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Assessment of Ethio Telecom Readiness for the Implementation of Cloud Computing Services

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List of Abbreviations

API -----Application Programming Interface
CSP---Cloud Service Providers
DB ----Data Base
EBS ---Elastic Block Storage
EC2 ---Elastic Compute Cloud
ECE--- Ericsson Composition Engine
ELB ---Elastic Load Balancer
e-LRS-- e-Learning Readiness Survey
IaaS ---Infrastructure as a Service
IBM ---International Business Machine
ICT---- Information and Communications Technology
ICTs--- Information and Communications Technologies
IT----- Information Technology
ITIL --Information Technology Infrastructure Library
LAN--- Local Area Network
MNO ---Mobile Network Operator
NGN ----Next Generation Network
NIST ----National Institute of Standards and Technology
OSS -----Operations Support System
PaaS---- Platform as a Service
QoS ----Quality of Service
RDA--- Reference Deployment Architecture
RDS---- Relational Database Service
RHEL ----Red Hat Enterprise Linux
SaaS---- Software as a Service
SAIL ----Scalable and Adaptive Internet solutions
SC----- Service Control
SCTP ----Stream Control Transmission Protocol
SDK ----Software Development Kit
SIP -----Session Initiation Protocol

SLA ----Service Level Agreement
SMB ----Small Medium Business
SOA ----Service Oriented Architecture
SPI -----Software Platform Infrastructure
SQS ----Simple Queue Service
TQM ---Total quality management
VLAN ----Virtual Local Area Network
VM ----Virtual Machine
VPC ---Virtual Private Cloud
VPN ---Virtual Private Network

Abstract

Cloud Computing is an emerging technology for processing and storing very large amounts of data. It is becoming popular among organizations because of its potentials such as cost reduction, on demand self-service, broadband network access, Scalability and flexibility, rapid elasticity, reliability, and user centric interfaces. Although Cloud Computing promises many benefits, it is equally important to note that there are some barriers to its adoption which needs to be considered before adoption in order to ensure implementation success. Proper understanding of these barriers and coming up with ways to mitigate them will improve the Cloud Computing readiness level of organizations.

The purpose of this study is to assess the readiness level of Ethio Telecom to implement cloud computing services. In order to achieve these objectives, this research has used Bakry's e-government assessment model, the STOPE model (Strategy, Technology, Organizational, People, and Environment). Validity and reliability tests were conducted using Smart PLS 3 software package. The demographic survey data was analyzed using SPSS version 16, and descriptive and analytical statistical reports were generated using Smart PLS 3. The survey questionnaire and interview contents were prepared based on the defined research model by partially adapting from existing literature. A pilot study was conducted with a sample of 35 in order to test the validity and reliability of the questionnaire. The quantitative aspect of the study involved 100 employees from Information system, Customer service and Marketing and communication departments of the organization with different work experience. In the qualitative study, direct interviews were used to collect data from 10 Top management members of Ethio Telecom. Moreover, document analysis was used as a secondary source of data to gain more information and to triangulate the findings.

The STOPE model results from this study show that **Strategy** has a strong relationship with **Technology, Organization, People** and **Environment**. Besides this study also shows how lack of Readiness to implement cloud computing affects all domains specially organization and people readiness to adopt cloud computing.

This study also use an e-Learning Readiness Survey which helps to gather a real assessment from top manager. E-Learning Readiness Survey constructs **Technology, Innovation, People** and **Self-development**. In addition to these each factor has three different constructs: Resources, Skills and Attitudes. From this assessment this study gathered the perspective of the top level manager for their employee and the gap they have. Based on the two e-assessment instrument and Qualitative data gathered by interview the research has put some conclusion and recommendation for future work.

Keywords: cloud computing, cloud computing readiness, cloud computing implementation, STOPE.

CHAPTER ONE

1.1. Introduction

Cloud Computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (such as networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud Computing has become prevalent among organizations looking for a cheaper way to access needed infrastructure, service, and/or applications and has changed organizations perception of software, infrastructures and development platforms (Olumide, 2014).

Cloud Computing is fast becoming a necessity for organizations to remain competitive and do their business faster with less resource than they would have used without Cloud Computing. It helps removes the cost of buying, installing, maintaining and upgrading hardware. Other benefits of Cloud Computing includes scalability, ubiquity, flexibility, and its deployment is quick and easy (Nitin, 2011). This study details a study on the assessment of Cloud Computing readiness of Ethio Telecom in Ethiopia.

