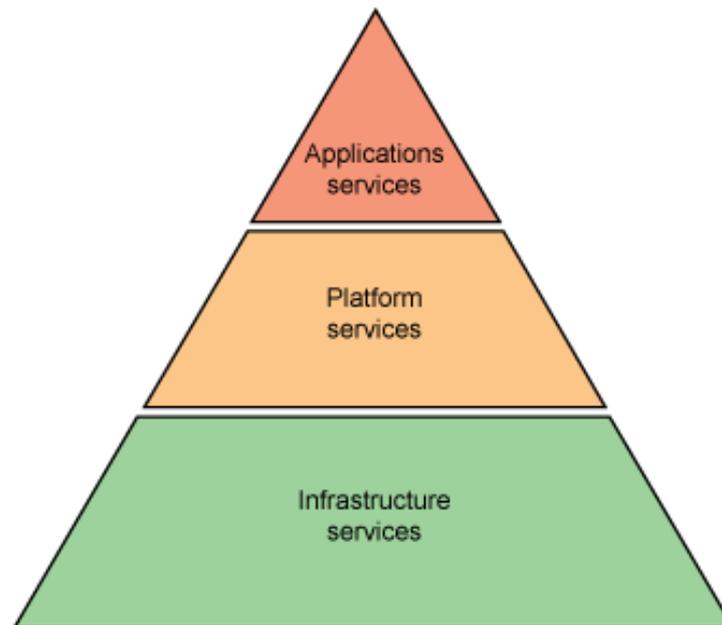


Figure 2.1 *The layers that make up the cloud*

Infrastructure as a Service primarily deals with the remote delivery of a full computer infrastructure (e.g., virtual computers, servers, storage devices, etc.); through the internet. According to Voorsluys et al. (2011), offering virtualized resources such as computation, storage, and communication on demand is known as Infrastructure as a Service (IaaS). The IaaS is at the bottom of the layer and where hosting normally takes place. An example of IaaS is the amazon's Elastic Compute Cloud (EC2) which offers 'as a service' virtual machines with customizable software stacks. This way, end-users are able to perform numerous activities similar to having a physical server on site.

Platform as a Service offers an environment in which developers can create and deploy applications. They do not necessarily need to know how much memory or how many processors an application will be using. This implies that application infrastructure on this layer appears as a set of services. Google AppEngine, for example, has a Platform as a Service environment that offers a scalable environment for developing and hosting

Web applications on Google's infrastructure. It supports applications written in various programming languages including java and python.

Software as a Service delivers applications as a service to end users. These applications perform comprehensive business tasks, or accomplish business services, and allow you to consume them as services with no internal application requirements other than composition and user interfaces (UI). This means that the applications can be accessed easily through web portals. This has since resulted in shifting users from locally installed computer programs to online software services that offer the same functionality, thereby reducing the problem of routine software maintenance and initial capital investment. Salesforce.com, which relies on the SaaS model, offers business productivity applications like customer relationship management (CRM) that rely completely on their servers, allowing customers to customize and access applications on demand (Voorsluys et al., 2011). Thus, in the Software as a Service (SaaS) domain, cloud applications can be built as compositions of other services from the same or different providers.

In this research, the adoption of software as a service or cloud hosted application and service is investigated. The two terms are used interchangeably and the term cloud computing adoption unless otherwise stated, is also used to refer to the adoption of software as a service applications and services especially in the forthcoming chapters.

2.2 Cloud Computing Adoption by SMEs

In this section, the literature on cloud computing adoption by SMEs is analysed. Firstly, cloud has been defined as the delivery of software and technology as services over the internet by service providers where end-users

do not require knowledge of the physical locations or configuration of the systems that deliver relevant services to them. It also has other key features like the elasticity of the amount of computing resources to be used to suit the “on demand” delivery of computing resources characteristics (Voorsluys et al., 2011). Industry analysts Forbes have predicted that the cloud market would exceed \$120 billion by 2018, and business processes delivered as cloud services will be significantly larger components of the overall cloud service market taking up to about 62% (Columbus, 2015a). Gartner also projects the growth of public cloud services market in the Middle East and North Africa (MENA) region to 19.3 percent (19.3%) in 2016 totalling about \$880 million up from \$737 million in 2015 (Shetty, 2015). Beyond 2014, the cloud market in Nigeria and South Africa are also reportedly projected to worth \$100 million and \$230 million dollars respectively (Burnt, 2014; Uzor, 2015). Theories of economic growth also largely recognize that SMEs stimulate economic growth in societies. Currently 37% of SMEs in the United States have adopted some form of the cloud and the number is projected to rise to about 78% by 2020 seeing SME cloud market growth to about \$55 billion (Columbus, 2015b). These projections and many others indicate the rapid growth of cloud computing use by SMEs in the nearest future and hence the need for adequate research in the adoption and continuous use of the technology.

However, the adoption of cloud computing by SMEs is under-researched. Two literature surveys were undertaken in 2011 and 2014 to find out what is being published on cloud computing adoption by SMEs. The outcome of the surveys, which were restricted to English language documents, suggested that no serious publishing in this subject area has begun. Although the various

searches resulted in some other related work, they were found to be practitioner oriented and appeared only in academic magazines or at best work in progress on cloud adoption (e.g. Saya et al., 2010). Other publications required stronger justification for the many predictions that were made in them regarding cloud adoption as they were not based on empirical evidence (e.g. W. Kim, Kim, Lee, & Lee, 2009). In the W. Kim et al (2009) study, issues such as outage (availability), security, performance, compliance, integration, cost, and environment were identified as issues that could impede the rapid adoption of cloud computing from the perspective of potential users. Important as these issues raised may be however, the study requires strong justification and can at best be described as a forecast study that was only dependent on literature on previous technologies that were in some way similar to the cloud rather than on factual evidence. In another similar work, Le Roux & Evans (2011) have shown how cloud computing could bridge the digital divide in secondary education in South Africa. The study cited lack of political will and determination amongst other issues as key factors responsible for widening the digital divide. The study was based on a review of cloud computing applications and services, currently used by secondary education systems in developed countries. The study however, does not address actual adoption issues faced by these education institutions. The study was also more of a readiness, availability and uptake rather than impact as Heeks (2010a) categorizes.

However, from late 2013 to 2014, academic research relating to cloud computing adoption by SMEs started to emerge. The determinants of cloud computing adoption within the UK were investigated using the Technology

Organization and Environment (TOE) framework by Lumsden & Anabel (2013). The study, which involved both small and large organizations, was able to confirm the high rate of cloud adoption in the UK and identifies compatibility, relative advantage, technology readiness and top management support as the most important determinants of cloud adoption in UK organizations. As the study was however not targeted at SMEs alone, the conclusions drawn by the study on the determinants of cloud computing adoption may not necessarily be applicable to SMEs.

2.2.1 SME Adoption of cloud

Little systematic research has been conducted into how SMEs proceed with cloud computing adoption (Alshamaila et al., 2013). Existing research has focused on cloud computing architecture, potential applications, and costs and benefits, while that of adoption has received little attention (Saya et al., 2010). This indicates a gap in cloud computing adoption research. This gap is further evident when the sub-Saharan region of the African continent is to be considered as the little research that does exist is focused on other region e.g. America and the OECD countries.

Carcary et al. (2014) for instance, tested the applicability of SMEs adapting existing cloud computing adoption models designed for large enterprises when transitioning to the cloud. The exploratory study, which targeted Irish SMEs transitioning to the cloud environment, did not find the existing models to be suitable for adaptation. This indicated a justification for developing an SME specific framework, to be used when adopting cloud computing. The research however, fell short of doing so possibly because it was an exploratory study.

However, the researchers identified that any such model needs to be cognizant of the nature, degree of complexity and inherent characteristics of SMEs.

One of the few limited publications identified on actual cloud computing adoption by SMEs is that of Werfs, Baxter, Allison, & Sommerville (2013) and that of Alshamaila et al. (2013). In the study by Werfs et al. (2013), the authors investigated how a set of SME high-value software vendors were migrating their software products to the cloud. Using an adaptive socio-technical systems (ASTSS) concept, the study identified a set of macro and micro themes relating to key phases of strategy development, the migration process and the impact on customer perceptions. Although the study also identified key emergent tensions in cloud adoption and proposed a way to manage those tensions, the solutions may not necessarily be generalizable to all organizations as the study is still ongoing and relies heavily on limited data. Furthermore, the adaptive socio-technical systems concept pays more attention to the possible effects on organizational resilience, hence other important tensions might have been overlooked.

In the study by Alshamaila et al. (2013), the development of an SME cloud computing adoption model using the Technology Organization and Environment framework was explored. Using qualitative techniques, the study obtained data from fifteen different SMEs and service providers from the North East of England. The strength of the framework was then used to identify the main factors that play a significant role in SME adoption of cloud computing in the region. The factors identified include: relative advantage, uncertainty, geo-restriction, compatibility, trial-ability, size, top management support, prior experience, innovativeness, industry, market scope, supplier efforts and

external computing support. The study did not find sufficient evidence to show competitive pressure as a significant factor that influences cloud adoption. The study however, did not specify the aspect of cloud that was considered for investigation. Nevertheless, findings from the study, being one of the first to identify actual issues significant to SMEs cloud adoption in the UK can be employed to formulate better strategies for cloud computing adoption by SMEs and can be used as a benchmark to compare other studies on SME cloud adoption.

2.3 Cloud computing adoption in sub-Saharan Africa

In this section, the literature on cloud adoption in sub-Saharan Africa is reviewed. Few studies have been carried out to explore the use of cloud computing in sub-Saharan Africa. The South African internet governance forum in its first issue paper introduced several emerging issues related to the use of cloud computing (Alex, 2011). The issues introduced were related to internet broadband, economic development, and security privacy and trust issues. However, as clearly stated in the paper, detailed analysis of the issues introduced was not carried out and thus could not provide or inform any sort of user or policy recommendations. Kshetri (2011), on the other hand submits that, the findings on the potential benefits and impact of cloud computing in the developing world are inconsistent. In sub-Saharan Africa, this may be due to the lack of the current cloud service/applications being used or lack of metrics about the usage of cloud in the region.

Akande & Van Belle (2014) proposed a framework that can be used to assess the readiness to adopt cloud computing by financial institutions in South Africa. The study, which also employed the Technology Organization and

Environment framework as a theoretical base found out that security and privacy, governance issues, inadequate cloud service level agreements, vendor lock in, poor vendor transparency, inability to assess risks, confidentiality, integrity and availability are some of the barriers that impede the full implementation of cloud computing. Since the study was limited to large organizations in the financial sector in South Africa, it could be overstretching to attempt to link or conclude that the findings are also applicable to SMEs in sub-Saharan Africa.

However, an earlier study by Dahiru et al. (2014a) which forms parts of this thesis has identified several cloud computing adoption issues faced by SMEs in sub-Saharan Africa which include: security, privacy and trust, fear of data loss, awareness, top management support, availability of good internet connection and cost. Some of the issues identified like security, privacy and trust and fear of data loss were found to have influenced adoption decisions positively for both existing and start-up SMEs. The study made use of qualitative means to obtain and analyse data from ten SMEs that have adopted cloud computing as an IT strategy. These SMEs span across various sectors including finance, information and communication technology, and manufacturing in Nigeria, a sub-Saharan African country.

Although industry analyst Gartner, has predicted the significant rise in the cloud market (Pring, Brown, Frank, Hayward, & Leong, 2009); in sub-Saharan Africa, a few companies are using cloud hosted SAP, enterprise resource planning (ERP) and microfinance banking operations and accounting packages and very few universities, like the University of Pretoria in South Africa are

using it for research (Dahiru et al., 2014b). Several indigenous companies have also started providing cloud services to local consumers.

2.4 IS/ICTs in Developing Countries

Within developing countries, the potential for IS/ICTs enabling improvement in various sectors including healthcare, education and businesses is no longer controversial. In sub-Saharan Africa, where this research is focused, many countries operating on this notion have propagated the potential use of technology as one of the drivers for economic growth and sustainable development (NITDA & UNECA, 2008). However, the failure of various IS/ICT deployments to be sustained and to produce the desired result (impact) in many instances have been an issue of concern (Heeks, 2002). Furthermore, the IS research community may be facing a real challenge or difficulty in determining what constitutes failure or even success for that matter when investigating the adoption and impact of IS/ICTs in developing countries. Taking one of the views and drawing from the design-actuality gap model developed by Heeks (2002), it can be argued that transfer of IS/ICTs from an industrialized-country context to a developing country without considering the actuality of the local conditions in the developing country is one of the main causes of failure. Using IT investment as an indicator, the study by Heeks (2002) has also shown how there is a difference in the success and failure rate of IS/ICT adoption between developing and OECD countries with about 80% gross returns for the latter countries. Avgerou (2010) has also acknowledged how there can be a difference in the context in modelling the adoption of new technologies in advanced economies vis-à-vis a developing one. Indeed, there are other different contexts that are physical, social and

political in developing countries that can also lead to failure and/or success in IS/ICT adoption.

2.5 IS/ICT Adoption and SMEs

The adoption and diffusion of IS/ICTs have been considered, studied and published by various researchers. As far back as the 1980s, the idea that society had begun an information revolution was popular. According to Huff & Munro (1985), this may be connected with the cost and capabilities of information technology changing rapidly. For the purpose of this research, the definition of ICTs by Huff & Munro (1985) is adopted; where ICTs are defined as "the broad range of technologies involved in information processing and handling, such as computer hardware, software, telecommunications and office information, and includes such "technologies" as new systems development methodologies". The definition fits the phenomenon under investigation in this research, i.e. cloud computing, which is also referred to as both the applications delivered as services over the internet and the hardware and systems software in the datacenters that provide those services (Armbrust et al., 2010). The definition adopted is also not far from Duncombe & Heek's (1999) definition of ICTs which they referred to as any electronic means of capturing, processing, storing, and disseminating information. Both definitions point to the necessity of understanding information first before the mechanisms that can be used to handle it. In that way, the appropriate technology to capture, process, store and disseminate information of a particular organization can be used (adopted). Adoption on the other hand refers to the strategies, processes and tasks employed explicitly or otherwise

by organizations to identify, acquire and diffuse appropriate information technology (Huff & Munro, 1985).

It is noticeable from studies in IS/ICT innovation adoption and diffusion, for instance, (Agarwal & Prasad, 1998; Davis, 1989; Huff & Munro, 1985; Manuela, Angel, Pilar de Luis, & María, 2004; Rogers Everett, 1995; Venkatesh, Davis, & Morris, 2007) that have been conducted and published, that the field is an ever changing and gradually expanding one. Venkatesh, Davis, & Morris (2007) and Jasperson, Carter, & Zmud (2005) posited that the extensive body of work on the adoption and use of new ICTs makes it one of the richest and mature research streams in the information systems field. It is apparent, however, that despite the considerable amount of studies that have been undertaken, there is the need for attention to be given to the inconclusive nature of some of the findings in this research area. Thus, to mitigate this, more attention is needed to be given to factors such as differences in the ICT innovations studied, different methods of data collection, differences in the operationalization of constructs, and differences in the innovation context (Ramdani & Kawalek, 2007).

Weber & Kauffman (2011) have conducted an extensive study to analyze the drivers of global ICT adoption using economic, social and other related factors. The study considered the levels at which the impacts of ICT adoption can occur in a country starting from the level of the individual through to the organizational, industrial and national levels. Like Ramdani & Kawalek (2007), they also believe that in a number of areas within the IS/ICT research field, it might be appropriate to conduct new research with different theoretical and different methodological perspectives. Apart from setting a research agenda

for new technology adoption theories which involves the mapping out of theories to explain the relationship between factors and levels of adoption as stated earlier, the study also outlined the need for the analysis of these factors and levels regarding how they create an impact in regions within countries, across multiple countries and in key global regions.

Indeed, the adoption and use of IS/ICTs have become a central issue for most modern organizations and is considered a way to improve efficiency, productivity, reduce the cost of information handling and a host of other advantages (Huff & Munro, 1985). As the attention of software vendors turns to small and medium-sized enterprises (SMEs), there is the need to further understand their limitations in innovation adoption; some of which are methodological, and others theoretical (Alshamaila, 2013), as pointed out earlier. There is certainly no clear differences in the context of SMEs' adoption of IS/ICTs but researchers have recognized the need to understand and explore the critical factors that are enabling or inhibiting IS/ICT adoption by SMEs (Harindranath, Dyerson, & Barnes, 2008). Some hold the view that SMEs are less likely to adopt new technologies than larger organizations, as in the survey conducted by Goodwin (2013) involving 268 SMEs. Factors like cost, unsystematic approach to adoption, lack of strategic planning, and lack of awareness are some of the factors that Aquilina (2014) reviewed as inhibiting technology adoption. Others yet hold the view that SMEs can potentially be more flexible and more innovative due to their size and lower levels of bureaucracy (Lumsden & Anabel, 2013).

In summary, careful analysis of the literature indicates that, although the IS/ICT adoption field has benefitted from many studies; there are areas within

the field that deserve further attention. This research highlights two main areas to contribute to. Firstly, developing a conceptual framework to evaluate the adoption of a new technology contributes to the need for researching new technology adoption theories that can address the rapid changes going on in the field. As will be discussed further in section 2.6, there are several innovation adoption theories used in the IS field, but most studies have concentrated on the use of the technology acceptance model (TAM), which is gradually weakening the technology adoption research field due to the overall homogenous nature it could turn the research field into (Alshamaila, 2013). Secondly, conducting the research with SMEs in sub-Saharan Africa contributes in determining the social factors to adoption from an industrial and regional perspective; this can further address issues like the digital divide as posited by Bhatnagar & Singh (2010), developmental impact of IS/CT adoption and the concentration of research mainly in developed countries.

2.6 IS/ICT Innovation Adoption Theories

As stated earlier in 2.5, there are several theories used in examining IS/ICT adoption ranging from those drawing from frameworks for studying technology innovation adoption to those based upon social processes and those based upon development. This research has found useful information and has benefitted from summarizing some of these key theories/frameworks.

2.6.1 Technology Adoption and Diffusion Theories

Two main research streams have been identified as the determinants of IS/ICT usage, viz. intention-based models research like the technology acceptance model (TAM) and diffusion of innovation as exemplified by Roger's diffusion of innovation theory (Taylor & Todd, 1995). This subsection briefly reviews these two streams.

TAM, initially developed by Davis (1989) has been one of the influential theories in information systems. Technology acceptance and/or resistance by organizations has turned out to be one of the major contexts that have been addressed by IS/ICT innovation adoption research. Researchers have used the TAM to determine the factors that influence the decision for the adoption of technology by focusing mainly on users' perception of usefulness and ease of use. Perceived usefulness is defined as the degree to which a particular system is believed to enhance performance; and perceived ease of use refers to the degree to which using a particular system is believed to be free from effort. TAM draws a lot of influence and use by researchers interested in framing individual's IT adoption behaviors and from its simplicity. It provides a solid theoretical base for explaining the adoption behaviors of individuals (Lucas Jr, Swanson, & Zmud, 2008). TAM has equally drawn much criticism for neglecting other important issues like social and organizational factors (Benbasat & Barki, 2007). According to Alshamaila (2013), a majority of the existing studies have focused on reviewing the literature relating to technology acceptance, rather than on providing a comprehensive review of the broader issue of adoption and diffusion. Thus, over time there has been an increased concern regarding the appropriateness and comprehensiveness of using TAM.

In response to some of the criticisms regarding TAM, the model has evolved over time leading to modifications by various researchers. The Unified Theory of Acceptance and Use of Technology (UTAUT) for instance, extends the TAM and focuses not only on the perceived usefulness and the perceived ease of use of the system, but also the social influences and conditions that

facilitate and are direct determinants of usage intention and behavior (Venkatesh, Morris, Davis, & Davis, 2003). TAM has also been extended to include variables such as trust, personal characteristics and/or culture (Zheng, 2015).

As earlier stated, many researchers in IS/ICT have employed TAM in studying technology adoption. For instance, in a study by Ndubisi & Jantan (2003), the TAM was used to understand the relationship between computing skill and technical backing as anchors to perception of usefulness and ease of use in small and medium-sized firms. The study found that not only do computing skills and technical backing serve as strong anchors to a user's perceptions of the usefulness and ease of use of information systems; they also wield direct influence on systems usage.

Notwithstanding, the theory has been criticized for presenting only limited guidance about how usage is influenced through design and implementation (Taylor & Todd, 1995; Venkatesh et al., 2003). Another limitation of the TAM as argued by Bagozzi (2007) is its failure to take into cognizance the group, cultural and social aspects of technology acceptance thereby alienating possibilities of individuals acting spontaneously, or in response to social pressure.

The diffusion of innovation (DOI) theory, on the other hand, seeks to explain why, how and the rate at which a new idea and technology spreads through cultures (Rogers Everett, 1995). According to the DOI theory, five variables determine the rate of adoption (Rogers, 2003). These include: the attributes of the innovation itself, the communication channels used, the type

of innovation-decision, the nature of the social system and the extent of change agent's promotion efforts. Grunfeld (2011) argues that innovation must be accepted and adopted prior to its diffusion. A number of studies have considered the adoption and diffusion of ICT-based innovations using the attributes of the innovation as characterized by Rogers. These innovation attributes, which include, relative advantage, compatibility, uncertainty, complexity, trialability can directly affect the diffusion of ICT innovations.

To briefly pick on these attributes, relative advantage can be referred to as the degree to which an innovation is perceived as being better than the one currently in use (Rogers, 2010). Compatibility and complexity can relate to the experiences and expertise of adopters as well as the ease of use of the innovation in question. On the other hand, uncertainty can be interpreted as the 'fears' that are harbored of the consequences of using an innovation while trialability can refer to the temporary testing of the innovation before final implementation.

The Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology and the Diffusion of Innovation theory are popular in IS/ICT research. Whilst some aspects of the TAM and its extensions as well as the DOI can be useful in this research, for instance in examining the acceptance and diffusion of cloud hosted applications, they may not be suitable to offer analytical and practical insights into understanding the social drivers that may inhibit or enable individuals and organizations from adopting the technology in question and its potential impacts. Furthermore, critics of the theories have argued that the theories fail to sufficiently account for contextual factors and actual uses of technology as they do not take into account the values

embedded in a technology and neglect issues like power, politics and culture which in reality interact with users' perception and practices in relation to technology (Zheng, 2015). Furthermore, the theories are not best suited for explaining the manner in which SME adopt IS/ICT considering the need for researching SMEs to be practical (Tatnall & Burgess, 2002). Another point to note here is that the author does not assume the technology being investigated herein as intrinsically good or that technology adoption and diffusion are based solely on voluntary decisions but rather can be influenced in varying degrees.

2.6.2 Socio-Technical Change Process Model

According to Kwon & Zmud (1987), IS development can be represented as a socio-technical change process. The foundation of this model combines Leavitt's (1965) socio-technical change model and the punctuated equilibrium theory (Gersick, 1991). The advantage of this was to identify how the story of implementation unfolds over time, linking history to outcomes and placing the story within the context of the organization and beyond. The socio-technical change process model is also a good way of determining failure and success factors associated with the design and use of IS and ICTs. Newman & Zhao (2008) have described and analyzed the process of introducing enterprise resource planning (ERP) systems in organizations using this model.

One of the drawbacks of using this innovative process model is that it can be time-consuming as it requires an understanding of both the socio-technical model and the punctuated equilibrium theory (Newman & Zhao, 2008). Furthermore, despite the simplicity of Leavitt's (1965) socio-technical change model from which it draws its strengths, the static nature of the model and the

frequent need to discuss other components such as power, politics and culture has been criticized. As this research is about adoption rather than trying to understand an independent story of implementation over time, the socio-technical change process model is not selected for this study. It may rather be more applicable to a longitudinal study. As there is also a limited availability of studies that employed the combined model for research, there are not many references or lessons to draw and learn from. However, Leavitt's (1965) model was useful in the initial development of data collection materials.

2.6.3 Actor-Network Theory (ANT)

Actor-network theory (ANT) has its roots in science and technology studies. ANT takes the view that all entities (human and non-human) take form and acquire their characteristics through their relations with other entities in the location in which they circulate (Callon, 1986; Latour, 1999; Law, 1994). According to Zheng (2015), ANT is a worldview that sees society, including institutions, knowledge, artifacts, and organizations as a product or an effect of their interaction among a network of heterogeneous human and non-human actors, rather than as objective independent entities. Everything is both an actor and a network. In the theory, network refers to the "framing" and "summing up" of interactions and relations through various methods, into a very local, practical, narrow focus (Miles, 2012). ANT stresses that actors are already aware of what to do and what social forces influence them; so it does not try to explain the social behavior of actors. Rather, researchers are left to determine what actors do, how they do it and why, without their imposing some artificial categories or constructs. In the context of SMEs, Tatnall & Burgess (2002) have used ANT to investigate the implementation of a business-to-business e-commerce portal in the western region of Melbourne,

Australia describing in detail the construction of networks and alliances to support and embed the changes it produces in order to make them durable. The study showed that adoption is made not only on the basis of the characteristics of the technology but other factors may also be involved in the decision making process. In some instances, characteristics of the technology may not actually be significant in the decision making process.