1.2. Background

Cloud computing is a practice of using network of remote servers hosted on the internet to store, manage and process data rather than a local server or personal computer (Nitin, 2011). Cloud computing provide users and enterprises with various capabilities to store and process their data in third-party data centers. It relies on sharing of resources to achieve coherence and economy of scale, similar to a utility over a network. The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams.

Cloud computing use three service delivery models Software as a Service (SaaS), Platform as a Service (PaaS), IaaS (Infrastructure as a Service) and four deployment model: private, public, community, or hybrid cloud (Nitin, 2011).

Readiness is the ability of an organization to successfully adopt, use, and benefit from a technology (Fathian, Akhavan, & Hoorali, 2008; Olumide, 2014). Cloud Computing readiness can therefore be defined as the ability of an organization to successfully adopt, use, and benefit from Cloud Computing. Cloud computing readiness of an organization can be defined as “the ability of the organization to successfully adopt, use and benefit from cloud computing through efficient use of accessible resources” (Alemayehu, 2015).

In order to ensure a successful achievement of cloud computing and properly manage changes that occur as a result of cloud computing organization need to implement cloud computing, the organization should determine their level of readiness for cloud computing to determine their suitability for a successful adoption. The lack of readiness for a technology before adoption will lead the implementation failure of many technology initiatives and this shows that it is important for organizations to assess their readiness before adopting Cloud Computing. The aim of this study is to assess Cloud Computing readiness level of Ethio Telecom in Ethiopia and identify the barriers and enablers of Cloud Computing in Ethio Telecom.

1.3. Statement of the problem

The advent of cloud computing has rapidly triggered interests in many industries, especially in the developing countries. Theoretically, cloud computing reduces infrastructure costs, and leverages the service demand and resource supply. However, issues, such as broadband connectivity, security, contract issues and regulatory environment hinder this adoption in both the private and the public sectors. Moreover, in order to efficiently and effectively initiate a successful deployment of cloud computing, a comprehensive examination of the current state of readiness is vital, especially when taking into consideration the unique opportunities and challenges of a country or region (Liya Xi, 2014). Adopting cloud computing would add value and benefit to government. First of all, cloud services could improve the level of service delivery, while lowering the overall costs (Lam, 2011; Liya Xi, 2014). Secondly, optimized utilization of onsite resources could be achieved by leveraging the purchasing power amongst different departments – through the use of cloud-computing technologies (Creger, 2009; Liya Xi, 2014). Lastly, the adoption of cloud

computing could enrich government's ability to develop innovative ways to interact with the citizens in a broader realm (Wyld, 2009 & 2010; Liya Xi,2014).

Currently telecom industry has advanced rapidly and in unpredictable way in to the twenty-first century. Competition, cost pressures and the demand for services and applications anytime, anywhere ,on any devices are forcing telecom service provides to consider alternative delivery models to acquire and deliver IT services demanded by their customer (Nitin, 2011).

Although Cloud computing has been widely embraced by different organizations, research in Cloud computing is still in their early stages .Most of the current research in the field of Cloud computing is focused on the adoption, diffusion, implementation and impact of Cloud computing on IT development practices. Research on Cloud computing readiness is minimal. This needs urgent attention because readiness is a phase before adoption and it is an essential factor in determining the success of adoption because lack of readiness has been found to account for majority of the failures in technology adoption. lot of research has been conducted on CC adoption, privacy, security and trust issues in Cloud computing, and service oriented design and development. It is however evident that research focus has not been on organizational readiness of Cloud computing as most of the research has focused on the implementation and post implementation phases leaving the pre-implementation phase less researched.

There is limited literature and information related to this subject in Ethiopian context. However, in recent years a few works have been done by different researchers on different topics. But, previous studies focused on the on adoption of cloud computing as pointed out in table 2.2 with details. Many organizations adopt technologies without considering their level of readiness for that technology and this leads to weak implementation and sometimes failure. This is mostly a result of lack of awareness and lack of a regulatory framework for implementation. In order to avoid the problem of weak implementation and failure, there is an urgent need for researchers to come up with tools which will guide organizations and improve their implementation and readiness level before they finally adopt the technology.

In recognition to this fact, the current studies focus on exploring and conducting a deep analysis of the organization's readiness and identify the major drawbacks that may affect the

implementation of Cloud Computing in Ethio Telecom. This study will also help to increase the chances of success of Ethio Telecom with Cloud Computing implementation by identifying the company's current capability and the actual gaps which will be an input while planning to implement cloud computing in the company.