However, while ANT might have the potential to give a better insight into adoption than the initially mentioned theories, it is not selected for this study. ANT has been criticized for being over descriptive without offering a proper methodology for distinguishing bad or ineffective descriptions from good or effective ones (Miles, 2012). With ANT, it is not sufficiently clear where the boundaries of a network lie or whose account of a network is to be taken as definitive (Tatnall & Burgess, 2004). Furthermore, one of the main advantages that Actor-network theory offers over other IS research approaches is in situations where 'political' considerations are important (Tatnall & Gilding, 1999). Political considerations are not the focus of this research.

2.6.4 Institutions Theory

The core concept of institutions theory is that organizational structures and processes tend to acquire meaning and achieve stability in their own right, rather than on the basis of their effectiveness and efficiency in achieving the desired ends, such as the mission and goals of the organization (Miles, 2012). Institutions, defined through Scott's (2008) concept of institutions comprises "*regulative, normative and cultural cognitive elements that, together with associated activities and resources, provide stability and meaning to social life*" (pp. 48). According to DiMaggio & Powell (1983), institutions exert three types

of isomorphic pressures, viz. coercive, normative and mimetic. The basic similarity in all institutional theoretical claims however, is that something identified at a higher level is used to explain processes and outcomes at a lower level of analysis (Clemens & Cook, 1999). However, institutional analysis has been criticized for overlooking some social drivers that play a role in adoption when used in isolation (Bass, Nicholson, & Subhranian, 2013). Institutions theory is combined with the capability approach in this research to examine cloud computing adoption in sub-Saharan Africa. The reasons for selecting institutions theory and the justification for combining it with the capability approach is further reviewed in chapter three.

2.6.5 Capability Approach

The capability approach as conceptualized by Sen (1999), concentrates on what people are effectively able to do and be, i.e. the ability of people to lead the lives they have reason to value. The capability approach is grounded in human development and offers an alternative view of theories of economics that focus on growth or development measurement through income, utility, consumption and other metrics like gross national product or industrialization. According to Heeks (2009), the increasing popularity of the capability approach in ICT4D studies is an indication that it could provide the foundation for future studies in the area. Researchers have also described the capability approach as an idea which is conceptually rich but methodologically vague (Heeks & Molla, 2009; Robeyns, 2005; Zheng, 2009). The proponent of the approach, Sen, however, expects it to be adapted to suit a variety of purposes. Alkire (2005) and Robeyns (2005) have put forward ideas to develop the capability approach more cohesively and effectively link the range of opportunities exposed to an individual into realized achievements (functionings). As one of the selected

theories used to conceptualize the framework in this study, it is also reviewed further in chapter three.

2.7 Summary

In this chapter, the pertinent literature related to this research was reviewed. The background to cloud computing and the aspect of cloud computing this research is considering was examined together with the literature on cloud computing adoption. The literature showed that cloud computing adoption and its impact is under-researched and there is a need for in-depth studies especially in sub-Saharan Africa and other developing countries where research is lacking. This led to the investigation and analysis of appropriate theories, frameworks and approaches that can be used to examine cloud computing adoption. Several IS/ICT adoption theories were considered and like any other research approach they were not without their limitations. These theories included the technology adoption model (TAM), the diffusion of innovation theory (DOI), the socio-technical change process model, actor-network theory, institutions theory and the capability approach.

A critical analysis of the frameworks was conducted and their appropriateness for use in this research was evaluated. Several criticisms of the frameworks and models were cited as reasons for not selecting them for this research. The TAM and DOI fail to sufficiently account for contextual factors and actual uses of technology as they do not take into account the values embedded in a technology and neglect issues like power, politics and culture which in reality interact with users' perception and practices in relation to technology (Zheng, 2015). The socio-technical change process model depends on Levitt's model which has been criticized as being static and often

calls for the need to discuss other components such as power, politics and culture. It has also been described as more appropriate for longitudinal studies. The ANT, though better in giving insight than the TAM and the DOI has been criticized for being over descriptive (Miles, 2012) and more advantageous where political considerations are important. The institutions theory may overlook some important social drivers and categories like the role the individual plays with respect to adoption. The capability approach has been described as methodologically vague and its operationalization difficult. Thus, whilst all the frameworks are useful and important in IS/ICT adoption studies, none of them would however be suitable on its own as a theoretical lens for achieving the objectives set for this study. This led to the decision to combine institutions theory and the capability approach to complement each other as carried out by Bass et al. (2013). The advantage of this approach is not to overlook the social drivers that may inhibit or enable individuals from taking full advantage of IS/ICT resources when using either of the approaches in isolation.

In chapter three, institutions theory and the capability approach will further be analysed and the justification for combining them as the theories to be used as an analytical lens for this research will be discussed.

Chapter 3 – An Institutions-Capabilities Analytical Framework

3.0 Introduction

In this chapter, the framework selected for this study, a combined institutions and capabilities framework is critically examined in order to highlight the underpinning theories and literature that inform why and how the framework has been chosen for this research. The chapter starts with a review of the theoretical underpinnings of institutions theory and its applications in the IS domain. This is then followed by a review of the capability approach also with its application in the IS field. Finally, the conceptual framework guiding this study and the justification for choosing it is presented, highlighting how it can be used to explain the excitors and inhibitors that can influence technology adoption.

3.1 Institutions Theory

The core concept of institutions theory is that organizational structures and processes tend to acquire meaning and achieve stability in their own right, rather than on the basis of their effectiveness and efficiency in achieving desired ends, such as the mission and goals of the organization (Miles, 2012). The manner in which organisations respond to changes is often dependent on the socio-political, economic and technological influences exerted by the environment in which they operate (Weerakkody, Dwivedi, & Irani, 2009). Thus the impacts of such external forces on organizational behaviour have been studied by many researchers using the institutions theory. Other studies however, have focused on using the theory to understand the adoption and diffusion of IS/IT or the impacts of IT-enabled change on organizations (Weerakkody et al., 2009). Nevertheless, both the interpretive paradigm, and

positivist paradigm have been utilised by researchers when employing the institutions theory for IS-related issues, and similarly, in terms of the type of data used; both quantitative and qualitative data have been collected (Weerakkody et al., 2009).

According to DiMaggio & Powell (1983), institutions exert three types of isomorphic pressures or effects, viz. coercive, normative and mimetic. The basic similarity of all institutional theoretical claims however, is that something identified at a higher level is used to explain processes and outcomes at a lower level of analysis (Clemens & Cook, 1999).

Coercive pressures originate from environmental sources such as those from a dominant customer or supplier, or from government regulations. Hence, these entities may have resources that make organizations dependent on them. Normative pressures result from the existence of relationships between members of a network which can lead to a consensus and the development of norms and rules that become entrenched amongst members of a network. Following professional standards and practices amongst a network can be a source of normative pressures. Mimetic pressure occurs when organizations imitate each other due to similar changes occurring in organizations that are similar to them or in the same industry, usually when these organizations are not certain about what to do. The actions of competitors are a particularly relevant source of mimetic pressure. DiMaggio & Powell (1983) also view the effects of cognition through mimetic isomorphism. Jennings and Greenwood (2003) suggest that the notion of institutional pressures is akin to the concept of institutional pillars proposed by Scott. These pillars are reviewed in the next sub-section (3.1.1).

3.1.1 The pillars of institutions

As stated in 3.1, Scott (2008) has identified three key pillars that can make up or support institutions viz. *regulative, normative and cognitive*. This section describes the pillars.

	Regulative	Normative	Cultural-Cognitive
<i>Basis of compliance</i>	Expedience	Social obligation	Taken-for-grantedness Shared understanding
<i>Basis of order</i>	Regulative rules	Binding expectation	Constitutive schema
<i>Mechanisms</i>	Coercive	Normative	Mimetic
<i>Logic</i>	Instrumentality	Appropriateness	Orthodoxy
<i>Indicators</i>	Rules, Sanctions	Laws, Certification, Accreditation	Common beliefs Shared logics of action Isomorphism
<i>Affect</i>	Fear Innocence	Guilt/ Shame/Honor	Certainty/Confusion
<i>Basis of Legitimacy</i>	Legally sanctioned	Morally governed	Comprehensible Recognizable Culturally supported

Source: Institutions and Organizations (Scott, 2008) pp 51

Table 3.1 *The three pillars of institutions*

Table 3.1 (Scott, 2008), describes some of the principal dimensions by which the arguments by theorists emphasizing the importance of one element over the other are made.

a. *Regulative*

The regulative aspect of institutions has been given emphasis by almost all scholars according to (Scott, 2008), especially regarding explicit regulatory

processes like; (i) rule setting which involves the capacity to establish rules, (ii) monitoring and sanctioning activities, which give the opportunity to inspect conformity with the rules, by installing sanctions such as rewards or punishments, all in order to attempt influencing future behaviour.

As can be deduced from table 3.1, these processes may function via informal or formal mechanisms such as shaming or shunning activities in the case of the former and policing and courts in the case of the latter. The main mechanism of control that can be observed in the regulative system considering DiMaggio & Powell (1983) isomorphic pressures is coercion.

In summary, institutions, through the lenses of the regulative pillar can be viewed as a stable system of rules that can be informal or formal backed by monitoring and sanctioning powers and accompanied by feelings of fear or guilt and/or innocence or incorruptibility.

b. Normative

Normative systems include both values and norms (Scott, 2008). Values can refer to the qualities that can render or cause desirability or preference while norms can be regarded as a standard, model or pattern that can be regarded as typical. In normative systems, not only are goals and/or objectives defined, appropriate methods of pursuing them are also defined. Norms and values can vary depending on what the position is or who the actors are. Thus the appropriate goals or activities assigned to particular actors or positions lead to the creation of roles or normative expectations of how specific actors are required to behave. Like the regulative system, roles can occur informally or be formally constructed.

According to Scott (2008), the normative concept of institutions continues to guide and inform contemporary work by sociologists and political scientists in organizations. Further, norms can also evoke strong feelings even though in a different way when compared to violation of rules and regulations.

c. *Cognitive*

Cognition can be described as the psychological result of perception and learning and reasoning. Scott (2008), DiMaggio & Powell (1983) and other organizational scholars have stressed the centrality of cognitive elements of institutions as being the “shared conceptions that constitute the nature of social reality and the frames through which meaning is made” (Scott, 2008: 57). In the view of several cultural-cognitive theorists, compliance happens because other types of behaviour are inconceivable. DiMaggio & Powell (1983) have also emphasized the extent to which wider belief systems and cultural frames are adopted by individual actors or organizations. Further, Mimetic isomorphic pressure can be considered a major mechanism of control that can be observed in cultural-cognitive systems.

In summary, the three elements – *regulative, normative and cognitive*, all have their distinctive features and ways in which they operate as shown in table 3.1. However, Scott (2008) pointed out that in most empirically observed institutional forms, a combination of the elements are observed at work which can lead to the formation of a stable social system.

Organizations are perceived by institutional theorists to be rooted in their institutional framework and be inhibited by institutional forces (Barley & Tolbert, 1997). Despite the plethora of research that have applied institutional analysis, few studies have focused on using the theory to understand the

adoption and diffusion of IS/ICT or the impact of IS/ICT-enabled change in organizations (Weerakkody et al., 2009). Institutional analysis has the potential to help researchers understand how institutions influence the design, use, and consequences of technologies, either within or across organizations (Orlikowski & Barley, 2001).

This research contributes to the few studies that have applied institutional analysis as a theoretical lens for studying the adoption of IS/ICT by organizations in line with similar studies that have investigated institutional effects (pressures) on the diffusion of IS/ICT innovation.

3.1.2 Application of Institutions Theory in IS/ICT and Gaps

Institutional analysis has been used by various researchers for some time now. In the field of IS/ICT particularly, a review by (Weerakkody et al., 2009) and (Mignerat & Rivard, 2009) revealed the application of institutions theory by different authors covering different contexts. Teo, Wei, & Benbasat (2003) found evidences of the influences of all three institutional pressures, viz. coercive, mimetic and normative in a research that investigated the adoption of electronic data/information interchange (EDI). In a similar study that applied methods proposed by Teo et al. (2003), Son & Benbasat (2004) investigated the impetus for organizational participation in Business-to-Business electronic marketplaces to which they also found evidences of the significant influences of mimetic and normative pressures on the intention to adopt.

Within the context of SMEs, Khalifa & Davison (2006) have applied institutional analysis to investigate the adoption of electronic trading systems by SMEs. Even though they found that coercive pressures from dominant customers were the strongest driver among the institutional pressures followed

by mimetic and then normative pressures, SMEs do not adopt IT uniquely as a response to these pressures from external and internal sources. Rather, they argue that SMEs are strongly motivated by the perceived desirability and feasibility of the technology under consideration. What Khalifa & Davison (2006) fail to capture in their study however, is the distinction between internal normative pressures (captured in employee pressures) and external normative pressures (norms prevalent in the general business environment). Similarly, Salmeron and Bueno (2006) have applied institutions theory to explain the assimilation of IS/ICT in SMEs. The study explored the possibility of organizations in the same industry eventually reaching the same level of IS/ICT assimilation as a result of sharing similar environments and concludes that institutions theory offers an explanatory potential to understanding the adoption and use of IS/ICT in SMEs.

This research attempts to capture the social drivers (e.g. influence of industry, top management support, individual spontaneous decisions) that may inhibit or enable the taking up of (adopting) IS/ICT which may be overlooked when using institutions theory in isolation. To achieve these goals, institutions theory is combined with the capability approach. Before doing so however, a review of the capability approach is presented in section 3.2.

3.2 Capability Approach

The capability approach as conceptualized by Sen (1999), concentrates on what people are effectively able to do and be, i.e. the ability of people to lead the lives they have reason to value. The capability approach is grounded in human development and offers an alternative view to theories of economics that focuses on growth or development measurement through income, utility,

consumption and other metrics like gross national product or industrialization. The capability approach has stimulated debate, critique and expansion. For example, Nussbaum has used the capability approach as the foundation for a partial theory of justice (Robeyns, 2005). Alkire (2005) and Robeyns (2005) have put forward ideas to develop the capability approach more cohesively and effectively link the range of opportunities exposed to an individual into realized achievements (functionings).

According to Heeks (2009), the increasing popularity of the capability approach in ICT4D studies is an indication that it could provide the foundation for future studies in the area. Researchers have also described the capability approach as an idea which is conceptually rich but methodologically vague (Heeks & Molla, 2009; Robeyns, 2005; Zheng, 2009). The proponent of the approach, Sen, however, expects it to be adapted to suit a variety of purposes.

3.2.1 Key Concepts of the Capability Approach

Functionings – Functionings denote the various things a person may value doing or being. This can vary from elementary functionings like nourishment and shelter to complex ones such as self-esteem and community participation (Sen, 1999).

Capabilities – Capabilities, on the other hand, refers to what people are effectively able to do and be. In essence, capabilities may then refer to the alternative combination of functionings available for an individual to select from. Thus, as expanded by Robeyns (2006), functionings can be more easily evaluated considering the difficulty in measuring capabilities.

Agency and Choice – According to Sen (1999), capabilities can also relate to agency, which is the ability to pursue and realize the goals that one values while choice is the mental selection of a preferred option from a variety of such options an individual has been exposed to.

In essence, the capability approach is concerned with possession and access to resources as well as the ability for individuals to exercise their agency freedom. To avoid seeing ICT as intrinsically good, the capability approach views it as a kind of commodity. However, Sen (2005) recognizes the importance of IS/ICT for development and has even extended it to include capabilities such as ICT literacy. According to Zheng (2009), the term “capability” in ICT4D research has the tendency to be referred to as an individual’s ability to use technology.

3.2.2 Applications of the Capability Approach in IS/ICT

Researchers have applied the capability approach in the field of IS/ICT and ICT4D in particular. According to Gigler (2004), a key characteristic of ICTs is their multi-sectoral dimension. Sen’s capability approach can offer a holistic and well-suited evaluation method for the potential effects of ICT intervention. Using the capability approach, Kivunike, Ekenberg, Danielson, & Tusubira (2011) have explored how individuals in rural communities in Uganda perceived the importance of ICT for their quality of life and how this perception influenced their adoption of ICT. The study established that while perception was inclined to social benefit, ICT uptake (adoption) and use toward improved quality of life is still limited.

Zheng & Walsham (2008) have attempted to apply concepts of the capability approach to emphasize the options, choice and opportunities related

to accessing and using ICTs in developing countries. The study demonstrated the relational features of social exclusion and different types of capability deprivation in e-society and highlights “unfavourable inclusion” which can be masked by technological diffusion.

Within the context of enterprises, Good & Qureshi (2009) investigated the ways in which technology may enable microenterprises to survive and stay competitive in the global economy. Using Sen’s capability model as a lens, the study scrutinized how ICTs enable micro-enterprises to achieve what they think is valuable to them. The study further illustrated instances in which the introduction of ICTs increased microenterprise capabilities via increased mobility, ability to organize customer information, and by connecting microenterprises to the community as well as to other microenterprises.

The capability approach however, is not without its shortcomings. Apart from the large body of literature that is scattered in various fields, Kleine (2013) has highlighted the challenge of operationalizing the capability approach in its conceptual richness and the fundamental question of how individual and collective choices relate to each other. Heeks and Molla (2009) have also criticized the approach as frequently being too individualistic in its use, regarding which Evans (2002) also noted that, the approach has paid less attention to groups and social structures such as communities and institutions. Lehtonen (2004) contests this view claiming that the capability approach has both an individualistic and a social point of view. On the one hand, it looks at the capabilities of rationally and responsibly acting individuals, and on the other hand, at the social capabilities of a society and the roles of social actors. Robeyns (2005) further argued that individuals do not exist in isolation but are

in constant interaction with the institutions that operate in their societies. But then, as earlier posited by Lehtonen, Sen considers the capabilities of rationally and responsibly acting individuals whose choices are regarded as autonomous and independent of cultural conditioning.

The views expressed in these arguments are important, as such, the combination of the capability approach with institutions theory in a complementary way in this research, will address the chances of overlooking the social drivers that may inhibit or enable individuals from taking full advantage of IS/ICT resources for furtherance of their lives should either of the approaches be used in isolation.

3.3 A Conceptual Framework for This Study

The theories, frameworks and approaches reviewed and discussed in chapter two are useful and important in IS/ICT adoption studies. None of them would however be suitable on their own as a theoretical lens for achieving the objectives set for this study. TAM, DOI and UTAUT fail to sufficiently account for contextual factors and actual uses of technology as they do not take into account the values embedded in a technology and neglect issues like power, politics and culture which in reality interact with users' perception and practices in relation to technology (Zheng, 2015). Furthermore, the theories are not best suited for explaining the manner in which SME adopt IS/ICT considering the need for research into SMEs to be practical (Tatnall & Burgess, 2002). The socio-technical change process model is also not suited for this research considering the static nature of Levitt's model upon which it was built and the frequent need to discuss other

components such as power, politics and culture. Further, this research does not examine an independent story of implementation over time.

In selecting an appropriate framework for this research, the aspects of the reviewed frameworks in chapter two that shed light on specific parts of the research are noted and absorbed implicitly. Institutions theory is thus combined with the capability approach as an evaluative framework that can assist in determining the potential impact of adopting cloud computing by SMEs and the factors that can enable or inhibit its adoption.

Bass et al. (2013), the proponents of the application of the method in the ICT4D domain, have illustrated the benefit of applying the combined framework. Building upon the works of Evans (2009), they argue that the contrasting strength of both institutions theory and the capability approach can offer practical and analytical insights to understanding the social drivers that may inhibit or enable individuals from taking full advantage of IS/ICT resources for furtherance of their lives. Theirs (Bass et al. (2013)), is not the first IS/ICT study to combine two theories together. Jensen, Kjærgaard, & Svejvig (2009) have combined the institutional theory with sense making theory to show the need to address macro-level structures, as well as individual interpretations and practical use situations, in order to identify how and why information systems are adopted by users. Institutional theory has also been combined with other theories like the relational view of the firm and organizational inertia (Bala & Venkatesh, 2007); organizational ecology (Cannon & Woszczynski, 2002); organizational politics, organizational culture, and organizational learning (Robey & Boudreau, 1999).

Drawing on the capability approach, Musa (2006) also modified a version of the TAM to make it more applicable for researching IS/ICTs in developing countries emphasising the importance of understanding how interaction between socio-economic and human-development needs may inhibit adoption of IS/ICTs in the developing world. As such, the decision to combine the institutions theory and the capability approach in this research is neither out of place nor the first.

3.3.1 Can institutions theory and the capability approach be combined?

Institutional theory is broad with two significant themes, first, the new institutional school that originates in neoclassical economics and second, the early institutions tradition that emerged from sociology and political science. The capability approach was also derived from neoclassical economics. Thus, at paradigmatic level, the new institutional branch of institutional theory and the capability approach share neoclassical economics roots and hence are capable of being measured by a common standard. As stated earlier, the two approaches complement each other. The institutions theory, a top-down approach, uses something identified at a higher level to explain processes and outcomes at a lower level while the capability approach, a bottom-up approach, starts with the consideration of individuals' opportunities to achieve what they want.

As presented in the previous sub-sections, there are substantial bodies of work associated with both the institutions theory and the capability approach; hence, the facets with most relevance to the scope of this study will be focused on. The combined theoretical framework employs the complementary strengths of institutions theory and the capability approach. While the

capability approach offers a “bottom-up” analytical framework; one where the starting point is a consideration of individuals’ opportunities to achieve their wants and needs, institutions theory enables a “top-down” analysis of the rules and norms used to regulate interaction and transactions in society, and from which organizations sometimes emerge. Furthermore, Bass et al. (2013) used the framework to identify how enhanced capabilities may lead to institutional changes. An illustrative example of the use of the combined framework is the investigation of a classroom video conference multi-casting project in Nepal conducted by Bass & Thapa (2014). The research found out that there is a disparity between how teachers and health workers are treated in the multi-casting project which can impact on the sustainability of the project. While capacity building is emphasized for health workers, teachers are being side-lined which can threaten the long term sustainability of the project.

Institutions theory can facilitate emphasis on other contexts (e.g. political structure, culture, etc.) that have influence on adoption decisions and outcomes. In essence, a broader scope of factors that influence SMEs’ adoption of new innovations like cloud computing can be examined better using institutions theory. However, the individual category that varies across time and space is often missing in research using institutions theory. For instance, how are institutional logics understood and influenced at the individual level of analysis? Thus, there is a need for a bottom-up mode of analysis (which this research found in the capability approach) that starts with the consideration of individuals and complements the institutions theory. Indeed, individuals can vary significantly in their decisions to adopt a new innovation. For instance, two individuals might have access to the same

commodity or may be exposed to the same institutional forces but one of them may lack the capability to benefit from access to that commodity due to lack of skills or refuse to be influenced by the institutional forces due to some other reason. Furthermore, an understanding of the reciprocal relationship between IS/ICTs and capabilities can give a good picture of the influences of adoption e.g. benefits. As such, whilst the limits and opportunities presented by the social context may be analyzed using institutions theory, retaining the analytical benefits of the capability approach for understanding conversion factors and capabilities is essential.

This research employs the tactics used by Bass and Thapa (2014) to investigate and evaluate the adoption of cloud hosted applications by SMEs. The early realization of the issues that can excite (enablers) and/or inhibit the sustainability of cloud computing adoption by SMEs is important should the technology turn out to be advantageous to them. The combined theoretical framework is shown in Figure 3.1 as initially proposed and evaluated by Bass et al. (2013).

3.3.2 Description of Framework

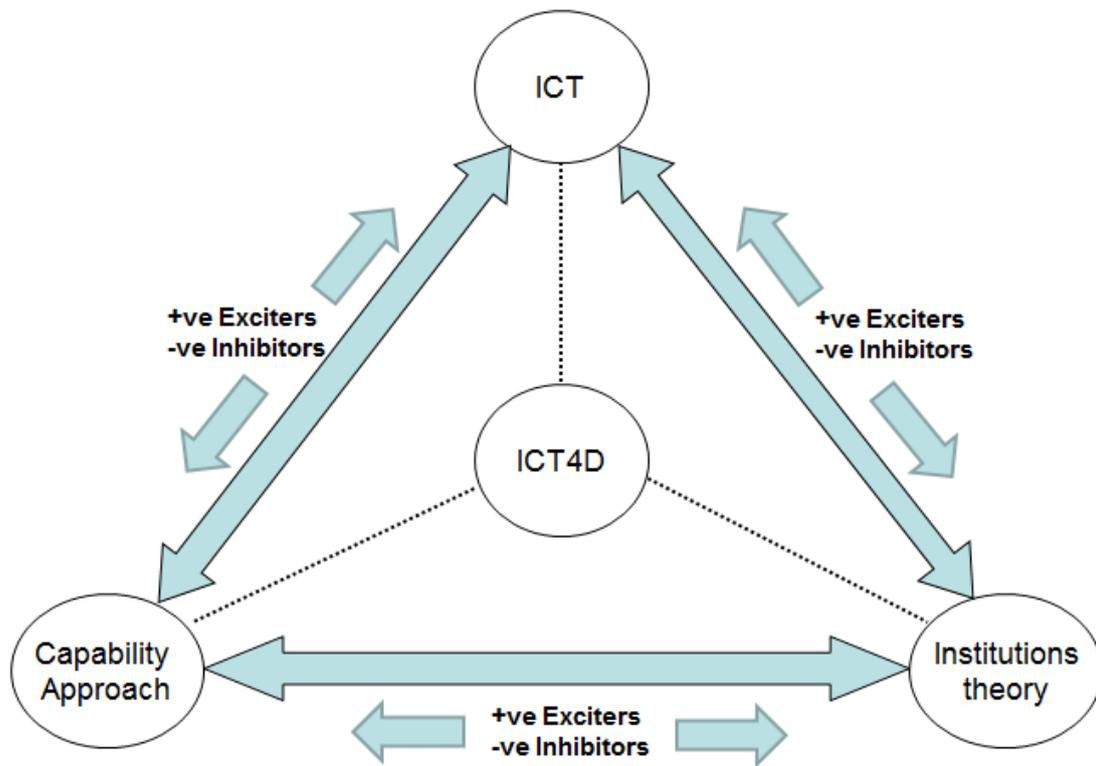


Figure 3.1 *Institutions theory, the capability approach, & ICT showing Exciters and Inhibitors as Influences*

The main components of the framework, capability approach and institutions theory have been described in section 3.1 and 3.2. Information and Communication Technologies (ICT) has also been defined as the broad range of technologies involved in information processing and handling in section 2.5. Information and Communication Technologies for Development (ICT4D) is defined as the ability to make use of technology (ICTs) for development. The bidirectional arrows represent the influences between ICT, the capability approach, and institution theory. These **influences or factors** can either be **positive or negative**. Positive influences are referred to here as **exciters** and negative influences are referred to here as **inhibitors** respectively. The dashed lines indicate the effects each component can have on the goals of ICT4D. The

relationships provide an abstraction to establish causal relations or for explanations and predictions as interpreted by Bass et al (2013).

Figure 3.2 shows an adaptation of the framework for this study. The dashed lines indicate the effect or impact of each component on small and medium-sized enterprises (SMEs). As represented in figure 3.1, exciters and inhibitors represent the degree of influence and describe the relationship between elements of the framework. Simply put, they are the factors that can encourage (excite) or preclude (inhibit) the use of SaaS cloud applications services. These are denoted as '+ve Exciters' and '-ve Inhibitors' on figure 3.2. Dimension 'A' represents all the influences between the two components cloud computing and institutions theory and vice-versa. Dimension 'B' represents all the influences between the two components institutions theory and capability approach and vice-versa. Dimension 'C' represents all the influences between the two components capability approach and cloud computing and vice-versa. For example: a) an exciter on dimension 'A' represents any factor that encourages cloud computing adoption and is normally influenced, has an effect on, or is affected by institutional forces; b) an inhibitor on dimension A is any factor that can preclude the adoption of cloud computing by SMEs and is normally influenced, has an effect on, or is affected by institutional forces. Likewise for exciters and inhibitors on dimension B and dimension C; wherein they represent influences between elements on the dimensions respectively. In chapter six, the adoption of cloud computing is analysed and evaluated using the combined institutions and capabilities framework.

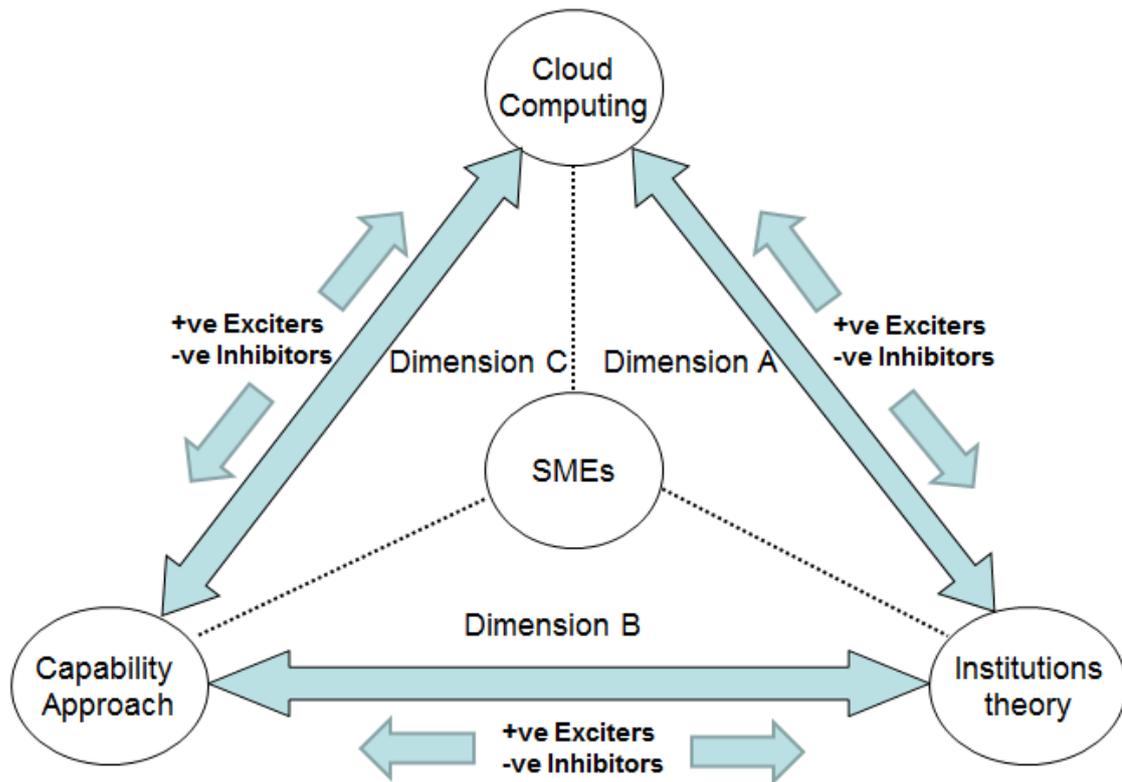


Figure 3.2 *Adaptation of the Framework*

3.4 Summary

In this chapter, the framework selected for this study, a combined institutions and capabilities framework was critically examined in order to highlight the underpinning theories and literature that informs why and how the framework has been chosen for this research. The chapter starts with a review of the theoretical underpinnings of institutions theory and its applications in the IS/ICT domain. This was then followed by a review of the capability approach with its application in the IS/ICT field. The conceptual framework selected for this research and the justification for choosing it was also examined highlighting how it can be used to explain the exciters and inhibitors that can influence technology adoption.

Chapter 4 – Methodological Issues

4.0 Introduction

This chapter captures the methodology considered for this research. The choice of the methods and strategies is aimed at using a valid approach that can fit the purposes of the research undertaken. This research was conducted in two major phases. An exploratory pilot study was conducted in the first phase to enable refinement of the data collection instrument and familiarization with the research phenomenon. The second phase involved a deductive synthesis grounded in the initial research carried out which enabled the adoption and development of the proposed framework described in chapter three.

This chapter is divided into three main sections. First, a review of the research perspective and philosophical assumptions underpinning this study is presented. Secondly, the research approach for the initial phase of the research and the motivation for choosing that approach is described. Details of the research sites, data collection and data analysis conducted for the initial phase are provided. The approach adopted for the second phase of the research, which utilizes the theoretical framework presented in chapter three is then presented. The research sites, and data collection and analysis conducted for the second phase of the study is also described. The final section discusses the methodological limitations of the research and ethical concerns taken into consideration while conducting the research.

4.1 Philosophical Perspective

At an epistemological level, two main philosophical research paradigms, namely positivist and interpretive are initially reviewed. Philosophically,

epistemology is how people know (Tan, 2010) and three perspectives have dominated the IS field viz. positivism, interpretivism and critical research (Orlikowski & Baroudi, 1991). Positivist research is deductive and uses systematic protocols and techniques to test theory in order to increase predictive understanding of phenomena (Myers, 1997; Orlikowski & Baroudi, 1991). Interpretive research on the other hand is inductive and emphasizes on the building of theory and involving the researcher in a naturalistic way (Orlikowski and Baroudi, 1991). According to Lee (1989: pp 47), any distinctions between research approaches are artificial and inconsequential. Hence, methods do not always fit into a single philosophical perspective. In retrospect, the argument that one approach or philosophical perspective can in some way be better than another is debatable, rather the goals of the researcher and the nature of the research topic influence the selection of a strategy (Benbasat, Goldstein, & Mead, 1987).

Methodologies in social research can be broadly categorized as either quantitative or qualitative. According to Patton (2005), qualitative methods permit the selected issues considered for research to be studied in depth and detail. Quantitative methods, on the other hand fit the varying experiences and perspectives of people into a limited number of predetermined response categories to which numbers are assigned. As such, quantitative methods tend to give a broad generalizable set of findings that can be presented concisely and prudently. By contrast, qualitative methods produce a wealth of detailed findings about a smaller number of people and cases. However, this increases understanding of the issue under study but reduces generalizability.

4.1.1 Use of Qualitative Approach with Interpretive Viewpoint in This Research

In this research, a qualitative approach with an interpretive research viewpoint is adopted. This is because the researcher's aim is to understand the research phenomenon in depth based on the meanings or understandings assigned to it by the practitioners and experts in the research field. The phenomenon being investigated, cloud computing adoption is relatively new and under-researched within the context or location where it is being investigated. Little evidence of cloud computing usage also suggests a small number of cases and people to conduct any investigation and collect data therefrom. Further, some peculiar social aspects need to be examined thoroughly. An interpretive research position is then well suited for this kind of research over others considering the projected number of cases expected and its strength producing an understanding of the social context of a phenomenon under investigation and how it is influenced by or influences the social context as described by Walsham (1995).

The choice of the interpretive viewpoint in this research is in line with one of the principal categories of interpretive research defined by Klein & Myers (2001). Klein & Myers have developed and explained five classification schemes of the literature in interpretive research studies. Two of the categories are more related to this research as they are IS specific and seek to apply theoretical concepts and empirical phenomena in the field of information systems (Klein & Myers, 2001). Specifically, this research draws from the fifth category that involves the use of interpretive experiments or practical interventions (e.g. action research) within the domain of information systems. Orlikowski & Baroudi (1991) also consider interpretivism as a valuable

approach to studying IS/ICT in organizations. The other three are of less interest to this research as it is neither seeking to establish the philosophical foundations of interpretive research nor interested in building interpretive social theories. It is also not seeking to clarify the nature of interpretive research methods or formulate methodological standards.

Furthermore, the development of the selected framework in chapter three and analysis of interview data in this chapter and in chapters five and six are based on multiple interpretations, a characteristic feature discussed in relation to interpretivism by Cavaye (1996). The use of the interpretive perspective will give a better insight into both the 'what' and the 'why' and determine in depth, the uncertainties regarding the phenomenon under investigation.

A review of some of the initially considered research methodologies used in the IS/ICT field are as presented in the bullet headings in this section.

a. Case study research:

Case study research involves the in-depth investigation of a contemporary phenomenon, often over time, with one or more groups or organisations. This will require significant time on the part of the researcher. The organisation will also be required to have a positive and open attitude to the investigation. The aim of case study research is to reconstruct and analyse the case from a given perspective, so that the case is understood on a different plane to the purely descriptive level. Galliers (1992) view case study as a method while others like Cavaye (1996) and Benbasat, Goldstein, & Mead (1987) view it as a research approach or strategy.

b. Grounded Theory:

Grounded Theory is a qualitative approach discovered by Glaser and Strauss (1967). The theory proposed a way of developing theory or insights from data. Grounded theory consist of theoretical sampling, coding and constant comparison of data with existing theory. Strauss and Corbin (1990) have felt the need to develop a more formal mechanism to interpret the data. Grounded theory or other data analysis approaches can guide researchers in the interpretation of the data they have. The data sources can be primarily collected through interviews and observation or secondarily collected through construction of other people's perspectives.

4.2 Research Approach

Having excluded the use of case study, a grounded theory approach is initially considered because of its usefulness when studying new areas (Stern, 1994) and its strategy of allowing issues to emerge without forcing any preconceived ideas.

4.2.1 First Phase: Exploratory Pilot Study

For the exploratory pilot study, a grounded theory approach (Glaser & Strauss, 1967), specifically, the "Glaserian" or classical grounded theory approach with an interpretive viewpoint was adopted. This is mainly because of its usefulness when studying relatively new areas (Stern, 1994). The choice of grounded theory allowed issues discovered to emerge without forcing any preconceived ideas on the data.

Grounded theory is a qualitative approach discovered by Glaser and Strauss (1967). The theory proposed a way of developing theory or insights

from data. Grounded theory consists of theoretical sampling, coding and constant comparison of data with existing theory.

Glaser and Strauss (1967) define grounded theory as – "*the discovery of theory from data*" (p. 1). It is a qualitative approach that has been variously described as positivist, interpretive or critical (Urquhart, Lehmann, & Myers, 2010). The importance of these research perspectives has been highlighted in section 4.1.

Matavire and Brown (2008) have identified four main grounded theory approaches in IS research. These approaches include the two distinct strands of grounded theory that have been openly debated by Strauss and Corbin (1990) and Glaser (1992) the proponents of the method. The primary differences of these two strands are on the "coding style, families and paradigm" (Sulayman, Urquhart, Mendes, & Seidel, 2012). The coding procedure for the glaserian grounded theory approach is simpler to use and closer to the original version (Urquhart et al., 2010). Strauss and Corbin (1990) have felt the need to develop a more formal mechanism to interpret the data. Grounded theory like other data analysis approaches can guide researchers in the interpretation of the data they have. The data sources can be primarily collected through interviews and observation or secondary through construction of other people's perspectives.

There has not been much previous work conducted on the phenomenon under research. Grounded theory does not support conducting an extensive literature review before collecting data. So, in accordance with the recommendations of grounded theory by Glaser (2004) that argues;

“undertaking an extensive literature review before the emergence of the core category can violate the basic premise of grounded theory”; a minor literature review just enough to allow for the development of an interview guide for data collection and for interaction with participants in the study on the subject of cloud computing was conducted.

To carry out the minor literature review, an initial literature survey to find out what is being published by high ranking journals in the IS field on cloud computing adoption by SMEs in sub-Saharan Africa was conducted. This review was in 2011. No more than two publications in any of the journals consulted¹ were returned in the searches carried out, which suggested that serious publishing in this subject area of cloud computing had not yet started. The searches were restricted to English language documents, within the time frame 2005 to 2011. The various searches carried out also resulted in some other related publications most of which were found to be either practitioner oriented and appeared only in academic magazines or basically required stronger justification as discussed in the literature review chapter (chapter 2). An updated literature survey was carried out in mid-2013 and in 2014 in the same high ranking journals and in ICT4D journals² as ranked by Heeks (2010b) and no new publications emerged to significantly distinguish the results from the initial findings. This research begins to fill the literature gap by investigating the cloud computing adoption issues in actual enterprises (SMEs) in sub-Saharan Africa.

¹ IS Journals consulted included MISQ, ISJ, JMIS, JSIS, ISM (see appendix - 1 for details)

² ICT4D journals consulted included ICTD, ITID, EJISDC, ITD, AJIC (see appendix - 1 for details)

Research Sites (pilot phase)

The research sites chosen for this study is made up of small and medium-sized enterprises (SMEs) in Nigeria. The importance of SMEs as a medium for studying diffusion and impact of innovation has been highlighted in chapter one and two. The potential implications of cloud computing adoption to SMEs have equally been highlighted. The Central Bank of Nigeria (2010), defines SMEs as any enterprise which employs fewer than 199 persons with a maximum turnover of N500 million (approximately USD2.51 million) and assets of N50 million (approximately USD251, 000) excluding land and working capital. The International Telecommunication Union (ITU) 2011 ICT statistics report showed that Nigeria is the second country after South Africa, in sub-Saharan Africa, with the highest number of fixed internet broad band subscriptions and first in the number of total mobile broadband subscription (International Telecommunication Union, 2012b). Nigeria also has a positive broad band strategy that has resulted in the increase of tele-density from 8.5 per cent in 2004 to 64.7 per cent in April 2011, thus representing over 90 million active telephone lines (ITU News, 2011). This showcases Nigeria as having a larger market opportunity for cloud service providers and identifies Nigeria as a potential hub for providing cloud computing services to surrounding countries should the technology live up to its prospects.

SMEs in Nigeria were also chosen because of the availability and accessibility of a favourable government national policy on SMEs that contains a blueprint of SME development through the use of information and communication technology as a strategy for success. The policy seeks to make SME a driver for national economic growth (SMEDAN & UNDP, 2007). This policy is similar to what is obtainable in the South Africa and Botswana SME

policy. There is also information and communication technology for a development strategic action plan for implementing an existing national information technology policy that seeks to make information technology a driver for sustainable development (NITDA & UNECA, 2008). Again, this is similar to the government of Rwanda's focus on making information and communication technology a driver of economic growth. Also, according to SMEDAN and UNDP (2007), much of the growth of SMEs in the electronic and information technology sub-sector in Nigeria is based on outsourcing from developed economies.

To inform the sampling and selection of the research sites, pieces of information gathered from initial research sites are used. This is also referred to as theoretical sampling in grounded theory (Glaser, 1978). Participants are also requested to provide information regarding similar enterprises like theirs that they are aware of in order to further guide the researcher to more SMEs using cloud hosted services as part of their IT strategy. This and the theoretical sampling method led to the selection of enterprises across different industries in Nigeria including IT, manufacturing, finance, networking and telecoms.

Seven of the enterprises interviewed use enterprise resource planning (ERP), SharePoint or accounting packages hosted in the cloud. All of the enterprises use cloud hosted email services while three use other applications and data storage services hosted in the cloud. A summary of the profiles of the SMEs are presented in table 4.1.

	Domain	No of Employees	Assets in Thousands of Dollars (\$) Excluding land & building	Age	Cloud Hosted Service
SME-A	IT	7 – 10	< 30	2	Email, Storage
SME-B	Manufacturing	40 – 50	30 to 300	7	Email, PeachTree
SME-C	IT/Training	40 – 50	< 30	9	Email, Storage
SME-D	Finance	140 – 150	300 to < 3000	8	Email, CRM, CPAS
SME-E	Finance	80 – 90	300 to < 3000	7	Email, CRM, CPAS
SME-F	Finance	40 – 50	300 to < 3000	8	ERP
SME-G	Networking	35 – 40	300 to < 3000	13	Email, Service-desk, SharePoint Storage
SME-H	Telecoms	50 – 60	300 to < 3000	10	CRM, Email, ERP
SME-I	Networking	120 – 130	300 to < 3000	10	CRM, Email, ERP
SME-J	Networking	60 – 75	300 to < 3000	16	Email, Storage

Table 4.1 Profile of SMEs – Pilot Phase

Data Collection (Pilot Phase)

Data was collected from the research sites through open-ended face-to-face semi-structured interviews. An interview guide³ that introduces the topic of discussion and a consent form⁴ was provided before the beginning of each interview. The structure of the open-ended interview and the development of

³ See appendix 2 for copy of interview guide containing sample interview questions

⁴ See appendix 3 for copy of consent form

the interview-guide follow Patton's (2005) qualitative interview strategies. Each participant was authorised by his superiors to speak on behalf of the enterprise. While all the participants were asked the same basic questions, which were prepared in advance, the exact wording and sequence of questions were determined during the course of the interviews. Participants were also assured that any data used for publication would be made anonymous.

The initial data collection conducted in May 2012 involved ten SMEs and twelve interview participants. Different categories of practitioners comprising two Chief Executive Officers (CEOs), four Chief Technology Officers (CTOs) and six Information Systems' (IS)-staff were interviewed. This is summarized in the shaded area on table 4.2. The interviews were conducted in their office premises in the English language. English is not their first language but all participants were fluent. The interviews lasted between 30-40 minutes. The interviews were conducted to find the participants' views and experiences in using cloud computing as part of their strategic IT practices. Two of the participants were interviewed twice and one contacted over the phone to verify or clarify information. Two participants were not comfortable giving out information about costs and decision making issues without first checking with their superiors. All the interview sessions were audio-recorded except for one CTO who declined the request to be recorded. For that one participant, notes were taken and written up immediately after the interview session. The interviews were then carefully transcribed. See appendix 4 for sample interview transcripts. To ensure accuracy, the audio records were listened to again and the transcripts inspected for errors.

PHASE 1 (Pilot Phase)			
Role	No	[Interviewees]	Industry/Sector
Chief Executive Officer	2	1,10	IT, Education
Senior Manager	1	3	IT
CTO/CIO/IT-Admin	4	2,5,8,9	Education, Finance, IT, manufacturing
IT- practitioner	5	4,6,7,11,12	IT
Total number of interviews	12		
PHASE 2			
Role	No	[Interviewees]	Industry/Sector
<i>Chief Executive Officer</i>	<i>1</i>	<i>16</i>	<i>IT</i>
<i>Senior Manager</i>	<i>4</i>	<i>17-19, 21</i>	<i>IT, Telecoms</i>
<i>CTO/CIO/IT Admin</i>	<i>7</i>	<i>13-15,22,24-26</i>	<i>IT, Finance, Telecoms, E-commerce, hospitality</i>
<i>IT- practitioner</i>	<i>1</i>	<i>23</i>	<i>IT</i>
<i>Sales</i>	<i>1</i>	<i>20</i>	<i>IT</i>
Total number of interviews	14		

Table 4.2 Summary of participants

Data Analysis (Pilot Phase)

The data analysis conducted was inspired by the 'Glaserian' grounded theory approach which involved using key point coding to derive concepts and categories by the method of constant comparison (Glaser & Strauss, 1967). Dey (1999), in giving the definition of grounded theory asserts that data analysis is systematic and begins as soon as data is available and involves identifying categories and connecting them (cited in Urquhart, 2001). Using the key-point style of coding as described by Allan (2003), significant points

emanating from the investigation were identified from the transcripts of the interviews. The transcripts were written in tabular form thus distinguishing the comments made by either the interviewer or interviewee. Identifiers (P1, P2...) are used for each significant point identified within the text of a specific interview transcript, where 'P' indicates a key-point. Key-points that are repeated in the same interview are assigned a suffix, for example 'P1a'. Also, to distinguish between the various research sites, a generated subscript is used; 'P_{ERC}1' for example. After identifying a key-point, it is then italicised before being extracted to a table and grouped together with other key-points where they are assigned codes. This is to enable easy tracking of the key-points right back into the transcripts. Subsequent transcripts from other research sites are treated in a similar way. Table 4.3 gives a preview of some of the key-points and codes generated from selected interview transcripts.

ID	Key-points	Codes
P _{ERC} 9	<i>"I can't say it is 100% secure... but it's for easy accessibility, it give me what I need"</i>	Security concerns Usage despite security concerns
P _{ERC} 14	<i>"New innovation comes from technical and training and then from marketing"</i>	Organized research and development
P _{MA} 2a	<i>"We needed to back them up on the cloud because of power issues"</i>	Data Access/Loss alternative Power (electricity) issues

Table 4.3 Key-Points to Codes

The table shows the key point identifiers on the left-hand column. As stated earlier identifiers in the form 'P_{MA}2a' for example indicate repetition of the key-point 'P_{MA}2'. The text of the key-point collected from the transcripts is shown in the middle column. The assigned codes are shown in the right-hand column of the table. The process described above is also known as open-coding in grounded theory. Similar codes are then grouped together by

method of constant comparison (Glaser & Strauss, 1967). This is achieved by comparing the codes that arose from one interview against codes from the same interview and those from other interviews. This resulted in a higher level of regrouped codes called concepts as shown in table 4.4.

Concepts	Frequency of occurrence/comparison with other codes
Efficient Service delivery	13
Availability of good Internet connection	6
Cost issues	11
Security issues	13
Concerns about privacy and trust	5
Data loss concerns	6
Management support issues	28

Table 4.4 *Codes to Concepts*

By applying the constant comparison method to the concepts, some core categories emerged from the groups. Some of the concepts were of course retained as core categories that emerged. The data from the transcript was revisited several times and key-points compared with the categories that emerged until no more key points could be picked out from the data. This was in order to be certain that theoretical saturation is reached and coding and conceptualization can end.

While it is one of the key features of grounded theory, this research does not aim at generating a grounded theory, but at developing an initial model of cloud services adoption in sub-Saharan Africa. Several studies in information systems that employed grounded theory have increasingly used it as a coding method only (Urquhart et al., 2010). Findings and limitations associated with

the research approach adopted in the pilot phase are presented and discussed in chapter 5. They form part of the main contributions to this research.