1.4. Research Questions

Research question 1: What cloud computing capabilities does Ethio telecom currently possesses?

Research question 2: What changes must be in place before embarking on a cloud computing initiative?

1.5. Objective of the study

1.5.1. General Objective

The general objective of this study is to make a readiness assessment on Ethio Telecom cloud computing to assess the current and the required cloud computing capability. This helps as an input to develop an assessment model.

1.5.2. Specific objectives of the study

- To assess the company's current IT status.
- To assess the company's current cloud computing capabilities.
- To assess what changes must be in place before embarking on a cloud computing initiative
- To identify techniques to facilitate the measurement of the "readiness gap".

1.6. Significant of the study

Organizations pursue Cloud in order to stay ahead of the curve and to increasing business performance and value. The Cloud is not just a passing phenomenon but a reality that has just begun to realize its potential (Alemayehu,2014). This study will provide a readiness assessment of the “current status” of the organization as well as provide fruitful information regarding the setbacks to implement cloud computing. In addition this study will try to identify the critical risks involved in the implementation within the company.

1.7 Scope and limitation of the study

The scope of this study is to identifying the readiness level of Ethio telecom to implement Cloud Computing and also to identify the drawback that company has to implement Cloud Computing. This study tries to assess the implementation of cloud computing in Ethio Telecom by using qualitative and quantitative methodologies .For quantitative an assessment models called STOPE frame work and e-learning Readiness Survey was used. And for qualitative an interview was used. This study only limited on Ethio telecom but the output of the study will be expected to be fruitful for other organization.

1.8 Organization of the thesis

This research encompasses six chapters. In order to give the reader a guideline on the structure and content of each chapter, an outline is provided, together with a brief summary of each chapter.

Chapter 1: This is considered to be an introductory chapter, which provides a brief background to the study. This chapter includes the problem statement, the research questions, and the research objectives, significance of the study as well as scope and limitation of the study.

Chapter 2: This chapter elaborates on the literature review of the study and related word done by other researchers .this chapter provides an overview of what cloud computing is all

about, the benefits and the challenges encountered with this innovative technology change. The main focus is on explaining what Cloud Computing is and related work done on this area

Chapter 3: This chapter presents the research Model which describes the frame work used for this study and the hypothesis developed to carry out the study.

Chapter 4: This chapter explains the Methodology used followed by explanations of the data collection and the data-analysis techniques that were implemented in this study.

Chapter 5: This chapter presents a detailed data analysis, as well as the finding of the study.

Chapter 6: concludes the entire study. It aims at the level to which the goals and objectives of the study were formulated. Some recommendations for future research are provided as well.

CHAPTER TWO

2.1 Literature review

2.1.1. Cloud Computing

According to National Institute of Standards and Technology (NIST) (Mell &Grance, 2011; Mathias M,Baldreck C 2011) Cloud computing is defined as “A model for enabling 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”.

The above definition is accompanied by these five essential characteristics

Broad network access: Capabilities and control of a cloud computing service must be available over the internet or other networks using standard protocols.

On-demand self-service: Customers can unilaterally provision computing capabilities, without requiring human interaction with the service provider.

Rapid elasticity: Near-immediate provisioning of capabilities, to quickly scale up, or down, according to demand.

Measured Service: Customers use of the capabilities is monitored, controlled, reported, and charged; with complete transparency enabling a pay-as-you-consume metering arrangement.

Resource pooling: Physical and virtual resources are dynamically assigned and reassigned according to demand, resulting in cost savings to the customer

2.1.2. Cloud Computing Models

Cloud Providers offer services that can be grouped into three categories.

Software as a Service (SaaS): In this model, a complete application is offered to the customer, as a service on demand. A single instance of the service runs on the cloud & multiple end users are served. On the customer's side there is no need for upfront investment in servers or software licenses, while for the provider, the costs are lowered, since only a single application needs to be hosted & maintained. The consumer uses an application without having hardware or software to buy, install, maintain, update, and manage the infrastructure on which the applications running. SaaS applications run on a SaaS provider's servers and the provider manages access to the application, including

Security, availability, and performances using open standards apply at the application level. According to (Raoj & Reddy ,2011; Alemayehu A. 2013) this types of cloud computing delivers a single application through the browser to thousands of customers using a multitenant architecture. Thus SaaS eliminates upfront investment in servers or software licensing for users and reduce the costs to manage access to the application compared to conventional hosting.