4.2.2 Second Phase: Deductive Synthesis

As stated in the beginning of this chapter, the second phase of the research involved a deductive synthesis grounded in the initial research carried out which enabled the adoption and development of the proposed framework. Thus, using the selected theoretical underpinnings, mainly Institutions Theory and the Capabilities Approach as described in detail in chapter 3, another data collection instrument was developed to obtain additional data. The second phase allowed for expansion of the research and provided an evaluation mechanism. It involved data analysis and mapping of data onto the framework. Conducting this phase enabled the categorization of the findings based on the theoretical underpinnings of the framework and provided a mechanism that establishes and/or shows the interaction between individual findings and how they influence each other to excite or inhibit adoption of cloud computing by SMEs. Findings from the intensive phase are presented and discussed in chapter 6. They constitute the main contributions to this research.

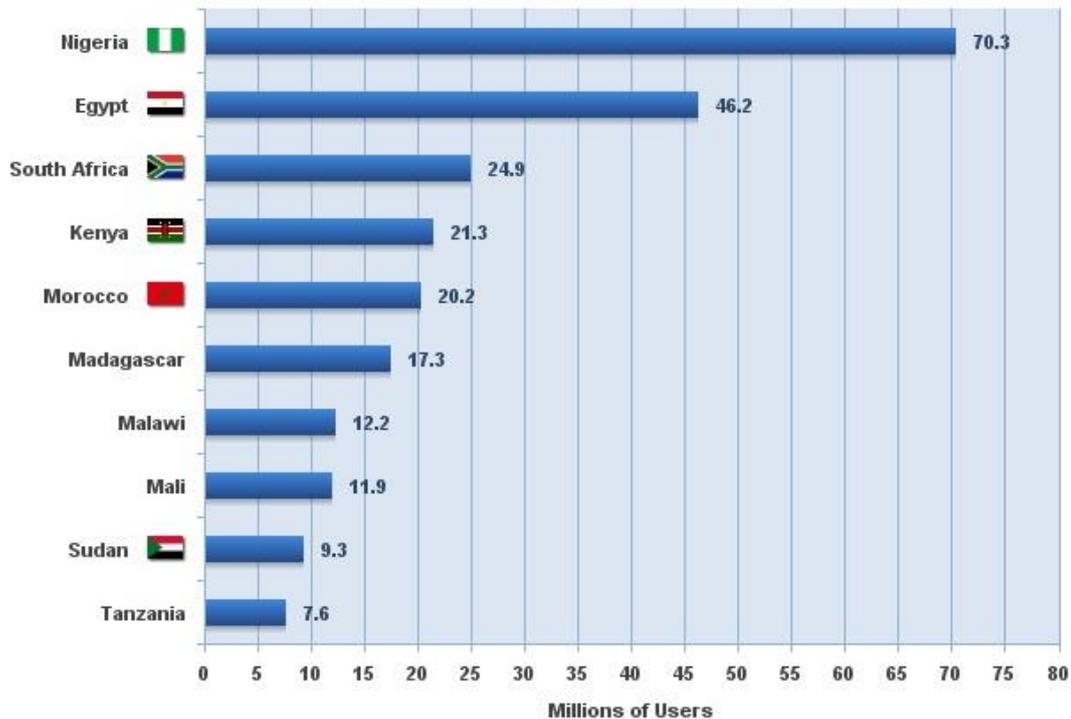
Research Sites (Second Phase)

The research sites chosen for this phase of the study were made up of SMEs in Nigeria a sub-Saharan Africa country. The Central Bank of Nigeria (2010) defines SMEs as any enterprise which employs fewer than 199 persons with a maximum turnover of N500 million (approximately USD3.2 million) and assets of N50 million (approximately USD320, 000) excluding land and working capital. In the OECD and EU definition however, this number varies, with the most frequent upper limit for employees as 250 and a turnover of EUR50 million (approximately USD 66,000,000) (European Commission, 2003;

OECD, 2005). It is thus safe to say that the definitions of SMEs vary significantly according to the place and the economy concerned. SMEs are important for economic growth especially in developing countries (Beck, Demirguc-Kunt, & Levine, 2005; Huang & Palvia, 2001; Smallbone & Welter, 2001).

In the section on '*Research Sites (Pilot Phase)*', several reasons for the choice of Nigeria as the primary research site have been identified. They include the number of fixed internet and mobile broadband subscriptions, a positive broadband strategy, a government ICT4D policy that is similar to other sub-Saharan African countries, etc. A recent report by the Nigerian Communications Commission (NCC) updates Nigeria's tele-density which this research earlier put at 85% in 2011 (during initial data collection) to 100% (Juwah, 2015). Nigeria is also the largest economy in sub-Saharan Africa (National Bureau of Statistics, 2014).

Since Nigeria can be viewed as being cloud ready and a potential early adopter (Lavery, 2011), this research envisions that a look at Nigeria will give an insight into the future adoption trajectory of other developing sub-Saharan African countries like Kenya, Tanzania, Sudan, and Malawi that have also been reported amongst the largest internet using population in Africa (Internet World Stats, 2015). See figure 4.1 for table of internet usage by populations in Africa. An investigation by Lavery (2011) into the cloud readiness of these countries also showed Nigeria as one of the countries that satisfies the indicators for the growth of at least one form of cloud technology in the future.



Source: Internet World Stats - www.internetworldstats.com/stats1.htm
 297,885,898 Internet Users in Africa estimated for June 30, 2014

Figure 4.1 *Top Ten Internet Users in Africa*

Apart from Nigeria where primary data was collected, other secondary data sources like reports and documents relevant to the research, and cloud service providers websites were also consulted to investigate the current status of cloud usage in some other sub-Saharan African countries.

To also inform the selection/sampling of the research sites, the method used in the pilot phase was adopted where pieces of information gathered from initial research sites are used. This sampling method resulted in a snowballing process that led to the selection of companies across different sectors in Nigeria including finance, IT/ICT, education, networking and telecoms, hospitality and manufacturing. Table 4.5 shows the summary of participant enterprises in Nigeria.

S/N	SMEs	No of Employees	Cloud Service	Established	Domain
1*	SME D	100 – 150	Email, CRM	8 years	Finance
2*	SME E	100 – 200	Email, CRM	7 years	Finance
3*	SME G	35 – 40	Email, Service-desk, SharePoint, Storage	13 years	Networking
4	SME K	200 – 250	Domain hosted in cloud, ERP, Mobile cloud,	3 years	E-Commerce
5	SME L	100	Emails, Google Apps, Moodle	3 years	Education
6	SME M	100 – 200	Domain hosted in cloud, CRM, Billing	6 years	Travel & Hospitality
7	SME N	1 – 20	ERP work flow tool, messaging & collaboration tools, Email	3 years	IT/cloud solutions Broker
8	SME O	1 – 10	Offer Core- Banking Applications as cloud service	2 years	IT/Cloud solutions Broker
9	SME P	More than 150	Exchange Services, SharePoint, Storage; offer IaaS	10 years	Telecoms
10	SME Q	More than 200	Offer SaaS and IaaS	10 years	Telecoms
11	SME R	80 – 100	Uses Q's banking operation cloud SaaS	4 years	Finance

Table 4.5 Summary OF SME Profiles – Second Phase

***Repeat** (also participated in Pilot Phase)

Data Collection (Second Phase)

As in the pilot phase, data was collected from the research sites through open-ended face-to-face semi-structured interviews. An interview guide⁵ that introduces the topic of discussion and a consent form was provided before the beginning of each interview. The structure of the open-ended interview and the development of the new interview-guide that is based on the institutions and capabilities framework also follow Patton's (2005) qualitative interview strategies. Each participant was authorised to speak on behalf of the enterprise. While all the participants were asked the same basic questions which were prepared in advance, the exact wordings and sequence of questions were determined during the course of the interviews. Participants were also assured that any data used for publication would be made anonymous.

Fourteen interviews were conducted involving eight new enterprises, three of which double as foreign cloud services brokers, two providers, and three enterprises that participated in the initial phase of this research. The second data collection was conducted in November – December 2013. The participants in this phase included one chief executive officer (CEO), four senior managers (SM); seven chief technology officers (CTOs) also called IT administrators, one IS/IT support staff and one sales officer. This is summarized in the shaded area on table 4.3. Each participant is also assigned a number in order to be identified.

The interviews in the intensive phase were also conducted in the office premises of the interviewees in the English language. Though English is not

⁵ See appendix 2 for the interview guide containing sample questions used for the semi-structured interview

their first language, all participants were fluent. The interviews lasted between 30-40 minutes. All the interview sessions were audio recorded except for one CTO who declined the request to be recorded. As in the pilot phase, notes were taken during the interview with that CTO and written up immediately after the interview session. The interviews were then carefully transcribed. See appendix 4 for sample interview transcripts. To ensure accuracy, the audio records were listened to again and the transcripts inspected for errors.

PHASE 1 (Pilot Phase)			
Role	No	[Interviewees]	Industry/Sector
<i>Chief Executive Officer</i>	2	1,10	<i>IT, Education</i>
<i>Senior Manager</i>	1	3	<i>IT</i>
<i>CTO/CIO/IT-Admin</i>	4	2,5,8,9	<i>Education, Finance, IT, manufacturing</i>
<i>IT- practitioner</i>	5	4,6,7,11,12	<i>IT</i>
Total number of interviews	12		
PHASE 2			
Role	No	[Interviewees]	Industry/Sector
Chief Executive Officer	1	16	IT
Senior Manager	4	17-19, 21	IT, Telecoms
CTO/CIO/IT Admin	7	13-15,22,24-26	IT, Finance, Telecoms, E-commerce, hospitality
IT- practitioner	1	23	IT
Sales	1	20	IT
Total Number of interviews	14		

Table 4.6 Summary of Participants – Second Phase

Data Analysis (Second Phase)

The data analysis conducted here also was inspired by the 'Glaserian' grounded theory approach which involved using key point coding to derive concepts and categories by the method of constant comparison (Glaser & Strauss, 1967). Analysis and discussion of findings from the second phase of this research are provided in chapter 6.

4.3 Methodological Development and Rationale

At the beginning of this research, cloud computing was a relatively new phenomenon especially for SMEs in sub-Saharan Africa. This led to the decision to use grounded theory because of its strength in investigating new areas. While the use of grounded theory might have allowed issues to emerge without forcing any preconceived ideas on the data, there are other critical issues associated with grounded theory that need consideration.

Firstly, using grounded theory seem to initially fit the phenomenon being investigated but the researcher may end up needing more data in order to ascertain and substantiate findings. This can blur the line asserting the inductiveness of the method by its proponents [Glaser and Strauss] who in summarizing some of the advantages of grounded theory claim that "*grounded theory could be more relevant and productive since it would at least fit the immediate problems being investigated, as well as opening up more fruitful lines of enquiry*" as described by Pratt (2012).

Secondly, as more than one category may emerge from the data, indicating that there can be even more distinct elements/concepts that may not have been discovered from the initial data that was collected, abstracting and/or conceptualizing a theory or understanding and making the necessary

interconnections between concepts may prove to be difficult. Indeed, Urquhart et al. (2010) asserted that *"the very strength of grounded theory – its unique tie to the data – may also be in fact the Achilles heel of the method"*.

Thus, this led to the development of a new methodological approach (second phase as described in section 4.2.2) in order to collect richer data and to refine the initial findings. This is not uncommon in the IS field. For instance, Walsham & Sahay (2006) have carried out a similar exercise using grounded theory initially to study ICTs in developing countries from existing literature and then subsequently complemented their study using another existing formal theory to come up with a conceptual framework. Thus in this research, the strength of grounded theory in exploring a new phenomenon was employed in the initial phase and a conceptualized framework was adopted in the second phase to expand and substantiate initial findings.

4.4 Limitations of the Methodology

Perhaps the most important limitation is that interviews are a limited source of data, and the perspectives and perceptions of participants can be subject to distortions, for example due to bias (Patton, 2005). In the light of the fact that individual views were collected only in Nigeria, it could be overstressing things to infer that the findings from this study can be generalised to reflect the adoption of cloud in the whole of sub-Saharan Africa. A rational choice of Nigeria as a research site was made to increase the possibilities of potential participants. As stated previously, Nigeria has the highest number of SMEs in sub-Saharan Africa, the highest number of internet subscribers, a potential early adopter and the largest economy in Africa. As such the choice of Nigeria is not entirely out of place.

4.5 Ethical Concerns

The investigation and study of the use, impact and consequences of cloud computing adoption by SMEs in sub-Saharan Africa was conducted with the help of an efficient, ethically sound model that maximises selected development impact factors. The researcher's experiences and familiarity with the country in which the investigation and potential application of the technology is examined also help to ensure the observation of basic ethical issues that have to do with investigating information systems intervention and culture. All data sources were well acknowledged especially during the compilation of this report or any report and/or publication associated with this research.

Since it is part of the researcher's responsibility to ensure proper conduct of the research, the integrity and confidentiality of all data were ensured. Confidential data were stored and secured with a password. Participants' confidentiality and voluntary involvement was also ensured by identifying explicitly the specific circumstances in which research data is collected. Unless the participant gave the permission, all the personal data gathered were used solely for the purposes for which they were collected. Hence, compliance with all ethical requirements especially when gathering and analysing empirical materials was observed.

4.6 Summary

This chapter summarizes the methodological issues involved in this research. The rationale for adopting a qualitative approach with an interpretive viewpoint was examined. The research approach, which involved the use of semi-structured open-ended interviews with twenty-six practitioners from Nigeria over a period of two years, was also described. Justifications for

selecting Nigeria as research sites were equally provided together with the modality adopted for the analysis of data. Finally, the limitations associated with the adopted methodology and how they were kept to a minimum, and the ethical concerns taken into consideration while conducting this research were appropriately discussed.

Chapter 5 – Emergent Cloud Computing Adoption issues in Sub-Saharan Africa

5.0 Introduction

In chapters three and four, the framework selected for this research and the research methodology adopted were presented. Chapter four particularly, specified the two phase approach that was used in this research; where a grounded theory approach was used in the initial phase and the institutions and capabilities framework described in chapter three, was used in the second phase. In this chapter, the outcomes of the grounded theory approach which resulted in five broad categories will be presented. These categories are the emergent cloud computing adoption issues faced by small and medium-sized enterprises (SMEs) in Nigeria. They form the initial findings of this research. This chapter is based on a conference paper and journal publication by this researcher (Dahiru et al., 2013; Dahiru et al., 2014a) and they form part of the basis for the contributions of this research.

5.1 Evidence of Cloud Adoption Issues for Sub-Saharan Africa SMEs using A Grounded Theory Approach

After careful analysis of data using the grounded theory style that involved key point coding of raw data to derive concepts and then categories as described in chapter four, this section examines the resultant categories, i.e. the cloud computing adoption issues that emerged together with pertinent literature on cloud computing adoption in the global north.

5.1.1 Security, Privacy and Trust Issues

The first category to emerge from the data analysis is the issue of security, privacy and trust. Indeed, one of the main issues surrounding cloud computing adoption is security (Carlin & Curran, 2011; Ohlman, Eriksson, &

Rembarz, 2009). The fact that cloud computing takes place over/across a network where users are able to gain access to computing resources via the internet from anywhere makes it 'appear' more vulnerable to all forms of cyber-attack. Several surveys and reports on cloud computing adoption in the global north have cited security as one of the key challenges that is keeping end-users away from adopting any form of the cloud (Gens, Mahowald, Villars, Bradshaw, & Morris, 2014; Shaikh & Haider, 2011).

For SMEs that participated in this phase of the research, a different notion towards the challenges that security poses to cloud computing adoption is identified. Most of the companies' CTOs and practitioners do not see security as a major threat or an obstacle in adopting the cloud. **[Interviewee 3]** for instance said that "*cloud computing is secured!*" and **[Interviewee 10]** said that cloud computing is secured because no threat has been experienced so far with regards to their usage of the cloud. Furthermore, even those that did actually express their fears about security are still using it (cloud computing) as part of their IT-Strategy, like this interviewee who said concerning cloud security: "*I can't say it is 100% secure... but it's for easy accessibility, it give[s] me what I need*" **[Interviewee 1]**.

Privacy and trust is another important component of this category. It is significant to differentiate between security and privacy because while security is about the vulnerability of your data in the cloud and the fear of attacks by third parties, privacy concerns more a breach of trust by the cloud service provider of your official or personal information. According to 9 out of the 12 interviewees in this phase of the research, they do not harbour fears regarding the privacy and safety of their data with their cloud services providers.

Evidences from the data shows that cloud solution providers have found a way to assure their clients of the importance of privacy, which has consequently earned them the trust of these clients. **[Interviewee 2]**, who is a CTO described their providers as being credible.

In another interviewee's opinion, *"if there is a guarantee from the providers, there is no fear at all"* **[Interviewee 10]**. One of the three participants concerned about privacy and trust in the cloud view it as an issue that will only arise when *"getting people to actually put stuff into it [cloud]"* **[Interviewee 4]**, but says the advantage on the other hand is *"having software [applications] that you can be able to use from a remote point that you can share with others easily"* **[Interviewee 4]**.

5.1.2 Data Loss concerns

The second category to emerge is about data loss. Unanticipated loss of information or data has been a source of concern even before the advent of cloud computing. All the 12 participants in this phase of the research did not express deep concerns regarding data loss in the cloud, and do not see the possibility of losing data as an obstacle that could prevent them from adopting cloud computing. For instance, **[Interviewee 4]** said that: *"there is no fear of data loss in the cloud... Enterprises are more at risk of losing their data if it is situated in-house due to electric power outage"*. It is noteworthy to state that most SMEs in Nigeria experience one form of electric power outage or the other and have turned to cloud technology as alternative in preventing data loss, like one interviewee stated: *"we needed to back them up [data] in the cloud because of [electric] power issues"* **[Interviewee 3]**. Also another interviewee said that: *"there are other advantages of having your data in the*

cloud like in times of disasters like fire outbreak, all our documents will still be intact somewhere else” [Interviewees 7].

5.1.3 Awareness and Top Management Support Issues

Another issue that emerged from the data as regards cloud adoption by SMEs in Sub-Saharan Africa is the awareness and support of the companies' top management. The general view of all the participants is that the top management need to know what cloud computing is, and what benefits their companies stand to gain by adopting this technology. One of the CTOs interviewed said that *"...it is difficult to get the 'buy-in' [consent] from the top [management]" [Interviewee 5].* Thus they were unable to move to the cloud fully despite the benefits it presented to their business. Another CTO also in charge of implementing IS said that: *"...the management have to be convinced that moving to the cloud is strategically good for their business" [Interviewee 12].* The Management team also plays a vital role in the cloud implementation process: *"...the management are really interested in ideas that seek to automate core business process which in turn can support successful adoption" [Interviewee 6].* It can be seen from some of the quotes that decision making is largely dependent on the CEOs. Thus, while CTOs and other departmental heads can deliberate on IS strategies at departmental level, the top management have the final say. Hence a top-down approach in the decision making process is identified.

5.1.4 Availability of Good Internet Connection

As stated in chapter two, the availability of a good internet connection is one of the key emerging issues that need to be addressed for the effective use of cloud computing especially in Sub-Saharan Africa where the infrastructure required to do so is still being developed. When asked what challenges they

are facing in the use of their cloud hosted applications, six of the participants first mentioned the lack of a good internet connection as a particular problem. *"The only challenge is the bandwidth, what the ISP is giving you at that time"* according to **[Interviewee 6]**. **[Interviewee 10]** also said that: *"if for example so many users are logged on to the system it gets slower"*. This causes the enterprises to move from one internet service provider to another in search of a better internet service that will meet the requirements of their systems, and ultimately the services they deliver as can be seen from the statement of this interviewee: *"the ISP [internet service provider] we use is called NS [not real name] and then we had problems with them, then we discovered that we could get a cheaper and more reliable source of the internet [service] [Interviewee 1]. [Interviewee 2]* also said that: *"most of the challenges we face at times is in terms of bandwidth... ...in fact we even changed the ISP"*.

5.1.5 Cost Issues

The pay-per-usage model and the scalability characteristics of cloud computing offers tangible benefits to enterprises that have adopted cloud computing in Sub-Saharan Africa. For these enterprises, the elimination of the upfront cost required for setting up IT infrastructural resources and reduced maintenance cost are key issues considered when using the cloud. **[Interviewee 4]** stated that: *"It [cloud computing] helps to reduce your maintenance cost"*. Using the cloud has also brought about a reduction in the license fees these SMEs purchase all the time from software vendors. **[Interviewee 3]** stated that: *"since we are a solutions company we need to buy the enterprise license for our software[s] all the time"*. **[Interviewee 6]** also stated that: *"it is better especially when you don't have to buy software*

and all the issue that come along with it, for small users it is very economical".

At the same time, the cost of maintaining computing resources that relies heavily on electricity which is unreliable in many places in Africa is partially mitigated. According to **[Interviewee 3]** *"it is cheaper to use the cloud especially here where there is a lot of power failure"*

5.2 Discussion

The categories that emerged from the data as presented in the subsections of section 5.1 of this chapter showed that there are five main issues that SMEs face when adopting cloud computing. These issues include security, privacy and trust, data loss concerns, top management support, availability of good internet connection and cost. Of the five only the fourth issue, i.e. availability of good internet connection is seen as an inhibitor of cloud computing adoption by SMEs in sub-Saharan Africa. This is discussed further in the next section 5.2.1.

5.2.1 Emergent Cloud Computing Adoption issues in Sub-Saharan Africa

Two of the five categories that finally emerged; security, privacy and trust, and data loss concerns as shown in section 5.1, present a different perspective from what has been observed or documented in the literature and surveys as obstacles to cloud computing adoption especially in the global north. However, some of the other issues that arose from studying the data were as expected and can be found in similar studies on new ICTs in SMEs for example (Huang & Palvia, 2001) in investigating issues concerning ERP implementation in advanced and developed countries. Thus, stating them as issues relating to cloud computing adoption and implementation is apparent. These issues are

about cost, the availability of a good internet connection, and infrastructural issues e.g. electric power outage.

Several studies and surveys have shown security as one of the major challenges that is keeping end-users away from the cloud, for example (Shaikh & Haider, 2011) and (Gens et al., 2014). This is contrary to the findings from the SMEs investigated in Nigeria as can be inferred from section 5.1.1. It can be deduced that fear of security breaches in the cloud model does not pose a major threat to these SMEs as far as adoption is concerned, likewise the issue of privacy and trust. Pearson & Benameur (2010) have also raised several issues associated with privacy and trust including lack of user control and unauthorized secondary usage. In the case of the SMEs that participated in this research it is observed that fear of data mismanagement by individuals handling the data in in-house IT outweighs that of the cloud and of the service providers. It has also been shown in section 5.1 that corporate data has been put on the cloud without recourse to its sensitivity. Like the security issue, the organizations were found to be more concerned with rapidly leveraging the cloud technology to potentially support the delivery of efficient services and reduce the cost of operation and maintenance.

Three main reasons can be attributed to this developing trend amongst these SMEs. Firstly, and most importantly is that the security provided in the cloud is in reality better than their locally hosted security environment. This means that the cloud model is providing a more secured environment for their business processes. Armbrust et al. (2010) have argued that "encrypting data before placing it in a cloud may be even more secured than unencrypted data in a local data centre". Secondly, these SMEs were more concerned about the

efficient service delivery using the cloud will support and/or the amount of computing resources they are able to leverage as compared to their traditional in-house IT infrastructure. Thirdly, which could be general to all the other issues raised in this section is that, cloud computing is still in its infancy stage and the adoption hype is still on. Consequently, some of the realities associated with the use of cloud hosted applications and services are not yet clear to these SMEs let alone influencing their adoption decisions.

The difficulty of extracting data from the cloud is raising concerns and preventing organizations from adopting the cloud (Armbrust et al., 2010). Also, in a survey in 2009, 43 out of 62 SME responses saw “loss of control of services and/or data” as being an important concern in determining their approach to cloud computing adoption (European Network and Information Security Agency, 2009). In section 5.1.2, findings from this research however, show that data loss concerns do not necessarily preclude the use of the cloud model by SMEs in sub-Saharan Africa. For these SMEs, the fear of loss of data that is locally hosted far outweighs the fear of loss of data in the cloud especially with the incessant electric power outages they experience. The cloud to them provides a solution to some of the infrastructural and cost issues associated with maintaining their IS.

Like many studies on new ICTs in SMEs (Newman & Zhao, 2008; Thong, Chee-Sing Yap, & Raman, 1996) for example, support of top management has been found to be a recurrent factor linked to successful adoption and implementation. There is the need for the awareness and support of top management regardless of the matrix hierarchy observed in the organizations. As shown in section 5.1.3, respective CTOs or IS-staff can only propose the

adoption of new technologies but the final decision making lies with the top management who are mostly the owners of these organizations. Thus, failure to gain the support of the executive could be a barrier to successful adoption. The emphasis by the participants during the course of this investigation also made this issue outstanding and important.