Platform as a Service (Paas): Here, a layer of software, or development environment is encapsulated & offered as a service, upon which other higher levels of service can be built. The customer has the freedom to build his own applications, which run on the provider's infrastructure. To meet manageability and scalability requirements of the applications, PaaS providers offer a predefined combination of Operating System and application servers.

Platform as a Service (PaaS) provides an environment upon which the customer can use to build and deploy cloud applications. These applications may be for use by the customer or offered as a service to others. Building applications using PaaS means that they are inherently cloud-enabled and the PaaS provider also provides the service upon which these applications run (Bhattacharjee, 2009; Alemayehu A. 2013). In the traditional model of software development applications are written in one environment, tested in another environment and deployed elsewhere. PaaS is a combination of a development platform and a solution stack, delivered as a service on demand. It provides infrastructure on which software developers can build new applications or extend existing ones without the cost and

complexity of buying and managing the underlying hardware and software and provisioning hosting capabilities

Platform as a Service (PaaS) layer incorporates all the environments used for development or for run time support, not being directly accessible by the final user (RuiEsteves, 2011; Alemayehu A. 2013). The consumer uses a hosting environment for their applications and controls the applications that run in the environment (and possibly has some control over the hosting environment), but does not control the operating system, hardware or network infrastructure on which they are running.

Infrastructure as a Service (IaaS): IaaS provides basic storage and computing capabilities as standardized services over the network. Servers, storage systems, networking equipment, data center space etc. are pooled and made available to handle workloads. The customer would typically deploy his own software on the infrastructure. For infrastructure as a Service, the provider maintains the storage, database, message queue or other middleware, or the hosting environment for virtual machines; while user can uses that service with the capabilities to control the operating system, storage, deployed applications and possibly networking components such as firewalls and load balancers, but not the cloud infrastructure beneath them (Raoj& Reddy, 2011; Alemayehu A. 2013). According to Alemayehu A. 2013 IaaS operates on a “Pay as you go” model ensuring that the users pay for only what they are using. To operate on this model, IaaS providers offer almost unlimited instances of servers to customers and make cost-effective use of the hosting hardware through virtualization. While the user can buy the infrastructure according to their requirements at any particular point of time instead of buying the infrastructure that might not be used for months and very costly if purchased completely. Thus dynamic scaling, usage based pricing, reduced costs and access to superior IT resources are some of the benefits of IaaS.

2.1.3. Deployment Models

Public, Private, Hybrid Cloud and Community Cloud

Public Cloud

As stated “A public cloud refers to the services offered to a diverse pool of clients over a public network. A public cloud is owned and managed by the cloud-service provider; therefore, such services provide users with the needed services without any initial capital expenditure on the infrastructure and this shifts the operating risks and costs to the providers”. According to Zissis & Lekkas, 2012 in a public cloud infrastructure, the servers and other resources are owned by a third party service provider who makes the resources available to the general public. The server and all other resources are shared among the organizations and they are billed per usage (Zissis &Lekkas, 2012; Akande 2014). In a public cloud, the user has no control over where the infrastructure is located as the infrastructure is located on the service provider’s premises (Ahmed, Chowdhury, Ahmed & Rafee, 2010; Akande 2014).

Private Cloud

This type of cloud computing requires organizations to have their own servers which may be managed by the organization or an appointed third party. The servers may exist on the organizations premises or on the third parties premises but they are dedicated to a particular organization (Zissis &Lekkas 2012; Akande 2014).

Private clouds allow organizations to gain control over the internal properties, as private clouds are designed and managed by a single organization within a private network. They may be hosted on-premises or outsourced to an off-site company. Thus, a private cloud offers the highest degree of control over performance, security and compliance requirements (Zissis & Lekkas, 2012; Liya Xi, 2014)

Hybrid Cloud

In hybrid cloud, the infrastructure is made up of a combination of two or more types of cloud. This type of cloud infrastructure is very efficient in a situation where an organization has data which is separated into sensitive and non-sensitive data. The sensitive data could be stored on the private cloud for better control by the organization while the non-sensitive data could be stored on the public cloud (Wang, Rashid, & Chuang, 2011; Akande 2014).

The hybrid cloud is a combination of cloud services, consisting of both public cloud and private cloud services. Hybrid clouds offer the combined flexibility of both cloud-deployment models. To be more specific, such a hybrid cloud retains sensitive data on the private cloud to allow visible control over data and security, while still providing the advantages of cost efficiency. However, a well-designed hybrid cloud requires careful analysis on how to split the public and private cloud services, according to the types of data an organization would require (Liya Xi, 2014).