With respect to the lack of good internet connection (5.1.4), the most commonly used speeds for cloud computing services, currently n*2 Mbit/s with xDSL technology and n*10 Mbit/s with Ethernet have not yet seen much development in Africa (International Telecommunication Union, 2012a). This may explain why lack of good internet connection has remained one of the major challenges faced by enterprises considering the cloud option. Despite this setback however, evidence of cloud computing usage by some SMEs has been found in sub-Saharan Africa. Thus, there is a need to investigate further what pushes these SMEs to adopt cloud computing despite the lack of or cost of good internet connectivity.

With regard to cost issues (5.1.5), reduced cost of maintenance and the elimination of the upfront cost for start-up SMEs is another potential advantage of using software as a service cloud hosted solutions. Here also, users identified the different kinds of cost that could be reduced as a result of the use of cloud hosted applications. More important is the cost relating to maintenance of hardware where provision has to be made for cooling and storage as well as external source of electricity due to incessant electric power outages.

Apart from the issue of cost, which has been well substantiated by the participants as an important issue that can encourage the use of the cloud, all the other issues required further validations at the end of this initial phase of the research. Three potential reasons were earlier stated as the reasons why findings from this study turned out to be different from what was observed in the literature on cloud computing in this section. The predisposition of SMEs to adopt the cloud in sub-Saharan Africa as stated earlier, can be due to the (1) expectation of the provision of better security and data management with regard to security, privacy & trust concerns, as well as data loss concerns; (2) expectation of a system that can create access and support better services delivery or; (3) cloud adoption is in its early stage and enterprises have not yet come to terms with some of the risks and challenges of cloud computing usage.

Overall, there was need to confirm why there are these differences between the findings and the existing literature at the time of the study and furthermore, what the implications of using cloud hosted solutions would be in reality to these SMEs. This led to the development of a new research strategy to follow on and complement these initial findings by collecting richer data to determine cloud computing adoption issues and their implications to sub-Saharan Africa SMEs. Walsham & Sahay (2006) have carried out a similar exercise using grounded theory initially to study ICTs in developing countries from existing literature and then subsequently complemented their study using another existing formal theory to come up with a conceptual framework.

5.3 Summary

In this chapter the outcomes of the initial phase of the research conducted on cloud computing adoption by SMEs in sub-Saharan Africa have been presented and examined against existing literature in the global north. Firstly, using the “Glaserian” grounded theory approach adopted in the initial phase; five issues relating to adoption of cloud computing by SMEs in Nigeria were presented. These issues included security, privacy and trust concerns, data loss concerns, awareness and top management support issues, availability of good internet connection and cost issues. A discussion highlighting specifically, the unusual way sub-Saharan Africa SMEs consider the first two adoption issues differently from their counterparts in the global north was also provided. Some expectations of the users were highlighted as the reasons for the distinctions in the way adoption is approached in sub-Saharan Africa and in the global north. These include the expectation of the provision of better and secure services in the cloud; the expectation of a system that can create access and support better services delivery or; the early cloud adoption stages and enterprises are not yet aware of some of the risks and challenges of cloud computing usage. The discussion also suggested the need to expand the study and collect more data in order to substantiate these initial findings citing similar research that has adopted such an approach.

Chapter 6 – An Institutions-Capabilities Perspective on Cloud Computing Adoption

6.0 Introduction

In chapter five, categories that emerged from the grounded theory approach selected for the pilot exploratory study in the initial phase of this research were examined and the need to expand and substantiate the findings highlighted. In this chapter, the findings derived from analysing both the initial and second phases of data that was collected using the selected framework, i.e. the institutions and capabilities framework, as described in chapter three are presented as results in 6.1 and critically analysed and evaluated in 6.2 respectively. Here also, the exciters and inhibitors to cloud adoption by SMEs in sub-Saharan Africa are identified. This chapter is based on a conference paper published and presented at the international conference on information society (i-Society 2014), an IEEE co-sponsored conference (Dahiru et al., 2014b). Further, a three-stage model that was developed to analyse the approach to cloud hosted services and solutions provision in sub-Saharan Africa is also presented and discussed.

6.1 Cloud computing adoption in sub-Saharan Africa – An analysis using institutions and capabilities

In this section, an analysis using the institutions and capabilities framework described in chapters three and four is conducted. In chapter three, the combined institutions and capabilities framework was critically examined and the underpinning theories and literature that informs why and how the framework was chosen for this research were discussed. Chapter four also described the processes that were involved in both the first and second phases of this research. This section and indeed the whole chapter draws

mainly from these two chapters, i.e. chapter three, where the logic behind the framework was described and chapter four, where the processes involved in the selection of research sites, collection of data, and analysis of data were also described. Figure 6.1 shows the framework adapted for this research.

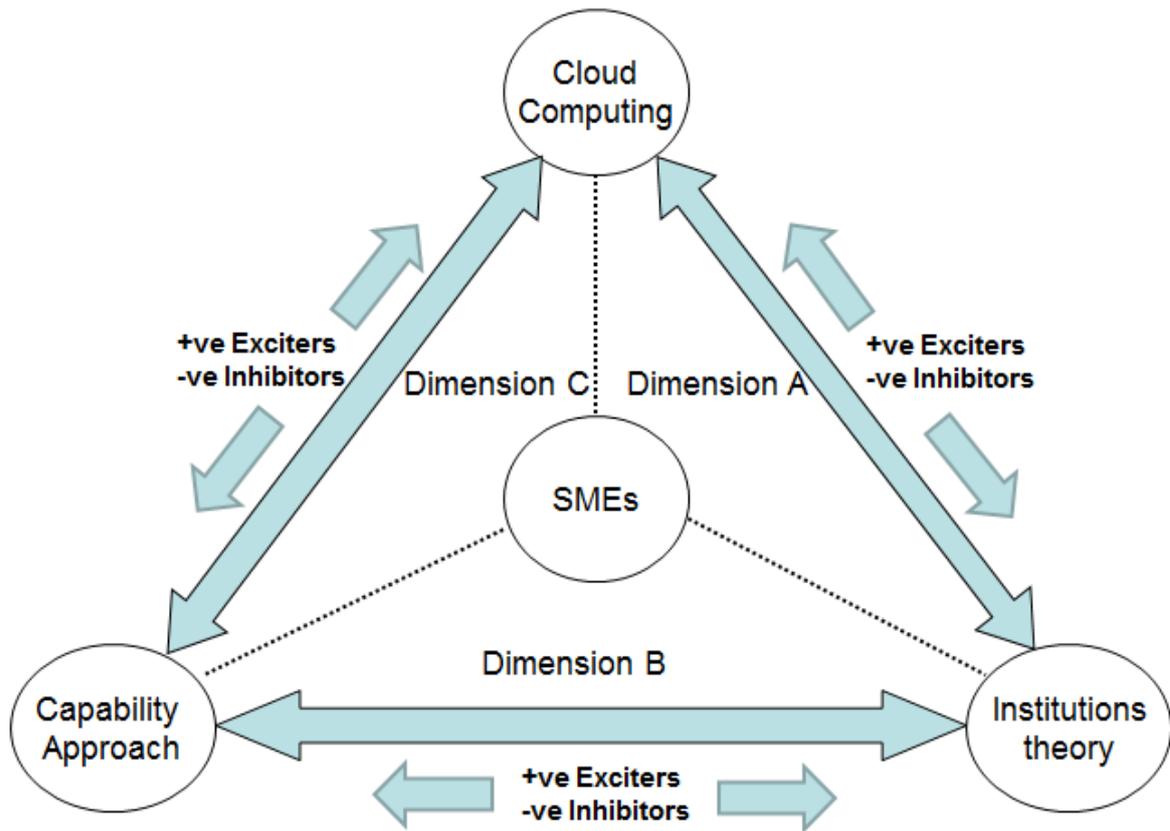


Figure 6.1 *The institutions and capabilities framework showing exciters and inhibitors on all the dimensions*

After careful analysis of the data inspired by the grounded theory approach and mapping the data onto the framework, the exciters and inhibitors on each dimension which represent the findings are presented on Figure 6.2. Exciters and inhibitors, as described in chapter three represent the degree of influence and describe the relationship between elements of the framework. Simply put, they are the factors that can encourage (excite) or preclude (inhibit) the use of SaaS cloud applications services.

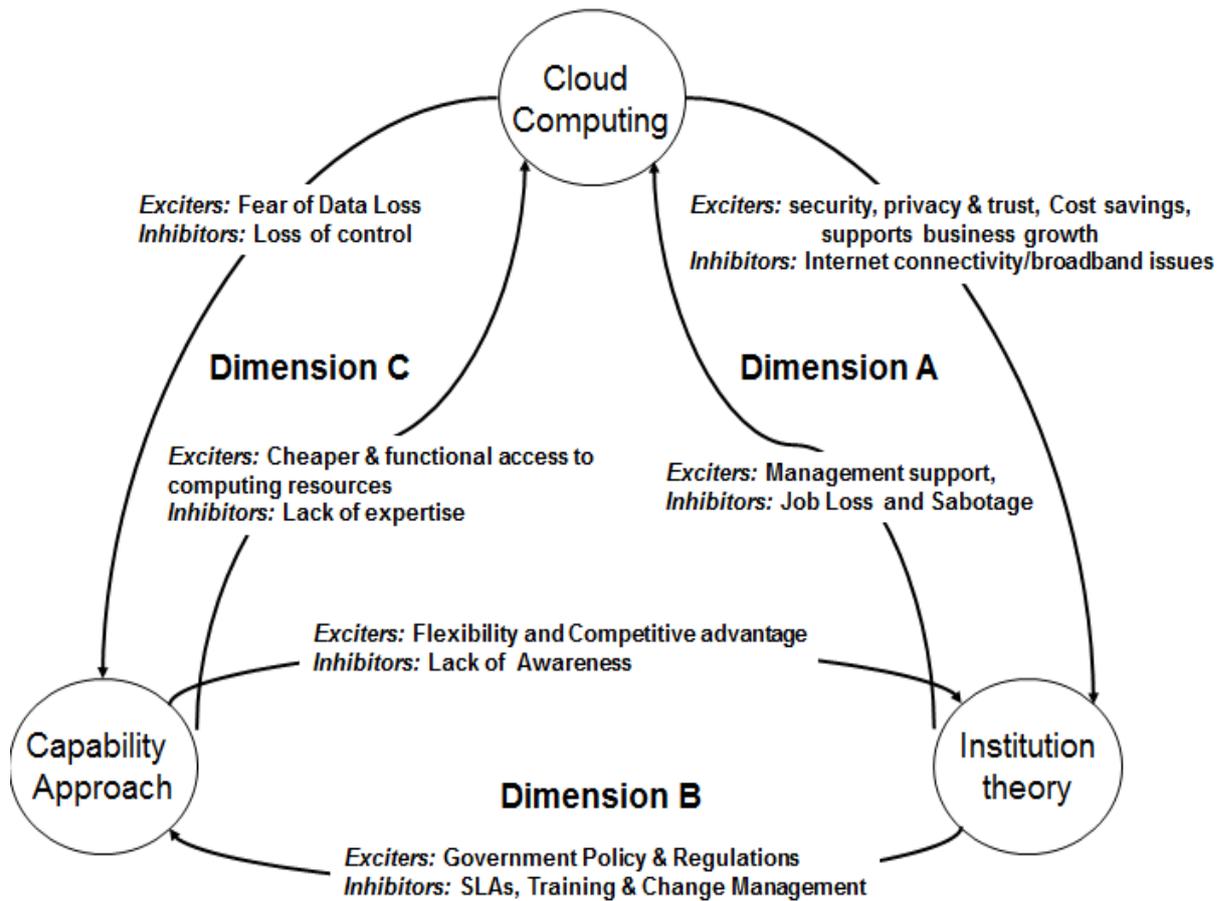


Figure 6.2 Summary of Findings

As can be seen in figure 6.2, two categories of exciters and inhibitors emerged. The first category are some of the exciters and inhibitors that have been presented in chapter five as issues (categories) that emerged from the data in the initial phase of the study. These include security, privacy and trust, data loss concerns, cost, availability of good internet connection and top management support. This confirms the initial findings that adopted the grounded theory approach in the initial stage of this research. The second category that emerged from the analysis on the other hand, confirms the presence of other issues that can influence adoption which have not been captured in the initial stage of this research. These include support for business growth, job loss and sabotage, flexibility and competitive advantage,

lack of awareness, government policy and regulations, training and change management, lack of expertise, cheaper and functional access to computing resources, and loss of control over data. This shows the benefit of the strategy that was applied in the second phase of this research that involved the use of the institutions and capabilities framework. The two categories of issues discovered are presented in the next sub-sections.

6.1.1 Security, Privacy and Trust (Dimension A)

Security, privacy and trust issues have been major concerns even before the introduction of cloud computing and play a major role in the decision to adopt SaaS cloud hosted applications. However, 21 out of the 26 interviewees in Nigeria do not see security, privacy & trust as threats. Concerning security, one interviewee stated that:

"What prompted the cloud environment is looking at the kind of business that we do, for you to be able to have a secured environment for customers to be able to trust their payments, from the three options we had, we saw that [chose] cloud is the best that can provide security for our information and data. So, as at the time we set up, their option was better than us having it in-house" [Interviewee 13].

The views of participants regarding security, privacy and trust can also be linked to lack of awareness, cost savings and SLAs according to **[Interviewees 17, 18 and 23]**, thus explaining some of the reasons why they do not see it as a threat to adoption. For instance, concerning awareness, **[Interviewee 17]** who is in the cloud brokerage business said that:

"Some users do not have any idea of what we are talking about; privacy, database, sharing and what have you". [Interviewee 17]

[Interviewee 18] links security, privacy and trust with cost;

"A lot of our users have mission critical stuff and require a good and secured environment..., and If you have to buy your own infrastructure, you have to first of all think about owning your real estate where you will provision such infrastructure, you are also going to be looking at provisioning of cooling, electricity" [Interviewee 18]

Regarding how to improve security, privacy and trust as well as building confidence between them and their clients, **[Interviewees 23]** in the cloud brokerage business said that:

"We just actually concluded ISO standardization...; information security service management; ...it gives you guidelines and rules of engagement when it comes to how you work internally and how you work with customers" [Interviewee 23]

All the interviewees show that they trust their service providers and willingly allow them access to their data rather than risk internal mismanagement of data. According to **[Interviewee 20]**, *"most of the fraud that usually happens is internal..."*

[Interviewee 21] in the cloud provisioning business summarizes the position of most cloud users amongst SMEs that:

"Quite a number of SMEs are bothered about security of their data and why they actually even came to us in the first place. I wouldn't say we loss any customer because of security concerns."

6.1.2 Cost (Dimensions A, B & C)

Cost related issues play a major role and can influence the decision to adopt cloud computing. The effect of cost can be observed on all the dimensions of the framework. All except **[Interviewee 25]** agree that adopting cloud computing can benefit enterprises by reducing the cost of IT infrastructure development and/or maintenance. According to **[Interviewee 25]**, the issue

of cost savings in the cloud is being exaggerated and that *"if you look at the total cost of ownership, the differences might not still be much especially in an African situation"*. But **[Interviewee 15]** stated that: *"the overhead cost of in-house IT maintenance pays for the cloud and when you look at the cost benefit it is worth it"*. **[Interviewee 21]** who is in the cloud service provisioning category also pointed out that:

"a lot of enterprises are trying to change their CAPEX model to OPEX hence their desire to adopt the cloud". **[Interviewee 21]**

Furthermore, **[Interviewee 13]** said that *"the pricing model of the cloud and the availability of different service providers is what makes it cost effective"*.

6.1.3 Support Business Growth (Dimension A)

Cloud computing supports business growth for existing enterprises and encourages start-ups. Microfinance institutions (MFIs) for instance do not have the required capital to use good and reliable solutions for their daily operations. **[Interviewee 17]** who has over five clients in the microfinance business argues that: *"cloud adoption has level the playing field and MFIs now play an important role in the financial market"*. The availability of cloud solutions has provided support that has allowed enterprises to concentrate on their businesses rather than managing and maintaining hardware or software which may erode their profit margin **[Interviewees 13 and 19]**.

"It removes unnecessary operational burden that allows you to concentrate on your businesses" **[Interviewee 19]**.

"...it makes your work more professional. It gives you especially as a manager it gives you more time to do other things, focus on other things like instead of focusing on your equipment, replacement and all that" **[Interviewee 13]**

According to **[Interviewee 20]** in the cloud provisioning business, implementing a cloud solution for start-ups is the easiest:

"...all you need to do is provision them, deploy their instance, and send them their certificates and they are up and doing the next day" **[Interviewee 20]**.

Finally, another interviewee said that:

"...if you want to quantify the value of what you are getting for what you are paying, it is not measurable at all". **[Interviewee 23]**

6.1.4 Internet connectivity/Broadband Issues (Dimension A)

The lack of good internet connection can be confirmed as one of the major impediments to cloud adoption by enterprises in sub-Saharan Africa. Fifteen out of the twenty-six participants have identified this issue as inhibiting cloud adoption. *"Fluctuation of bandwidth causes synchronization difficulties"* said **[Interviewee 13]** whilst **[Interviewee 17]** said that:

"The issue of internet has been a challenge for quite some time in sub-Saharan Africa, but countries in the region are developing strategies to resolve it".

Another interviewee said that:

"When connectivity issues are resolved more SMEs will be inclined towards the use of cloud hosted solutions."

When asked if challenges caused by internet connectivity issues affect adoption rate, providers **[Interviewees 18 and 20]** said, 'yes it does'.

"The challenge posed by this issue [lack of good internet connectivity] affects the cloud adoption market" **[Interviewee 18]**

[Interviewees 25] argues that *"poor internet connection leads to increase in the cost of hosting applications in the cloud"* **[Interviewees 25]**. However, *[Interviewee 14]* argues that:

"...because internet connectivity is not stable, it will be unwise to host your email for instance in a local domain, that makes it unavailable to users for most of the time there is a downtime. Cloud hosted emails on the other hand is available almost all the time". [Interviewee 14]

6.1.5 Top Management Support (Dimension A)

Another factor that can excite or inhibit the successful adoption of SaaS cloud hosted applications is support of top management, who are mostly the business owners. All the interviewees agree that decision making lies most of the time with the top management and input from CTOs **[Interviewees 1-26]**. They also all agree that if the cloud hosted solution will improve service delivery, the management will not have any issues with accepting it. For instance one of the CTOs stated that:

"The question is how can we improve our current delivery? That is the core issue. As far as this cloud hosted service can improve our service, our management has no problem accepting" [Interviewee 14].

However, *[Interviewee 22]*, another CTO argues that:

"It took almost a year to convince the top management of this firm to agree to adopt cloud computing" [Interviewee 22].

Another problem that the use of SaaS cloud hosted application also solves is:

"For us it is cutting the bureaucracy and turnaround time in dealing with staff, executive and customers" [Interviewee 22].

Top management decisions are also sometimes guided by other reasons e.g.:

"It may sometimes have to do with the organizations' context, the market segment the organization comes from or the kind of services the organization offers [Interviewee 14].

But in the end, as *[Interviewee 23]* stated:

"The psyche of the management is key for the adoption proposal to see the light of the day" [Interviewee 23].

6.1.6 Fear of Job Loss and Sabotage (Dimension A)

The need for understanding user resistance to change of information systems in organizations has been discussed by various researchers for instance (H. Kim & Kankanhalli, 2009). The majority of the interviewees are of the view that there were initial fears that jobs might be at risk when their organization decided to adopt the use of cloud hosted application. At the time of the interview however, there was no record of anyone losing their jobs due to the adoption of the cloud. For instance, *[Interviewee 23]* asserts that *"whenever there is change, there is some form of resistance especially at inception but these fears can be allayed by creating more awareness"* **[Interviewee 23]**. *[Interviewee 17]* also stated that: *"most users struggle and find it difficult to adopt [Interviewee 17]."*

However, another interviewee said that: *"the taking up of the cloud will be a threat to the employees of his organization"* **[Interviewee 25]**. According to the interviewee, employees will not be able to develop their skills further and such will reduce the value of the local content. On the contrary, *[Interviewee 14]* said that *"whatever IT/IS strategy is adopted, jobs are not always secured in this dynamic world and IT practitioners need to always upgrade their skills"* **[Interviewee 14]**. There was no evidence found that employees afraid of losing their jobs due to the adoption of cloud engaged in sabotaging the organization.

6.1.7 Flexibility, Scalability and Competitive Advantage (Dimension B)

Evidences gathered from interviewees show that the adoption of cloud computing has enabled employees to be more flexible and has made computing resources scalable. *[Interviewee 23]* stated that: *"you don't buy more than what is required and the way the cloud infrastructure is structured, is scalable, it can grow with your applications or your database"*. **[Interviewee 23]**. *"It has change the way we work and most of the daily routines have been automated which has gradually shut down human errors being made within the system"* **[Interviewee 23]**. In reference to the same issues, *[Interviewee 14]* as well said that: *"with the migration of our windows SharePoint and active directory to the cloud, connecting to the office wherever you are is no longer an issue, you can get access, so availability is what we are looking at"*. **[Interviewees 13 and 14]** are also of the view that with the growing number of users, enterprises cannot afford to be hosting locally considering also that more than one device is used by a single user most of the time. **[Interviewee 17]** asserts that *"our cloud solution is flexible; it is cheap and easily customized"*

When asked if the adoption of cloud has given them the advantage to leapfrog or catch up with larger organizations, or gain advantages over their competitors, the majority of the interviewees asserted that they have not been able to measure that. However, they are aware that there is relative advantage when compared to what they were using before. Relative advantage in this case can be in terms of cost savings and access to functional computing resources that gives them the ability to use similar applications that some of the larger organizations use. One of the interviewees whose

enterprise started up with the cloud for instance said *"...we chose to pick the cloud line and we did not look back. Because it was in our business plan from the initial stage"* **[Interviewee 13]**.

6.1.8 Lack of Awareness (Dimension B)

All the interviewees agree that there is a general lack of awareness of the potentials of cloud computing or its use. One of the interviewees said that: *"There is very limited awareness. People use cloud but they don't know they are using cloud. Yes that is the issue. Many people use it but they don't know"* **[Interviewee 14]**.

People are however becoming more aware with the rapid maturity of cloud technology as indicated by this interviewee: *"...cloud technology certainly is growing from where it was 3-4 years ago"* **[Interviewee 15]**. A great deal of effort also goes into creating further awareness as **[Interviewee 23]** said: *"So we try as much as possible to do workshops and seminars targeted at key stakeholders"*.

For start-up SMEs **[Interviewees 13, 15 and 17]**, possessing the knowledge of the availability of the cloud option played an important role in their adoption decisions. For instance **[Interviewee 15]** said that: *"It is fairly new in this part of the world... Companies like ours are very aware of cloud computing, we do research"*

6.1.9 Government Policy and Regulations (Dimension B)

This study did not find evidence to support the existence of any form of government policy on data location or protection. There is also no regulation limiting the kinds of cloud services these SMEs can use.

"Today there is no government policy on cloud solutions. I do know that, I have heard of a bill that's been sponsored, but to date there is nothing of such nature (so far)" [Interviewee 15].

There is however, a monitoring professional body or a government agency responsible for ascertaining the delivery of reliable electronic services or other outsourcing processes. In common with most sub-Saharan African countries, there is the existence of a national IT policy and a supervising agency for SMEs. According to this interviewee however,

"as the cloud infrastructure is growing and people are beginning to become more aware, definitely certain types of legislations have to be put in place so that you can have a kind of control on the entire IT cloud infrastructure" [Interviewee 23].

[Interviewee 17] in the provider/supplier category is of the view that some form of regulation or policy is needed to influence SMEs especially those in the growing microfinance sector. This indicates the activities of suppliers that can have an effect on government policy which can eventually affect or play a role in the adoption trend in sub-Saharan Africa.

6.1.10 Service Level Agreements SLAs (Dimension B)

Questions regarding service definition, service measurement, responsibilities and rates were grouped under SLAs. There are varying views regarding SLAs and the existence of relationship with cost on dimension A and other factors like access to computing resources or loss of control on dimension B. According to **[Interviewee 13]** whose organization started-up with the cloud, *"SLAs are tailored to almost what we want, harmonizing SLA with provider is not always an issue"* **[Interviewee 23]** in the cloud brokerage business asserted that if they are providing a direct service to a client, there has to be an agreed SLA but if a third party is involved, they normally have what they term as an "underpinning contract". Another

interviewee **[Interviewee 16]**, from the cloud brokerage category said that they extend the SLAs of their partners, i.e. the main provider of the cloud hosted service.

Linking SLAs with privacy and trust, **[Interviewee 18]**, a provider of cloud services asserted that: *"we always make it clear in the SLAs with our clients that their private information and data is secured with us and will not be misused"*. Regarding downtime issues, **[Interviewee 24]** stated that *"...we have our own monitoring tool that we use, if we have any downtime, our SLA stipulates that our providers pay for the downtime"*.

6.1.11 Implementation, Training and Change Management (Dimension B)

SMEs in the cloud brokerage business **[Interviewees 16, 17 and 23]**, asserted that, SMEs that have adopted some form of the cloud solutions they offer required only minimal training to get them started. For instance, according to **[Interviewee 16]**, *"training is offered as best practice for implementation especially for (top) management and it has been a fairly easy process for most organizations"*. In the view of **[Interviewee 23]**, the most important implementation best practice is to *"...try and tailor it to address challenges and also try as much as possible to align the cloud solution with business so that value can be created for the users"*. Further, *"with minimal training, it is not difficult to provision the service for your company"*. According to **[Interviewee 17]**, the basic requirement for the development and adoption of cloud solution is the understanding of the organizations' business, their needs and then constructively advising them on what to do and what the cost is for each solution. Another issue highlighted by **[Interviewee 17]** is an understanding of the market so that the solution can be customized to fit and

address the challenges of the enterprises subscribing for cloud hosted services.

6.1.12 Fear of Data Loss (Dimension C)

Confirming initial findings, fear of unanticipated loss of information or data when using cloud hosted services did not inhibit enterprises from adopting the cloud. Whilst it has been a major source of concern, the interviewees did not express such deep fears regarding this issue, and do not see it as an obstacle that could preclude adoption.

"The issue of fear of data loss in the cloud was discussed at start-up, "...and we did not consider it to be a threat" [Interviewee 13].

As **[Interviewee 18]** also said:

"The expectation to work seamlessly in the cloud with real time backup is part of the reasons that drew us to the cloud considering the possibilities of electric power interruptions without notice" [Interviewee 18].

Interviewees **[Interviewees 13, 14, 17, 25]** all expressed how incessant electric power outages have caused cloud computing technology to be viewed as an alternative that can help in preventing data loss, thus, reiterating and confirming the initial findings of this research.

"Most of our users work at home, so if we have it in our domain [host locally] and there is [electric] power failure, there is no access to our information system" [Interviewee 14]

6.1.13 Loss of Control over Data (Dimension C)

Loss of control has been identified by interviewees as a factor that can inhibit the adoption of cloud computing. It has been linked with trust, poor internet connectivity and data loss by **[Interviewees 15, 24 and 25]**. For instance **[Interviewee 15]** said that:

"...though we have never been locked out, when the service is not available sometimes you feel that lack of control and the fact that you don't have total control, you cannot do some things quickly enough but have to wait. So, I am not in control of my data... somebody is. But I have to trust someone with my data to get the services I am using now" [Interviewee 15]

In the same vein, **[Interviewee 24]** had these questions when his firm was considering the cloud

"What if the company (provider) suddenly enters into a legal litigation? What if the company is wiped off? How do we move from here if all of a sudden the company ceases to exist? What happens to my data?"

Despite the fears expressed by the interviewees however, it did not prevent these enterprises from finally making the decision to adopt one form of the cloud or the other. When asked why that was so, the majority of the interviewees said that the advantages of using cloud hosted services like cost, expectation of a more secured environment and higher possibilities of losing data locally (as shown in the sections earlier) far outweighs this factor.

6.1.14 Functional Access to Computing Resources and Global Market (Dimension C)

All the interviewees agree that using the cloud has given them unique access to computing resources they hitherto did not have access to. There is also access to the global market. Functional access has also been linked by interviewees to other factors like cost, collaboration and partnership, efficient service delivery, agility and enhanced operation. These factors in turn support business growth for existing enterprises and easy start up for new entrants.

"Using the cloud has made integration with other major payment services like eTransact and Interswitch easier. Customers will trust these payment options more" [Interviewee 13].

According to [Interviewee 14] also,

"Users can now work at or from home contrary to when it used to be in-house where access can be cut-off with the seizure of electric power supply". [Interviewee 14]

Access to computing resources is also linked with cost, partnership and enhancement of operations, for instance, [Interviewees 17 and 19], in the cloud services provisioning category partnered together to provide services for MFIs in Nigeria. According to [Interviewee 17], *"since our clients are in the microfinance sector, we partnered together with a larger company to come up with a solution to offer these MFIs"*.

With regard to enhancement of operations and saving costs, [Interviewee 17] said that: *It is a core banking application that will enhance them [the MFIs] to do their normal banking operation without necessarily having to buy servers and storage providing them also with a cheaper access to licensed software"*

6.1.15 Lack of Expertise (Dimension C)

Lack of expertise can relate to the experiences and expertise of adopters before or after consideration of adopting cloud computing. It can also relate to the ease with which cloud computing can be used and has been linked to cost issues (limited funding or capital at start-up) by interviewees. For instance, one of the interviewees said that:

"When we started, we have a limited funding, Then the technical aspect, I am the only person in the department, so logically I cannot afford or I don't have the capability to set-up all these infrastructure at the start" [Interviewee 14].

Another interviewee said that:

"we have quite a number of IT people [we can employ], but because we don't have enough to pay them, we end up employing people with low skill not really being able to take care of our banking apps" [Interviewee 26].

The experiences of early adopters as reiterated by [Interviewee 14] also counts when planning to transition to the cloud:

"We make a comparative study of available providers, then we choose the best by making some local contact with their current customers using the applications and by recommendation; so I didn't find it much difficult... although I have a lot of knowledge about cloud services before I even started using it [Interviewee 14]

Furthermore, the statement of [Interviewee 16] shows that, as a provider and user of cloud hosted services, experience and knowledge of the environment matters when proposing appropriate cloud services to their SME clients.

"...our product knowledge, is what gives them [clients] that level of comfort, [and] because of some of the organizations that are top brand especially in Nigeria that are already on the platform, we use those to leverage and get new clients" [Interviewee 16]

SMEs in the cloud provision (brokerage) business also found that they are able to custom develop some solutions for their customers and found it easy to train potential users where there is the lack of expertise to adopt cloud.

"In essence, what we do here is that, we re-sell their solutions and we also custom develop some solutions that sit-up some of the apps to help extend it for the global market" [Interviewee 16].

6.2 Discussion of Findings, Analysis and Evaluation

In the previous section (6.1), fifteen exciters and inhibitors to cloud computing adoption by SMEs in sub-Saharan Africa have been presented as results (findings) using the institutions and capabilities framework. In this section, these results (findings) from section 6.1 are further analysed, discussed and evaluated in the light of the institutions and capabilities framework. This is supported by highlighting the perceived relationships between the different dimensions of the framework and also comparing it with existing literature on cloud computing adoption. Furthermore, this section will examine how these exciters and inhibitors interact with each other to influence adoption.

6.2.1 The expectations of Cloud Users As Exciters

Findings from this research has shown that there are several expectations that cloud users in the SME sector in sub-Saharan Africa hold that enables or excite their adoption and use of cloud computing. SMEs were found to have relied heavily on these expectations in their cloud adoption decisions. Consider the issues of security, privacy and trust for instance. Although these issues are broad and might be understood differently by diverse users, security is about the vulnerability of your data in the cloud and the fear of attack by third parties. Privacy on the other hand is about breach of trust by the cloud service provider of your official or personal information. Thus, the responsibility for security in the case of the cloud lies mostly with the provider. So how do the expectations of users regarding the issue of security, privacy and trust excite adoption?

This research has revealed and established that there is less concern amongst SMEs that participated in the research on the challenges posed by

security, privacy and trust to cloud adoption. Contrary to what has been identified in the literature e.g. (Julisch & Hall, 2010), SMEs were found to be expecting a more secured and trustworthy environment in the cloud. It is thus unusual that while literature in the global north points to security, privacy and trust as inhibitors to the adoption of cloud computing, this is not so for many SMEs in Nigeria where data was collected. The research has shown that corporate data has been put on the cloud without considering its sensitivity. Users have shown satisfaction with the way their providers are managing the cloud services they subscribe to.

Drawing from the framework, an interaction can be observed to be taking place between security, privacy and trust on Dimension A and other exciters on dimensions B and C. For instance an interaction is observed between security, privacy and trust (Dimension A), with flexibility (Dimension B), and functional access to computing resources (Dimension C). For the SMEs, the cloud has provided an alternative environment they 'trust' to be more 'secure', 'flexible' and 'reliable'. This goes to show that security, privacy and trust considerations encourage cloud adoption rather than inhibiting it as the case is with SMEs in the global north, for instance. As can be observed from the framework, the interconnectivity between different dimensions on the framework has developed into a form of *virtuous cycle* beginning with the adoption of cloud computing where IT resources are hosted in a more secure environment in the cloud. An example is one of the enterprises involved in this research which is an e-commerce company. The IT-administrator was positive that starting-up with the cloud supported their routine operations by increasing their reliability and giving them more time to concentrate on other local processes. This in

turn improved their service delivery and customer satisfaction and trust. They now have a customer base of over three hundred thousand and are certain that adopting the cloud at start-up has contributed to growing their business and giving them an edge over other enterprises in the same category as theirs.

In essence, security, privacy and trust concerns are exciting rather than inhibiting cloud usage for SMEs in sub-Saharan Africa which means they prefer to select the cloud as a better *choice* to locally hosted services. *Choice* is the mental selection of a preferred option from a variety of such options, and functionings as previously defined in chapter three, denote the various things a person may value doing. Therefore, with regard to security, privacy and trust, SMEs in sub-Saharan Africa that have adopted cloud computing carefully choose to adopt after considering the option of locally provided security in comparison with the cloud option. They are not doing so because of coercion. They are also not trying to conform to some industrial standards as is the case in some European countries (El-Gazzar, 2014). They are equally not driven by mimetic pressures but rather make a conscious choice of reliable services that can improve access to computing resources, routine operations and efficiency for businesses growth. However, in terms of choosing the cloud service provider, experiences of early adopters and enterprises that come from the same sector is playing a role.

Another expectation of SME cloud adopters is that of the reduced cost of maintenance or starting-up. Looking through the lenses of the framework, elements of cost can be observed in all the dimensions of the framework. The pay-per-usage and scalability characteristics of cloud computing offer tangible benefits to cloud users. The elimination of the upfront cost required for setting

up IT infrastructure is a key issue for start-ups that encourage cloud adoption. Equally, the maintenance cost and mode of making payments, as well as the cost of hiring expertise or training and other cost related issues also influence the decision to adopt cloud for both start-ups and existing enterprises. Hence, cost issues are observed along all the dimensions of the framework, making it difficult to map neatly onto the framework without breaking it down into smaller components. This has however shown that there is the expectation of tangible benefits by way of reduced cost if the cloud solution is adopted.

Whilst mapping cost to the framework was difficult, and can be seen as a weakness of the framework, the dimensions of cost which the framework analysed are interesting findings. The framework helped in elaborating the importance of the cost factor to adoption and an important area of further research. The implication of this also is that, the expectation of reduced start-up, operational and maintenance costs can lead to the increased adoption of cloud computing, despite inhibiting issues like lack of good internet.

Unexpected loss of data is also a major fear when it comes to cloud adoption. However, participants in this research were more concerned about local data loss due to frequent electric power outages. Practitioners in this study also expressed more concern about the mismanagement of data by local staff members. With unstable electric power supply, the fear of data loss in-house is more glaring to the participant SMEs than on the cloud. Data is also more likely to be tampered with locally. This shows some interaction between data loss fears (Dimension C) and security, privacy and trust (Dimension A) and the decision to use cloud hosted services.

In summary, excitors include (i) the expectation of a more secure and trustworthy IT solutions and services environment, (ii) the expectation of tangible benefits arising from cost savings that can lead to or support business growth, (iii) the expectation that adopting cloud computing can provide a solution to loss of data (e.g. due to electric power outages) and finally (iv) the expectation that SMEs can also have access to computing resources that can be used to support operations and efficiency of the adopting SME.

6.2.2 The Fears of Cloud Users As Inhibitors?

There is less concern regarding the issues that 'appear' to inhibit adopting cloud hosted solutions and services by SMEs in sub-Saharan Africa. Lack of good internet connection for instance in 'dimension A' can lead to synchronization and access problems (Dimension C) which may lead to loss of control or data loss (Dimension C). As a *vicious cycle* emerges, this indicates a problem or an issue from the user endpoint rather than the technology or the service provider. The users are able to overcome fears related to lack of good internet connectivity by looking beyond the issue and focusing on the technology (cloud computing) and the potential benefits they stand to gain. The implication of this is that, as the internet infrastructure in sub-Saharan Africa develops, more SMEs are expected to adopt cloud computing.

Similarly, resistance to change (Dimension B) which can be caused by fear of job losses (Dimension A) due to lack of expertise (Dimension C) in new technology or the introduction of the new technology itself did not have any effect on adoption decisions. On the contrary, lack of expertise can only hinder an individual's desire to adopt the technology rather than the whole organization. As the decision to adopt mainly lies with top management (Dimension A), there was little or no effect of the fear of job loss identified in

adoption decisions. Nevertheless, it has been established from the findings that there were no reported cases of job loss in any way, due to the adoption of any form of the cloud hosted solutions. Both the issue of job loss and that of lack of expertise can be mitigated through the provision of training and according to the providers, only minimal (training) is required.

As showed in section 6.1.10, there are varying views regarding SLAs. On service definition, measurement, responsibilities and rates, providers have demonstrated the ability to harmonize and reach an understanding with users. Issues regarding SLAs (Dimension B) are linked with trust elements in Dimension A and the fear of losing control of data in Dimension C. Cloud providers that are not in direct contact with users can have SLAs extended through cloud brokers who are mostly indigenous and also have the understanding of the sub-Saharan Africa market. At present, users prefer to be able to have personnel they can engage with and discuss the terms of the SLAs face to face. This has increased their confidence in adopting the cloud and allays many of the fears they have in releasing control of their data to the cloud service provider. Indeed, not being able to harmonize SLAs can lead to fears such as data loss or lack of trust in the cloud. At the moment trust is a valuable exciter that cloud services providers enjoy.

In summary, several inhibitors to cloud adoption by SMEs are related to the fears harbored by users. Findings from this research have shown that these fears do not inhibit cloud adoption. They are rather overwhelmed by other exciters. These fears relate to, (i) the fear of job loss due to change, (ii) the fear of diminished capabilities due to lack of expertise in new technology area, and (iii) the fear of the cost of training and change management.

6.2.3 Other Influences

6.2.3.1 Government Policy and Regulations

As shown earlier in section 6.1.9, no evidence of government policy on data location and/or protection was found. If there is any, participants were not yet aware of it. The lack of regulation and policies can be attributed to the newness of cloud technology at the time the research was conducted. Indeed, government regulation can have either a beneficial or a detrimental effect on innovation (Baker, 2012). The lack of government involvement at present, in relation to data location restrictions is perceived to have encouraged the growth of cloud hosted services adoption.

The activities of indigenous suppliers (cloud providers) can influence the introduction of a government policy that may result in an increased use of the cloud. Cloud service providers; especially those in the telecoms business with some form of connection with the government, promote and encourage the introduction of policies that may see microfinance institutions (MFIs) engagement with the cloud. A similar trend has happened for instance with the setting up of ICT guidelines serving as minimum IT requirements for Pension Fund Administrators in Nigeria (National Pension Commission, 2009), which served as a guide for selecting the custom built software application to be used by organizations considering operating as fund administrators.

6.2.3.2 Lack of Awareness

Lack of awareness regarding cloud computing in sub-Saharan Africa is viewed by participants as affecting its adoption rate. Evidence in section 6.1.8 also indicates that prior knowledge of the availability of cloud hosted solutions

enhances the capabilities of individuals and enterprises. Awareness also broadens options enterprises can select from, in choosing their IS strategy.

Lack of awareness can be of two categories: lack of awareness of cloud computing technology and lack of awareness of some aspects of the cloud. Lack of awareness of the cloud technology refers to the lack of knowledge regarding the availability of cloud hosted services and solutions as an alternative to locally hosted IT services and solutions. This can lead to slower start-up for new enterprises due to the need for initial capital for investment on IT resources or in the case of enterprises in Nigeria, increased costs of maintenance of IT resources especially due to lack of constant electricity. Lack of awareness regarding some aspects of the cloud refers to the lack of knowledge of the impact or the risks associated with cloud hosted solutions use like security concerns, privacy concerns and possible total loss of control of data. Some enterprises are overwhelmed by the services they get in the cloud but lack the knowledge or skills to identify and mitigate the risks associated with cloud hosted services use. Mitigation of risks in SME cloud adoption is beyond the scope of this research and could be an interesting area for further research.

6.3 An Incremental Approach to Cloud Service Provision in Sub-Saharan Africa

This section analyses cloud hosted service provision in sub-Saharan Africa as part of the findings that emerged from the data. Using the institutions and capabilities framework provided a perspective on the three development stages regarding how cloud service providers approached cloud service provision in sub-Saharan Africa.

6.3.1 Stage 1

At this development stage we were unable to observe any indigenous cloud service provision. Cloud computing is still in its infancy stage and consumers focus on standard office applications delivered as services by foreign providers.

6.3.2 Stage 2

In Stage 2, local cloud brokers provide advice and support to users of foreign cloud service providers. These local brokers have knowledge of local markets and needs, which is difficult for foreign cloud providers to obtain. Some of the companies describe the services they offer thus:

"We are largely a cloud solutions broker, meaning we represent several cloud providers, google being the most prominent one today. But there are several other ones like Amazon, Rackspace. In essence what we do, here is that we re-sell their solutions and we also custom develop some solutions that sit on top of some of the apps to help extend it for the global market" [Interviewee 16]

"We [act] as a solution integrator... so like channel partners, we are actually the companies that do the end roll deployment." [Interviewee 23]

6.3.3 Stage 3

Local cloud service providers offer services using contracts governed by local laws. Local service providers launched in Nigeria, Ghana, Uganda and some other sub-Saharan African countries between 2012 and 2013. In mid-2013, one of Africa's largest mobile telecommunication companies started providing a range of cloud computing services for SMEs in Nigeria and Ghana. According to the company's representative interviewed:

"We do different layers of cloud computing, we do IaaS, PaaS, and SaaS. In the area of SaaS for example, it is dedicated to serve microfinance institutions... The basic background of the platform or the solution I can say is to actually take away the capital expenditure requirement that is needed to actually run the core banking applications by the MFIs to run their business." [Interviewee 19]

Another indigenous Telecoms company in Nigeria that provides IaaS also stated that:

"We are quite innovative with regards to provisioning of this [cloud] services and is largely dependent on what the customer wants. But we provide enterprise solutions for customers that want to take advantage of our cloud infrastructure for their businesses" [Interviewee 6]

6.4 Discussion

It can be seen from section 6.3 that over the past 3 to 4 years there has been an incremental or stage-wise approach to the delivery of cloud services in sub-Saharan Africa. Despite the use of cloud services/applications in sub-Saharan Africa in late 2011 and early 2012 (e.g. free cloud hosted email services, SharePoint, Google applications and other data storage services), there was no evidence found in this study to show that there are indigenous companies offering cloud services. The early cloud adopters set-up the

necessary collaboration in-house using their IS staff, outsourcing or employing specialists to handle complex deployments.

The entry of cloud brokers who understand the market and needs of both private and public enterprises changed the stakes in late 2012. They created awareness and expanded adoption through the development of a workflow to access cloud hosted services and enterprise messaging and collaboration products. The services they offer became popular with both public and private enterprises who want to adopt cloud computing or automate their organizational processes. The face-to-face interaction they have with customers also dispels some of the fears users of the cloud may harbour.

Indigenous cloud service providers in sub-Saharan Africa, mostly telecoms companies began exploring the cloud market in 2012. This can be attributed to the resources and capacity these telecoms companies have to set-up and maintain cloud infrastructure and data centres as well as partnership with enterprises that are able to develop cloud software solutions where they are unable to do so. Several services and applications were developed to target the medium to large scale enterprises as well as government agencies viewed as major beneficiaries of the new cloud paradigm. Most of these services became fully operational only in 2013. One example is the SaaS banking solution targeted at the growing microfinance industry in Nigeria. Another example in Uganda is *cumulus*, which is a SAP cloud service specifically designed for SMEs.

Users were observed to find it easier to trust, subscribe and leverage cloud services offered by indigenous cloud providers despite the absence of

legislation thus far governing how or where data is required to be located. This also explains why the cloud brokers market has also remained fairly stable even with the entry of indigenous cloud service providers. The choice of a provider may also solely depend on the kind of cloud service the user is interested in.

6.4 Summary

In this chapter the findings of this research which resulted from the data collected using qualitative means but two different approaches as described in chapter four were presented.

Using the institutions and capabilities framework, fifteen excitors and inhibitors to cloud adoption by SMEs in sub-Saharan Africa emerged. Excitors and inhibitors represent the degree of influence and describe the relationship between elements of the framework. Simply put, they are the factors that can encourage (excite) or preclude (inhibit) the use of SaaS cloud applications services. The excitors in 'Dimension A' of the framework include security, privacy and trust, business growth, and management support while the inhibitors included internet connectivity issues, and job loss and sabotage. In 'Dimension B', the excitors include flexibility, scalability and competitive advantage, and government policy and regulations while the inhibitors included lack of awareness, SLAs, implementation, training and change management. In 'Dimension C' the excitors are fear of data loss and cheaper and functional access to computing resources while the inhibitors are loss of total control of data and lack of experience or expertise. The issue of cost appears on all the dimensions of the framework.

The exciters and inhibitors to cloud adoption in sub-Saharan Africa highlighted that SMEs know the consequences of choosing cloud hosted solutions, and they are less concerned about adoption issues regarded as threats to adoption in the global north. This stems from seeing cloud as providing a better option that is more secure and cheaper than locally hosted IS/ICT solutions. The discussion of the perceived relationships between issues in the different dimensions of the framework showed how these issues interact with each other to enable or inhibit adoption thereby underlining the expectations of cloud users and their fears which are the main conditions that determine adoption.

Finally, findings describing the development stages of cloud service provision in sub-Saharan Africa were presented highlighting the roles played by foreign services providers, local cloud services brokers and indigenous cloud services providers. Three development stages of cloud service provision were described with the aid of an incremental model conceptualized to analyse the provision of cloud hosted service to sub-Saharan Africa SMEs. These development stages include: (i) no local provision, (ii) cloud brokers promoting foreign cloud service provision and (iii) locally available cloud service provision.

Chapter 7 – Conclusion

7.0 Introduction

The aim of this research was to analyse and evaluate the adoption of Software-as-a-Service (SaaS) cloud hosted applications and services by small and medium-sized enterprises (SMEs) in sub-Saharan Africa. The research was highly motivated because despite the potential benefits of cloud computing like the availability of computing resources on-demand and at a reduced cost; to date, research has primarily focused on the global north and pays less attention to adoption. There is also the potential impact on development that needs to be analysed. The approach used in this research was to adopt an analytical framework that has been applied in investigating and interpreting IS/ICT adoption and ICT4D interventions. The framework combines institutions theory and the capability approach in a complementary way in order to determine the social drivers that may inhibit or enable the adoption of cloud computing by SMEs in sub-Saharan Africa. *This chapter consolidates all the previous chapters and then discusses the research's contributions.* The chapter also captures how the framework was used for methodological triangulation. Chapter seven further highlights the main areas of practice to which this research contributes. Finally, the chapter also presents areas or ways through which this research can be extended.

7.1 Summary of the Thesis

The introductory chapter showed the importance of addressing the lack of research on cloud computing adoption and the concentration of research on cloud computing in the global north. It showed the need to expand the geographical narrowness of research on cloud computing and indeed other

ICTs in developing countries in order to determine their impact on development. The introductory chapter also showed the importance of SMEs in studying diffusion and the impact of innovation and hence their adoption in this research as the medium to explore and investigate adoption processes and to interpret adoption implications.

In the second chapter, the literature reviewed showed that cloud computing adoption and its impact is under-researched and there is the need for in-depth studies especially in sub-Saharan Africa and other developing countries where research is lacking. This led to the investigation and analysis of appropriate theories and frameworks that can be used to examine cloud computing adoption. Several IS/ICT adoption theories were considered and like any other research approach they were not without their limitations. The theories and approaches that were examined in the second chapter included the technology adoption model (TAM), the diffusion of innovation theory (DOI), the socio-technical change process model, actor-network theory (ANT), institutions theory and the capability approach.

A critical analysis of the approaches was conducted and their appropriateness for use in this research was evaluated. It was shown that TAM and DOI fail to sufficiently account for contextual factors and actual uses of technology as they do not take into account the values embedded in a technology and neglect issues like power, politics and culture which in reality interact with users' perception and practices in relation to technology (Zheng, 2015). The socio-technical change process model was found to be too dependent on Levitt's model which has been criticized as being static; and has been described as more appropriate for longitudinal studies. The ANT though

better at giving insight than the TAM and the DOI has been criticized for being over descriptive (Miles, 2012). The institutions theory may overlook some important social drivers and categories such as the role the individual plays with respect to adoption. The capability approach was described as methodologically vague and its operationalization difficult by various researchers. Thus, whilst all the frameworks were found to be useful and important in IS/ICT adoption studies, the chapter showed that none of them was suitable on its own as a theoretical lens for achieving the objectives set for this study. This led to the decision to combine institutions theory and the capability approach.

In the third chapter, the combination of institutions theory and the capability approach was proposed as being the most suitable framework for this study. The applications of the two frameworks in the IS/ICT domain were also reviewed, individually highlighting the strength and criticisms of each of the frameworks and how they could complement each other if combined. This was followed by a presentation and description of the framework. The justification for combining the two approaches and a review of previous studies that have applied the framework citing its suitability and appropriateness in explaining the excitors and inhibitors that can influence technology adoption was also discussed.

In the fourth chapter, the methodological issues considered and encountered in this research were summarized. The rationale for adopting a qualitative approach with an interpretive viewpoint was critically analyzed. The chapter examined the two phases this research passed through. The initial pilot exploratory study was conducted using a grounded theory approach, and then

the second phase which developed and complemented the initial phase through the use of an analytical framework. The fourth chapter also showed how the research was conducted using semi-structured open-ended interviews with twenty-six practitioners from Nigeria over a period of two years. Justifications for selecting Nigeria as research site was equally provided together with the modality adopted for the analysis of data. Finally, the limitations associated with the adopted methodology and how they were kept to a minimum, and the ethical concerns taken into consideration while conducting this research were properly discussed.

In chapter five, the outcomes of the initial phase of the research conducted on cloud computing adoption by SMEs in sub-Saharan Africa were presented and examined against existing literature in the global north. Firstly, using the "Glaserian" grounded theory approach adopted in the initial phase; five issues relating to adoption of cloud computing by SMEs in Nigeria were presented. These issues included security, privacy and trust concerns, data loss concerns, awareness and top Management support issues, availability of good internet connection and cost issues. A discussion highlighting specifically, the unusual way sub-Saharan Africa SMEs consider the first two adoption issues differently from their counterparts in the global north was also provided. The discussion showed that security, privacy and trust, and data loss concerns were found not to be inhibiting cloud computing adoption. Some expectations of the users were highlighted as the reasons for the distinctions in the way adoption is approached in sub-Saharan Africa. These include: the expectation of the provision of better and secure services in the cloud; the expectation of a system that can create access and support better services

delivery or; the early cloud adoption stages and enterprises are not yet aware of some of the risks and challenges of cloud computing usage. The discussion also suggested the need for expanding the initial phase of the research and substantiating the findings as it relied on limited data. Furthermore, the discussion showed that some limitations of the grounded theory approach may also affect the final outcomes, thus findings need to be substantiated.

In chapter six, the outcomes of the second phase of the research which confirm and substantiate initial findings from chapter five are analysed and evaluated in light of the institutions and capabilities framework.

Fifteen exciters and inhibitors to cloud adoption by SMEs in sub-Saharan Africa were identified through the analysis that drew from the combined institutions and capabilities framework. The exciters in 'dimension A' of the framework include security, privacy and trust, business growth, and management support while the inhibitors include internet connectivity issues, as well as job loss and sabotage. In 'dimension B', the exciters includes flexibility, scalability and competitive advantage, and government policy and regulations while the inhibitors include lack of awareness, SLAs, implementation, training and change management. In 'dimension C' the exciters are fear of data loss and cheaper and functional access to computing resources while the inhibitors are loss of total control and lack of experience or expertise. The issue of cost appears in all the dimensions of the framework.

The exciters and inhibitors to cloud adoption in sub-Saharan Africa highlighted that SMEs knew the consequences of choosing cloud hosted solutions, and their less concern for adoption issues regarded as threats to

adoption in the global north, stems from seeing cloud as providing a better option that is more secure and cheaper than locally hosted IS/ICT solutions. The discussion of the perceived relationships between issues on the different dimensions of the framework showed how these issues can interact with each other to enable or inhibit adoption. The underlying expectations of cloud users and their fears which were the main conditions that determined adoption were also highlighted.

Finally, findings describing the development stages of cloud service provision in sub-Saharan Africa were presented highlighting the roles played by foreign services providers, local cloud services brokers and indigenous cloud services providers. The development stages of cloud services provision were described and discussed showing how these stages can be conceptualized as an incremental maturity model for cloud services provision in sub-Saharan Africa.

7.2 Contributions

This research begins to fill the literature gap identified in technology adoption research, specifically, cloud computing adoption. The research questions posed at the beginning of the research sought to investigate the current state of cloud computing adoption in addition to the issues that could encourage or preclude its use by small and medium-sized enterprises (SMEs) in sub-Saharan Africa. It further sought to understand or evaluate the extent to which cloud computing adoption stimulates SMEs in sub-Saharan Africa to impact on development?

In answering these questions, this research employed a socio-technical framework. The framework is theoretically grounded in the combination of two

distinct theoretical traditions, i.e. institutions theory and the capability approach. Whilst institutions theory uses a top-down approach to explain processes and outcomes at a lower level, the capability approach uses a bottom-up approach to explain processes and outcomes at a higher level. Walsham & Sahay (2006) have made the case for the need of future research into ICTs in developing countries to focus on the scalability of ICT offered services, individual level of analysis and the need for indigenous researchers expanding the geographical narrowness of the current research landscape. This research has attempted to address all these points.

Drawing from the strength of the two frameworks, the enablers and inhibitors to cloud computing adoption in sub-Saharan Africa were identified. Furthermore, how these enabling and inhibiting factors interacted with each other to influence adoption was also highlighted. Factors like security, privacy and trust concerns that are viewed as inhibitors in other places (e.g. OECD countries) were playing a role in enabling the adoption of cloud hosted applications. This further acknowledges the position of researchers e.g. (Avgerou, 2010) who posited that there can be a difference in the context in modelling the adoption of new technologies in advanced economies vis-à-vis a developing one. Thus, in a virtuous kind of cycle, the factors continue to interact with each other to influence adoption. This can be viewed from the capabilities approach angle if considering an individualistic point of view or the institutions theory angle when considering the effects on a group.

Previous research, (e.g. Cohen, Mou, & Trope, 2014; Saya et al., 2010) has tried to establish the effects of institutional influences on cloud computing adoption. While Saya et al. (2010) could only establish such relationship on

the *intention* to adopt, Cohen et al. (2014) found evidence to support the influence of mimetic pressures on South African firms. On the contrary, the research presented in this thesis did not find significant evidence to support the influence of such mimetic pressures amongst the SMEs that participated in the research, rather, the adoption of cloud computing is driven by a conscious choice with users knowing fully what to expect. Further, the apparent lack of concern for adoption issues regarded as threats to adoption stems from seeing cloud as providing a better option. Users for instance, are less concerned about losing control of their data or losing the data itself because fear of data loss due to electric power outages outweighs that of the cloud. Since Cohen et al. (2014) did not specify the kind of firms their research considered, i.e. whether large or small, the differences in the findings can be explained with difficulty. Another reason is that even though South Africa is considered a sub-Saharan African country, it has a confounding socio-economic situation, where Western European influences are much stronger than in the rest of the region (Datta et al., 2005). Thus the South African situation can affect the generalisability of any study focusing on sub-Saharan Africa.

This research also becomes one of the first to use constructs of the capability approach as tools for studying the adoption of cloud computing as a new technology innovation and has contributed to the literature in that aspect. As an evaluative framework, the capability approach also afforded this research the ability to have an unbiased view of cloud computing, thereby not assuming it to be intrinsically good. Thus a more comprehensive understanding of the enabling and inhibiting factors to cloud computing

adoption including the expectation and fears of users (individuals or organized groups) was attained.

Furthermore, whilst previous studies; see for example: (Ibrahim Dasuki, 2012; Maiye, 2012), that applied the capability approach to study large scale IS innovation adoption in Nigeria found evidence of societal/cultural issues (e.g. political interference and corruption) as hindrances to successful adoption, implementation and impact, this study did not find such evidence. The reasons being firstly that, cloud computing is a different technology altogether and end-users require minimal or no knowledge of the physical locations or configurations of the systems that deliver relevant services to them. Secondly, SMEs, which are the focus of this research, are mainly privately owned. The manner in which IS/ICT is introduced can vary significantly especially in terms of the number of actors involved in adoption decisions and implementation.

Finally, this research, through the lenses of the combined institutions and capabilities framework has also contributed to research on the impact of ICTs on development. At individual and organizational levels, the impact of cloud computing is apparently clear. Its adoption has been shown to be clearly as a result of the advantages it offers like upfront capital cost savings and improved reliability. Whilst it can be overstating to conclude that cloud computing is making an impact on economic growth at this stage, it is the view of the researcher that, an increase in awareness and internet infrastructure, as well as careful government involvement with regard to the laws/regulations governing cloud computing usage will result in more SMEs seeking the cloud option. Consequently, future metrics regarding cloud usage

by SMEs in sub-Saharan Africa will aid in determination of the 'actual' impact which the technology is making and whether or not it is contributing to the desired growth expected of these SMEs for their economies.

In summary, to answer the first research question posed in section 1.1, there is evidence of growing use (adoption) of cloud computing applications by sub-Saharan Africa SMEs. The most common SaaS cloud hosted applications and services that are used by SMEs range from simple cloud hosted email and data storage services to fully functional applications and services like the ones used for banking operations and Customer Relations Management. In answer to the second research question, the research found that SMEs considered issues like security, privacy and trust as playing a role in enabling adoption of cloud computing. This is in contrast with SMEs in the global north where these specific issues are discouraging adoption. In answer to the third research question, cloud computing adoption has impacted positively on the SMEs that adopted it as part of their strategy. Functional access to computing resources and reliability, cost savings and data loss mitigation are some of the benefits that are identified which can lead to sustainability and business growth. However, and as stated earlier, it will be overstressing things to conclude that a positive impact on the SMEs directly impacts on development in sub-Saharan Africa at this stage without more comprehensive metrics on cloud computing adoption.

7.2.1 Methodological Contributions

This study makes important methodological contributions. Firstly, the two different research approaches employed for this research, i.e. the initial exploratory pilot and second phases all benefitted the research in their own unique ways. As conducted by Walsham & Sahay (2006) to study ICTs in developing countries, this research also applied grounded theory to initially explore and examine the cloud adoption terrain in sub-Saharan Africa (from which different categories emerged) and subsequently developed a framework for analysis that uses theoretical underpinnings of the institutions theory and the capability approach to expand and substantiate (complement) the findings. Unlike Walsham & Sahay however, the grounded theory phase was not conducted by only scoping existing literature, but empirical data was also collected to examine actual cases of cloud adoption and/or decision to adopt in Nigeria. As such, the combined framework could be viewed as having provided a methodological triangulation and a functional way of analysing gaps due to initial data collection not being sufficient, and where information was obtained, it captured the issues that have changed over time.

Secondly, this is the first research study to employ the combination of institutions theory and the capability approach to study cloud computing adoption. Bass et al. (2013), posit that both theories offer analytical tools for interpreting and guiding ICT for development (ICT4D) interventions. One disadvantage of the combination however, is the large body of existing literature on the two approaches that may leave a novice researcher confused regarding where to begin. Another drawback of using the framework is the difficulty of mapping the influences (exciters and inhibitors) between the different dimensions.

Based on the experiences acquired in applying the institutions and capabilities framework originally proposed by Bass et al. (2013) and the conceptualized framework used in this research (considering that this research is larger than the previous ones conducted by Bass et al. (2013) and Bass & Thapa (2014), a modified version of the framework is produced in order to enhance its use in the future. This is shown in figure 7.1.

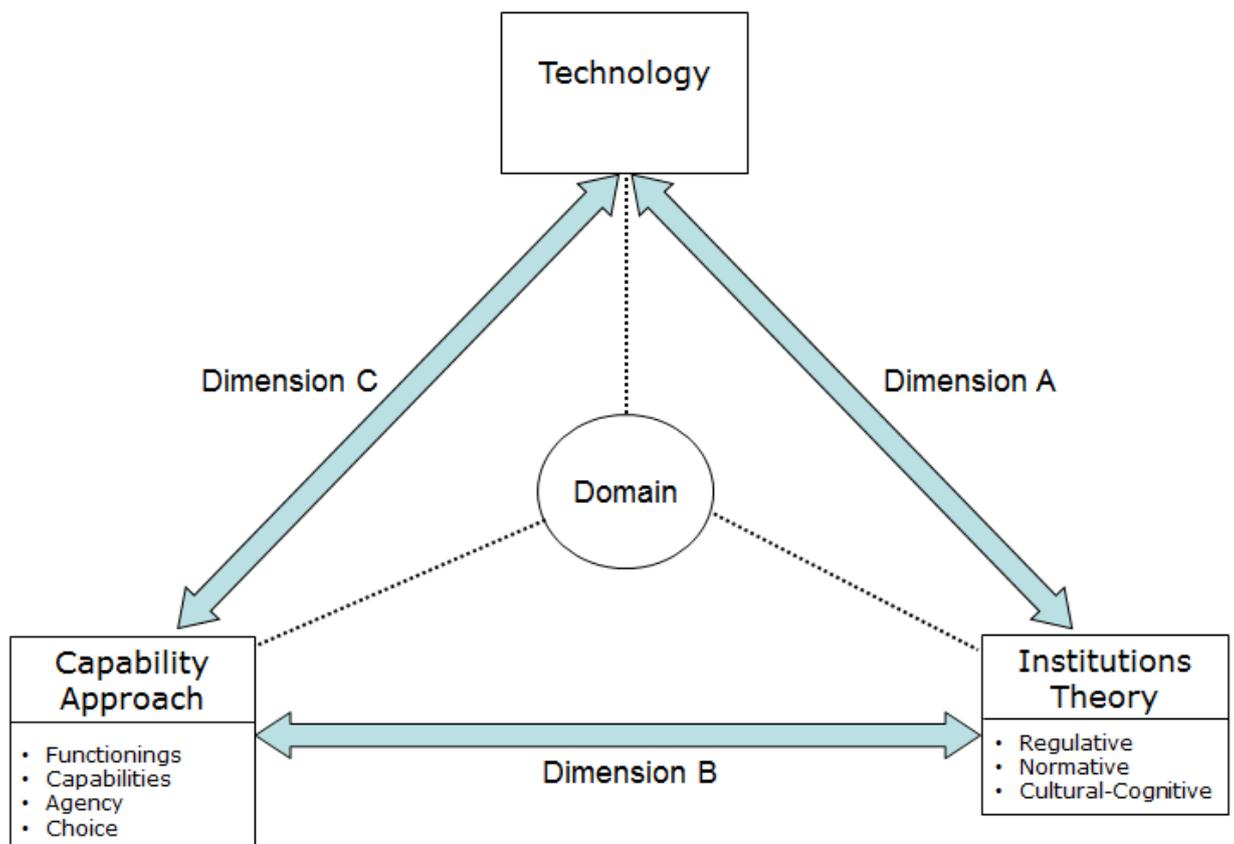


Figure 7.1 Modifications to the Framework applied in this research

The diagram builds on the original framework and shows the aspect of the two approaches the researcher can focus on. It adds the three pillars in the case of institutions theory component and capabilities and functionings in the case of the capability approach component. The dashed lines that connects the cycle in the centre shows the effect each component can have on the domain within which the technology is applied. The technology component could refer

to the new innovation (IS/ICT) that is adopted and is been analysed/evaluated.

In applying the framework to analyse cloud computing and indeed other new IS/ICT adoption/diffusion, and in line with the modifications as presented in figure 7.1, the following recommendations are also made for researchers willing to utilize the framework:

- a. To focus on the facets that are most relevant in both approaches, e.g. the effect of the three pillars to adoption with respect to the institution theory, and capabilities, functionings, agency and choice in the case of the capability approach.
- b. To view the two approaches as being complementary, e.g. institution theory for analysing issues affecting a group and/or a "top-down" analysis of issues and capability approach for analysing issues affecting individuals and/or a "bottom-up" analysis.
- c. To use elements of the institutions theory and the capability approach in the design of the data collection instrument in order to obtain rich and relevant data.
- d. The framework can be applied not only as a static or single mode of analysis but as something that happens over time, e.g. a second iteration can capture how a sudden change in government policy can affect adoption.
- e. In determining whether an effect is an exciter or an inhibitor, focus on the data, e.g. on the surface, an issue may look like an inhibitor, but on

further scrutinizing your data, it may turn out to be an exciter or enabler.

f. It is not necessary for a particular exciter or inhibitor only to appear in one dimension, e.g. a government policy on cloud usage in place can be an exciter by facilitating adoption in one dimension. The lack of policy can also be an exciter in a different dimension. For instance, legislating where data can be stored can strip parts of the technology of some of its strength thereby hindering the functioning of the provider which can further affect potential growth.

g. In the context of the SME, the functionings of a user is different from that of a person working in the SME. It is important to keep in view that different stakeholders have different motivations for use. It will be helpful for instance to distinguish the business owner from the user.

7.2.2 Practical Contributions

This research contributes to four main areas of practice which are useful to policy makers and entrepreneurs interested in developing IS/ICT infrastructure especially in sub-Saharan Africa.

Firstly, using the combined institutions and capabilities framework as a lens to analyse the adoption of cloud computing by SMEs shows that, although the SMEs investigated come from different sectors (finance, IT, education, etc.), they share many similarities in their fears and expectations (also exciters and inhibitors) and are all driven by the desire to gain from the benefits the cloud offer, especially in terms of cost reduction, availability and reliability. The reason for these commonalities cannot be exaggerated. For instance, all the SMEs are affected by the weakness or poor internet

infrastructure which may hinder/inhibit adoption but at the same time move towards the cloud due to lack of constant electricity which causes data loss and increases operational costs. However, there is a difference with respect to where the push for the technology comes from. For instance, whilst adoption is driven by both the owners and the users in IT oriented SMEs; it is driven by CTOs and the activities of the suppliers of cloud services in SMEs that are related to the education and finance sectors. Thus, in the case of the latter, if the capability does not exist, e.g. enlightenment and training is not provided, adoption might be unsuccessful.

Secondly, the framework also shows, from a general point of view, what the gaps are facing the adoption process itself. In essence, the framework helps to identify the different phases of maturity, development or adoption. In terms of the stages of the cloud services provision maturity model that was drawn from the framework, prospective users can carefully select service providers they can trust to deliver cloud hosted solutions that will strategically benefit and enhance their businesses.

Thirdly, cloud service providers willing to explore the sub-Saharan Africa market can use findings from the research framework to assist them in further understanding how SMEs in the region approach adoption. This research, through the use of the framework has outlined the fears and expectations of SaaS cloud users. For instance, security, privacy and trust, and fear of data loss which are uncertainties that users highly depend on, can be viewed as influencing cloud adoption, and exciting/enabling its use in sub-Saharan Africa contrary to what is obtainable in the UK for instance. Knowing this, providers can find better strategies to earn more trust from their clients and which

activities they can further be engaged in to create more awareness in sub-Saharan Africa.

Fourthly, it is the view of the researcher that, government regulators or policy makers in sub-Saharan Africa should be cautious in drafting policies regarding cloud computing adoption so that the policies (which are non-existent at present in Nigeria for instance) will not be detrimental to adoption. This is because it has already been established that the adoption of cloud computing has benefitted many of the SMEs in the region in a positive way. Furthermore, previous research in Nigeria (e.g. Jones et al., 2011) has shown the important role played by SMEs in economic and indeed other types of development, and the fact that this research has established the impact cloud computing has had on the SMEs that were involved in the research. Also, government agencies like Nigeria's SMEDAN and others similar to it in sub-Saharan Africa, that provide support for SMEs and have a blueprint of SME development through the use of ICTs, can determine who to target (the right audience) in each sector when planning the provision of training, networking or creating awareness with respect to cloud computing.

7.3 Reflection

In this section, three main stages of the research process are highlighted as points of interests to be reflected upon; a) the preliminary stage; b) methodological issues; and c) writing task and final journey.

- a) Preliminary Stage: Initially every aspect of this stage was exciting. Perhaps the most significant challenge was designing the research and coming-up with a strong and valid research questions, aim and objectives. There was the challenge of overcoming the scope of a

Master's degree project and this resulted in several proposals and the directions chosen for the research being rejected. The solution to this for future researchers embarking on a PhD study is the need to be self-motivated, creative and develop intense curiosity. The processes involved in the preliminary stage, if done correctly, will force researchers to re-think their ideas and establish a foundation for rigour quite early in the research.

- b) Methodological issues: The initial data collection was good enough to get a conference paper and journal publication. However, the lack of experience in using the grounded theory approach and in conducting semi-structured interviews at the beginning of this research may have caused initial data collected to lack richness and depth. This led to the development of a new approach in order to substantiate and refine initial findings and more so to collect rich data. With the benefit of hindsight, experience and training in the use of qualitative methodologies (which the researcher has now acquired) before setting out to collect data can save time and resources.
- c) Writing Task/Final Journey: from the onset, the supervisory team and the researcher had a plan regarding the writing-up phase, which is to start off with publications in conferences and journals and then expand such publications into sections and chapters in the final thesis report. This proved to be a useful strategy. However, the danger in this approach is the potential risk of relaxing and thinking that because two or three publications are in sight or out there, thesis write-up is done. This is not actually the case, as the style and amount of information required in each section or chapter is different. A lot of difficulty and

valuable time may be lost whilst re-arranging and re-writing ideas from previous publications. On balance, the idea that the write-up is not starting off on a blank page improves researcher's output and increases confidence to face the final examination (viva).

7.4 Future Work

This research begins to fill the literature gap identified in cloud computing adoption by SMEs and indeed the gap in researching information systems in developing countries especially the neglected region of sub-Saharan Africa. The research can be extended by considering cloud adoption by larger companies in sub-Saharan Africa which is equally under-researched. Investigating how to mitigate risks in adoption by sub-Saharan Africa SMEs and larger organisations alike is another interesting area of extension.

A longitudinal study can be conducted to collect primary data from more countries in the region. Since the framework has shown that different industry/sectors can have similar or different exciters and inhibitors to adoption, future researchers can examine potential adoption issues by industry/sector. The weakness of the framework has also been identified as being the difficulty in mapping the data due to the presence of functionings across different stakeholders. So, investigating issues surrounding cost for instance which appeared in all dimensions of the framework may be found interesting as highlighted in chapter 6. The modified version of the framework together with the recommendations provided can be utilized for that purpose.

Further research can also be conducted to investigate if technologies like cloud computing can mitigate societal/cultural issues in regions infested with

such problems (e.g. political interference and corruption), for instance in public enterprises.

Without comprehensive metrics on cloud computing usage in sub-Saharan Africa, the ability to generalize and draw conclusions on the actual impact of cloud computing adoption is limited. Future researchers may wish to conduct a quantitative study with an interpretive viewpoint as suggested by Walsham & Sahay (2006), and the framework can be used to triangulate as successfully conducted in this research.

Future research can also compare this research framework and other established IS/ICT adoption frameworks like the technology, organization and environment framework (Tornatzky, Fleischer, & Chakrabarti, 1990) in which this researcher has an interest and on which he has already begun work.

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Appendix 1

IS Journals consulted include but were not limited to:

MISQ – Management Information Systems Quarterly

ISJ – Information Systems Journal

JMIS – Journal of Management Information System

JSIS – Journal of Strategic Information System

ISM – Information Systems Management

ICT4D journals consulted include but were not limited to:

ICTD – Information and Communication Technologies and Development

ITID – Information Technologies & International Development

EJISDC – Electronic Journal of Information Systems in Developing Countries

ITD – Information Technology for Development

AJIC – African Journal of Information and Communication

Appendix 2

Interview Guide

About the technology

- Do you use (or have you previously used) any software applications to support the services you offer and management of daily schedules? e.g. billing or accounting, emails, etc.
- If yes, Please describe this software application in terms of the soft and hardware requirements needed for its proper functioning
- Can you also tell me how the use of these software applications has aided in achieving your organization's objectives?
- How did you acquire the software apps you use?
- Are these applications installed on your network systems (in-house)?
- Do you use any software applications remotely on (via) the internet?
- If yes, can you describe the software app and how it was deployed and now delivered to you via the internet?
- How secure do you think any information/data you keep on the internet is?
- What about privacy and trust issues?
- Can you further describe the network infrastructure on this premise, for instance, intranet, servers and storage etc.
- How secured will you say are your in-house servers and storage when compared to internet delivered services of same
- What about data loss issues?

- If you do not use remote applications delivered through the internet, have you heard about or used any software apps e.g. Google apps, Microsoft 365, SharePoint, etc. before?
- Does cloud computing mean anything to you?
- What about software as a service?
- What challenges do you face while accessing the cloud hosted services or apps via the internet? (e.g. Hard/software or service provider related?)
- What personal challenges or threats do you feel the use of these cloud hosted apps have posed or will pose to you in the nearest future?
- Can you briefly compare the experience you've had in using software apps delivered remotely on the internet to when these apps were installed in house? (e.g. in managing software upgrades and maintenance, cost, etc.)
- What are some of the things that you have really liked about the use of this new apps and how they are deployed?
- Describe your roles in designing, implementing and deploying the cloud hosted software applications you use?
- So far, what has been the greatest accomplishment the use of cloud hosted applications has derived?
- Based on your experience, what would you say are the strength of using software apps hosted in the cloud as opposed to in-house maintained software apps by enterprises like yours?

- How effective or efficient do you think the use of software apps hosted in the cloud has been to your enterprise?
- Can you describe the services you offer and how cloud hosted apps come in handy in the delivery of these services? (e.g. to your clients, government, etc.)
- From your experience, what factors influence or encourage enterprises like yours to use software applications hosted in the cloud?
- What about those factors that will discourage such use?
- What other impact has the use of cloud hosted software applications had on your enterprise?
- How have government policies on enterprises like yours affected the ability to use (or not) cloud hosted software applications (outsourced) from foreign companies? (e.g. In terms of support, restrictions, etc.)
- Where do/did you get information about new technologies from?
- How long have you been using the software application(s) remotely?

About your Enterprise

1. What is the size of this enterprise?
2. What is the name of your department and how many people do you work with?
3. Any idea about your customer base?
4. How is decision making organized?
5. Who is in charge of design/implementation/deployment of Information Systems in the enterprise?

About You

1. Can you tell me your full name and age?
2. What is your role/position in this enterprise? (Management/technical staff)
3. How long have you been working with your current organization (in this position)?
4. What experience or formal qualifications do you have?
5. When did you qualify for this role?

Appendix 3

Consent for participation Form

Topic of Research: Cloud Computing in Sub-Saharan Africa

Researcher: _____

I have been provided with and have understood the information regarding this research and the confidentiality conditions. I have been given the opportunity to ask questions and have them answered to my satisfaction.

I agree to be interviewed by _____ for the purpose of this research contributing towards a PhD degree and resultant thesis and conference paper publications. I also understand that I may withdraw from this research up to 30 days after the data collection/interview.

I give my consent to the collection and use of my opinions, perceptions, information and experiences during this research.

I agree to have the interviews sound-recorded (to reduce the risk of interviewer not being able to note down all information provided by interviewee)

YES NO

I would like to receive a copy of any publications that are based on these interviews?

YES NO

If yes, please provide an email or mailing address below.

Name: _____

Signed: _____

Date: _____

Appendix 4

Sample Interview Extracts (transcripts)

1. Transcript of Interview with SME-G, IT/Networking Company

QN: What do you do as a company by way of introduction?

ANS: Well, Thank you very much, my name is Mr X (not real name), I am the head of sales for SME G. SME-G is uhm... IT Solutions Company that was uhm, registered in the early 90s. What we do is uhm, we as a solution integrator we need to have various partnership levels with OEMs like CISCO, which we are gold partners as well as uhm, we have other vendors like EMC, HP, ORACLE, and a lot. You need to have certain level of partnership now, one of the advantages of being a partner is you work within some certain rules and regulations that this OEM partners allow. We happen to fall into groups that are called channel partners. Now the laws establishing OEMs does not allow them to go down to do actual deployment. They as OEMs, if they have a contract where they need to do a deployment they go through channel partners, i.e. companies like us. We are actually the companies that do the end roll deployment. So in cloud computing being a new technology that is taking over the entire IT infrastructure around the globe, basically what is cloud computing? *it's just a source of resources provisioned to provide uhm means to customers to do their daily operations and applications without actually acquiring the cost of setting up those infrastructures.* Somebody that needs clouds services does not need money to acquire a data center. He can just buy the services. We have some cloud services online like Rackspace which provision service and storage for clients so that you can just go online and buy exactly what you require depending on what application needs you have or data base size that you require. So you see you cut down on cost because you are only buying exactly what you need. You don't buy more than what is required and the way the cloud infrastructure is structured is scalable, it can grow with your application or your database. So the more your company is growing or your business is growing the resources grow with you. So you don't actually need to be thinking of okay, what do I do in the future when my resources start getting exhausted. So you can just apply for more resources within the cloud infrastructure. Now MA as a company has uhm, deployed some solutions, because we deal mostly in the public sector, that is government, MDAs. Now we just concluded one at CBN, because CBN did an IT refresh, so they had now come up with their own internal cloud infrastructure, because of the security sensitivity. They have their own private cloud from within their own organization, where all their applications and their servers are being hosted. Now the infrastructure that was setup uses the CISCO flexport solution which is a unified server fabric solution from CISCO that consist of CISCO networking switches, MDA san Switched, Unified Computing servers, as well as storage from NETAP which is also another company that deals with storage. Now the flex port solution is a unified infrastructure where by you have networking server, storage all combined into one infrastructure. It is just a rack whereby you just push it into the data centre. Now that is one of the services we have provisioned.

QN: What are the most Popular cloud hosted services that you know of?

Well we think about it as Nigeria is a little bit slow when it comes to grabbing new technologies out there. It is only now that banks are moving into the cloud infrastructure solutions. But in the past each and every one of them has their own private data centres within their house. Now most of them are thinking of having their own cloud infrastructure.

QN: Do you think of any reason that comes to mind as to why there is slow take up?

ANS: Well u see one of the reasons might be security reasons, most companies don't believe that they boost their services on a cloud infrastructure that is not privately owned. They believe they are exposing themselves to hackers and what might be out here. But gradually they are beginning to understand that the cloud services does not actually means the public one. Apart from the public one you as a company can also develop your own private infrastructure that will be useful to your own entire organization, no matter where you are that is if you have a wide geographical spread

QN: Do you think in-house provided Security is more secured?

ANS: Well it all depends on the ideology of the respected companies. Some companies take security literally very strongly like uhm, if you look at industries or companies that have to do with maybe defence, now there is no way you can convince somebody in defence to host his services on the public cloud, they will tell you that will never happen

QN: Any regulatory hindrances, e.g. location of data outside the country?

ANS: Well you see uhm, Nigeria is still a little bit premature when it comes to regulations on IT, but recently I have seen the National Assemble trying to come up with laws that will definitely govern the IT industry in Nigeria. But basically the restriction that you have with regards to placement of your infrastructure are not actually very active as of now, but eventually as the IT infrastructure is growing and people are beginning to become more aware, definitely certain types of legislations have to be put in place so that you can have a kind of control on the entire IT cloud infrastructure

QN: What about deployment you have carried out, any positive feedback so far?

ANS: Definitely because what we have done so far is that we have changed the way they work, we have taken them up another notch, they have seen now a lot of professional efficiency in the way they work and the cost of operations has really gone down. There is evidence of actual cost savings and most of the daily routines have become automated, so it has gradually shot down on errors being made, man made errors within the system.

QN: What about privacy and trust issues?

ANS: Well they don't, uhm since it is their own private infrastructure, that doesn't arise since it is within their own organization and it is not something open for people from outside to access. You can only access that if you are within the CBN network. So it is a kind of close environment.

QN: Do you use any form of cloud service in-house?

ANS: Yes we do, some of our, like our windows SharePoint servers, our active directory are all being hosted on rackspace. So these are all hosted technology. It is not that we don't have servers in house, what we are looking at is availability, where ever you are in the world anywhere you are if you need access you can get it.

QN: Any issues so far with your providers?

ANS: Well actually we had not have any significant problem or issue with the provider of the cloud infrastructure, but as you know in Nigeria you have problem of connectivity, internet at times is a little bit erratic, we get some downtime with the service providers, apart from those down times actually from the cloud infrastructure providers perspective we have not actually had any cause for alarm.

QN: Do you feel threatened by loss of control of your data?

ANS: No not at all we believe that the cloud infrastructure is the future and we are trying as much as possible to see to it that we get people on board.

Cuts in -- is there the awareness? Yes definitely that's even though it is a little bit on the low key, but we as a company have like for the coming year 2014 are organizing some workshops and seminars whereby stakeholders and customers alike will be invited so that we can now showcase this cloud infrastructure so that they can understand this is the way forward when it comes to IT.

QN: Any other challenges apart from awareness?

ANS: one other aspect that comes to mind, is as you know in Nigeria there is the power issue, the FG has so far sold it (PHCN) to the private sector... So we are waiting to see

QN: Do you think the Power issue will push people to the cloud?

ANS: Yes, exactly, because if you look at the cost savings, you don't have to build a data centre, you don't have to make provision for power, cooling and space. All that has been taken away from you. Right now, what we are also trying to do, we are not only looking at the big enterprises, the hotels, the workshops, the supermarkets, low, earning businesses... You see most of these people out there don't have that. We have started building them in-house programme targeting supermarkets like SAHAD and what have you. To show them that you can have these facilities.

QN: Threat to Jobs of IT staffers?

ANS: Well you see whenever you have change, at the inception of that change, definitely you will meet some little resistance, but we believe a way of tackling that is by awareness. You see people always fight something they don't understand, but if you give them information, you now show them that this new technology is going to improve the way they work and is not going to take away their jobs, the resistance tends to dissipate and you find people actually adapting the new changes.

QN: Personal important lessons you have learnt?

ANS: Well, I believe the cloud infrastructure is the future of IT, its actually connected the whole world, data centres across the world are now becoming consolidated and I believe if it is truly adopted within Nigeria I believe it will cut down seriously on some excesses of funds especially within the (government system).

QN: Can you describe your role?

ANS: As head of resale, I work collaborately with my sales team in terms of when you are qualifying an account, with our prospective customers and they need the technical aspect of the solutions to be explained in detail, so that you are able to get a buying form the customers, there is where we come in and go to the client and do workshops presentations basically give information to the customers so they understand the solution we are doing and also at the same time we try as much as possible to get the challenges so that when we are designing the solutions we try and tailor it to address those challenges and

we try as much as possible to align with business so that we can bring value to the users.

QN: How much training is required by clients?

ANS: Just basic internet training, if you are able to browse and login to the internet, with just minimal training you will know how to actually provision the services for your company.

QN: Recommendations?

ANS: Well uhm, there is this notion within the country that if you actually look at uhm, developed countries everything is moving to applications, CISCO is moving away from hardware. They are moving to software because they are trying to virtualize their hardware to reduce the bottle necks when it comes to, it is easier to manage a software that to manage a hardware. As you can see, technology is moving we are now getting to 100s of GB of speed, so technology is evolving to meet up with these new technologies that are coming up, there is where the future is.

QN: Top Management issues?

ANS: Well like I said earlier change is a little bit hard for people but uhm, mostly the psyche of the management is key, cos if you don't get a buying with the management, hardly will any IT proposal see the light of the day. So we try as much as possible to do workshops and seminars. Most of these workshops are targeted at key stakeholders within an organization. Now these key holders might be the CIO, CTO or Executive management. During these workshops they are tailored where by the ones for Executive Management is not too technical but the business value because a top management doesn't want anything to do with the technology but expects the CTO or CIO to handle that aspect. So even the workshop that you tailor you have to look at what level you are looking at or the one you are giving the presentation to. That is very key because if you don't get the buy in form the management, hardly do you have success.

QN: So what are strength and weakness?

ANS: For a country like Nigeria what I will say the weaknesses are is maybe loss of connectivity or power, if you are in an environment where you don't have a good internet access, then the aim of aspiring to cloud infrastructure is defeated because you are lying to yourself as the service is not going to be available then there is no need for you to invest into it. But uhm, the advantages if it is available far outweighs its disadvantages because you have huge cut on expenses and when you look at return on investment, its actually

wonderful, because if you try to quantify the value of what you are getting for what you are paying, it is not measurable at all.

QN: What about the PAYG feature of the cloud?

ANS: It depends on what the actual customers want. Some people go for PAYG, they will pay for the service as at when they require while others ask for a bundle. This one buys license for a long period of time.

As for us, what we do we buy a bundle service and pay annually, because uhm... we run a company that generates data on a daily bases so most of these data needs to be uploaded to those infrastructure so we don't just buy it as we need it because that infrastructure or resource has to be available 24/7/365 days in a year. We don't want a situation whereby maybe when you require it and there is an internet access problem and you don't get it when you need. So we buy a license for a long period of time.

QN: How are SLAs reach in both scenarios?

ANS: You see, we are just actually concluding an ISO standardization, MA as a company, we are being (1000&27000) ...which is service management as well as information security service management. Now what that entails is that it gives you guidelines and rules of engagement when it comes to how you work internally and how you work with customers. Now one of the standardization policies is if you are going to provide service to a customer, there has to be an agreed service level agreement but if you are going to have a third party contractor, i.e. like MA, we normally have what you call an underpinning contract between you and them, there will be guidelines of engagement as stipulated in that contract, where both parties are required to adhere to the rules and regulations that are stated within that contract. so that is how we interact with third party vendors like people that provide cloud services for us.

QN: Is there an organization or body that hold you as a provider responsible for not adhering to guidelines?

ANS: There is the Nigeria computer.... (CPN or so) there is a professional body actually that monitors the services provided by all IT companies. Now we tend to as much as possible to see to it that we don't flaunt the SLAs that we have reached agreements with respective customers. But clients having issues with us can definitely take it up with the body

QN: How long have you been using cloud services?

ANS: Internally this is about our third year and as a provider we started deploying last year, but moving ahead we are trying as much as possible to see to it where we can have our own cloud infrastructure so we can now sell

services to people. We are trying to make it local, when we have customers that start thinking, I have to put my resources somewhere that I don't know they become sceptical but when they know that this company is here in Nigeria in Abuja, they get connectivity directly into this infrastructure, I believe it tends to give them a more comforting view to enable them actually try and see the benefits.

QN: What is your Customer base with respect to the cloud hosted services you offer?

ANS: No, the cloud services as an enterprise solution right now we just rounded up with CBN, we are actually looking at other MDAs

QN: Any SMEs amongst them?

ANS: as I just told you we are just doing ISO re-organization so our business unit can be focused on SMEs. That is what we are looking for in 2014 and beyond, so hopefully by next year definitely the business unit would be moving out there to see how we can get a buying from businesses for the cloud services

QN: Do you have any comments for our research group?

ANS: It's an opportunity as it is not every day you get opportunity you see people do research on future technologies out there.

2. Transcript of Interview with SME-O, IT/Cloud Solutions Broker

Qn: Thank you for agreeing to participate in this ongoing research. Can I know what software apps you offer as services to enterprises?

Ans: Presently I am working with SME-O and the kind of cloud software we are packaging at this time is the MTN SaaS Cloud Platform. It is dedicated to serve microfinance institutions in Nigeria. The basic background of the platform or the solution I can say is to actually take away the capital expenditure requirement that is needed to actually run the core banking applications by the MFIs to run their business. So we partnered together with Company X to come up with this solution to offer to MFIs, that includes microfinance banks, mortgage (institutions), every financial institution that falls within the micro categorization.

Qn: Just what exactly does it do?

ANS: it is a core banking application. The solution enhances them to do their full banking operations. It kinds of offer to these MFIs a solution that will enhance them do their normal banking applications without necessarily having to buy servers and storage... So they can just subscribe to it.

Qn: Can you quickly say what users may require before they start using the SaaS?

ANS: Basically, Ahhm, you will expect an MFI to have designed what their operation is in terms of e.g. loans savings, credits, deposit and what have you. They may have decided clearly what and what their basic operational activities will be. So all of this put together will enhance us at this end customize the solution to meet their need. They only require internet connection to access it.

Qn: Can you describe the process of acquiring these solutions/services?

ANS: They can subscribe to it. It is basically based on subscription. We are not fixed on how we (bring) on board individual MFIs because what we are saying is that most of these MFIs do not have the required capital to use good and reliable solutions. So what we are saying is that lets understand what their business is, what their needs are, (and) then we constructively advise them on what to do, and what the cost price is for each solution.

Qn: Can you give them the cloud computing pay as you go feature?

ANS: That's what I am saying; it depends on what business they are doing. We don't have a fixed way of selling (our solutions), we actually help. You know this is microfinance; this is actually helping people develop what they do. The Idea is to enhance developing the microfinance sector.

QN: Any positive feedback from your clients so far?

ANS: Sure... as a matter of fact as far as time is concern now, we are beginning to see, you know, huge interest and buy. There has not been any form of complain. That means that solutions actually meet every industry and operation requirement. So as I speak to you, our solution is flexible, is cheap and it is easily customized. So if you come up and tell us we want this, can we have something like this, we look at it and we tell you what we actually aahh (show you) then we customize with you the solution to meet that specification.

QN: When did you start and how many MFI have you got so far?

ANS: Running into a year and some months now, okay? In terms of ahm customer base, I may not have the free as in free hand to disclose that but the bottom line is that the solution.. ahhm in the pilot we are looking at, our hands are very full. That's why they've been calling and everyone is engaged. Actually we are even running it here in Nigeria and in Ghana. We are pushing it as far as Uganda and our target is across Africa. We are sure of what we have and we know it meets every international requirement and best practice.

QN: is there homogeneity in what clients in Nigeria and Ghana for instance require?

ANS: I was in Ghana a couple of weeks ago; we worked with indigenous institutions to understand what are the specific requirements and the peculiar industries. We don't copy and paste. Cloud services used in banking has to do with data services so you cannot just put one pipe into another. So you have to get the understanding of the market is then you can now customize to actually fit and address the challenges in each MFI.

QN: Is the MFI solution the most popular?

ANS: Sure, sure... as it is now, even the big banks are all looking at the retail market and the only way you can target and exploit the retail market is through solutions like this. For big banks they find it difficult to bank those people at the bottom of them because the critical expenditure they need, they require to bank them is very high. So solutions like these enhance them too. The advantage is smaller banks coming up and bringing everybody to play at the financial side.

QN: What about range of customers?

ANS: in the pipeline here in Nigeria we are looking at 10-15 at different stages.

QN: What about growth rate, is there the demand?

ANS: Sure, am just speaking with the senior manager and she told me that the clients that we have engaged in the past and said no! no! we are not ready are now coming up and telling us we want this we want that. We want to get on board we want to subscribe you now.

QN: Do the clients show any form of security concerns?

ANS: Our solution is very secured, our customers are impressed. Normally when they are coming on board, naturally the have questions about security. So they do ask and we give them our security specifications so security wise we are good to go...

QN: What about Privacy and Trust issues?

ANS: Every individual bank has got its own private line... VPN attached to it. SO the privacy and security issues are taken care of.

QN: Do you thin privacy & security issues can prevent SMEs or MFIs from taken up your solutions?

ANS: Sure.. Some MFIs do not have any idea of what we are talking about, privacy, database, sharing and what have you, but few of them that have questions only worry about the services and tell us they are okay with it. The issue of privacy and security is as big as your business and the entire of your business portfolio. so if these concerns are not taken care of even at the implementation stage (we apply) ahm we have provision to take care of this, and how our systems takes care of this and ensure individual privacy.

QN: Are the clients convinced that it is?

ANS: Yes

QN: What are the major challenges you face?

ANS: Ahm... as far as we are concerned at the initial stage it is natural for every business to struggle at the beginning. So at the initial stage most of the MFIs find it difficult to adopt. The usually say we don't believe in this... it is another way of putting us in... You know, that industry acceptance is always an issue. Okay, aside that, ahm, regulatory wise we can say this is Nigeria, the environment is different from other countries. That's why I told you, you need to go into each place and understand what the regulations are. In Nigeria you know the MFI sector is just everywhere, the CBN is just waking up to its responsibilities. So we have a number of articles in the past that have actually kind of affected the industry. The MFI tells you CBN say this or that, but the fact is that regulation is one of the key challenges we have. The industry is not, you know this is microfinance which is very very important to the actual development of the Nigerian environment. The masses belong in this sector. The big banks you have today with years of experience have been only able to bank 30million Nigerians. We still have about 100million that are not banked, so which this MFIs are the only ones that are close to them. SO the CBN needs to really do more in helping/working with us to develop these MFIs

QN: Are there also policy issues that have to do with where MFIs are allowed to store their data?

ANS: No on data storage no. Those are technology issues.

QN: Are there companies in Ghana you can store their data in a Nigerian data center for instance?

ANS: Technology wise it is possible... but ehm, operational wise and best practice it shouldn't be. Even among the big banks today that their data are not in Nigeria, mostly that rely on foreign technology (and) have to play by their rules. So for each country we provide service, we establish our data centre to help them get the resources they require to manage and do their operations right there.

QN: What other challenges?

ANS: There is the issue of internet, and in terms of coverage and facility Nigeria is still coming up. It has always been a challenge. We use company X, which is what the benefit of the partnership is. Company X is both internet and GSM service provider. At times we bundle the solution with several other products like internet and database and sell, okay? Internet will always be a challenge even to big banks.

We sell value propositions to help enterprises achieve their objectives. The basic idea is to provide the required support to customers not to just sell and go away

QN: What about implementation issues (and Failure) without achieving the desired impact?

ANS: The question is why do they fail? Why have they not succeeded, the basic idea of service is that what I am taking to the market for sale, does it answer certain questions in the market, does it resolve certain outstanding issues/problems, if your solution is not answering this questions then you've got yourself a problem

QN: Do you believe the MFIs are cloud ready?

ANS: Today we have over 1000MFIs in Nigeria; the percentage that actually has a defined banking solution can be as less than 5%. So they cannot afford. If you automate rubbish, you get rubbish. A number of MFIs are switching though to our platform.

QN: What have you personally learnt so far?

ANS: Basically before now, my passion has been to innovate an apt financial solution, innovate about people's development, and innovate about economic empowerment. MFIs today not just in Nigeria, the target are for them to be used as developmental tools. SO my understanding is that this is actually an avenue to give something of value.

QN: Cuts in:-You believe some form of development can be achieved....?

ANS: Not just some, Huge development would be passed on.

QN: How do you think we can measure this impact?

ANS: Like I was telling my colleague today, development/growth of Nigeria's GDP is 6.8. I looked at it and said growth is actually not development, growth is increase in income, okay, actual development is growth buckled up with structural changes, societal changes, so if the CBN is telling you they've seen 60 or 70% growth rate in GDP but in reality we are not seeing movement from bottom to the middle or top, that is not development. The only way they can do that is to groom people financially, support and capacity building. What does MFIs do, the give loans and credit, what are the loans for, SME business. In the multiplier effect of it, you get to improve peoples' standard of living. Growth is not impacted until... The CBN should wake up and work with parties like us to actually develop the MFIs helping the people in the long run.

QN: Any threats?

ANS: That is where the regulations come in.

QN: Do MFI personnel feel there is a job threat?

ANS: No no no... What I see as threat are the regulations and operational activities of other big banks. Regulations... you will see in Nigeria the regulators come up with articles, regulations that sometimes hinders the progress of these enterprises.

QN: What have you really liked about the delivery of these services?

ANS: I am happy with what I am doing, for the fact that I hear people telling me this is what I want to do, I have been struggling with it for years and I give them answers, you create value and solve problems. And when you answer an average MFB, whatever their customer base is that means you have given an answer to say 50 or more thousand people. You have helped them in certain ways, you have empowered them.

QN: What is your role?

ANS: I am the business and strategy development manager. I handle technical and business end of it. We drive innovation, we drive research and engagement. So I research into it do analysis and consult. Look at how best we can create value.

QN: So what are your recommendations for use or delivery of cloud services?

ANS: What I want is the CBN should (you know this is an industry of over 1000 MFIs not to talk of SMEs) these our solutions not only answers SMEs, it answers Mortgages, savings, debits and loans. Let the CBN come up and enter this industry. Some of these MFIs are confused. They need some form of regulations to guide them. Let them certify several solution companies to develop solutions and recommend them for these MFIs. With that you will have guided the MFIs and position them for development. We too can be regulated through such medium.

QN: What kind of training have you undergone?

ANS: Training in this area is every day. As for the MFIs when we are setting them up we train them on the technical aspect of it, operations, we deploy with them and we give them certain training on the business environment.

QN: Can you describe the strength of your software solution?

ANS: We are very high we cover almost every aspect of banking operations. The basic thing that people look for is reconciliation and e-banking and we have them well set out

QN: What about Weaknesses?

ANS: I have not seen any, the fact is every industry required till date we satisfy them.

QN: What do you think will encourage SMEs to buy into your solutions?

ANS: The value we are bringing on board, we integrate to ATM channels/cards, we integrate into government, institutions and commercial banks we are building agency banking into it, we are building mobile money into it, so we are creating value, so the value everyone wants to see we are bringing them on board

QN: What do you think will discourage the use?

ANS: The only thing that will discourage them like I said is lack of awareness, once they don't know what this solution offers to them they will still remain in the dark.

QN: What about SLAs?

ANS: That's right, we have it, then we look at what they do and we tell them how best they can do what they are doing and our support is always on. We have our support team, if you have any challenge you call us and we deal with it.