Community Cloud

This deployment model is adopted by several organizations that have shared interests or concerns, such as security, mission objectives and compliance policies. It may be managed on-premises or off-premises. Therefore, those organizations can benefit from the advantages of a private cloud, while avoiding extensive costs(Liya Xi,2014)

Deployment Model	Pros	Cons
Public Cloud	<ul style="list-style-type: none"> • Minimises the resource's wastage • Minimises the IT infrastructure cost 	<ul style="list-style-type: none"> • Protection of sensitive data • Lower quality of service
Private Cloud	<ul style="list-style-type: none"> • Ensures security of sensitive data • High quality of service 	<ul style="list-style-type: none"> • The high IT infrastructure cost • The high cost of managing and maintaining the infrastructure
Hybrid Cloud	<ul style="list-style-type: none"> • Better data protection 	<ul style="list-style-type: none"> • Less cost efficient than public cloud
Community Cloud	<ul style="list-style-type: none"> • Minimises the IT infrastructure cost • Ensures security of sensitive data 	<ul style="list-style-type: none"> • Less cost efficient than the public cloud

Table 2.1: Comparison of cloud-computing deployment models (Shoshatari, 2013; Liya Xi,2014)

2.1.4. Cloud Computing Benefits

New emerging technologies have always addressed the issues of previous technologies. According to (Zhang, Cheng & Boutaba, 2010; Liya Xi 2014) the emergence of cloud computing makes businesses aware of their economic efficiency like never before. It supports organizations in maximizing the profit, while minimizing unnecessary equipment costs and energy consumption through optimized utilization. This sub-section depicts the benefits of adopting cloud computing.

Scalability and flexibility

The scalability and flexibility of cloud computing is one of the factors attracting organizations to cloud computing. Cloud Architecture can easily be scaled up or down depending on demand because it is easy to add a new node or server to the cloud network in case of high demand. When the demand is low, a node or server can also be removed from the cloud network without any negative effect on the efficiency of the network. As Liya Xi, 2014 stated Cost savings are the advantage for using cloud computing in small-to-medium enterprises; while for large international enterprises, it makes good sense to avoid the hassle of setting up a basic infrastructure to run and support a fully deployed service.

Broad network access

Cloud computing infrastructure can be accessed over a wide range of networks from smart phones, laptops, and iPads. Cloud computing can provide a quick access to infrastructure, services, or platform that will help organizations Speed up their business processes and lead to a faster time to market. Cloud computing enables to sustain “work on the go”, where and whenever you wish, with access to fast and reliable Internet speed and computing power (Wyld, 2010; Liya Xi, 2014). Thus, ubiquitous Internet access is the most essential factor in enabling cloud computing technologies (ITU, 2012)

Economies of scale and cost effectiveness

In the past, organizations have had to buy their own hardware and software to automate and improve their business processes. Information Technology (IT) teams were also employed by organizations to manage their hardware and software. Cloud computing implementations have modernized as the management of the hardware's and software's is now the responsibility of the third party service provider. Cloud computing implementation have been found to be cost effective as it help organizations to eliminate the cost of buying, installing, maintaining and upgrading hardware and software, and allow companies to pay for services on demand. This will assist the users to maximize their resources and yield better outcomes from their resources as they only pay for what they use.

Moreover, According to (Creeger, 2009; Liya Xi ,2014) Cloud Computing frees companies from planning for the unpredictable demands and its associated capital expenditure. In this way, companies can transform what was a high fixed cost into a lower variable one. Therefore, this benefit provides the main incentive for both private and public sectors to move to cloud computing.

Reliability

The consistent availability of multiple redundant sites improves the reliability of Cloud computing and makes it efficient for disaster recovery planning and business continuity. According to (Shoshatari, 2013 Liya Xi, 2014) Universal access to cloud-computing resources enables flexible working collaborations, thereby increasing productivity. The key feature of being time-and-location independent also increases the collaboration of organizations or departments to share data and resources. Consequently, data consistency and integrity can be achieved between organizations or departments that share common concerns, thereby increasing the overall collaboration

User centric interfaces

The cloud interface does not require users to change their working habit and environments like Programming language and operating system. Cloud interfaces are independent of location and can be accessed from anywhere via interfaces such as web services framework and internet browser. Moreover, Cloud computing allows applications to run off-premises,

which would require a higher degree of automation in the cloud. Self-service could be seen as the key feature of a Cloud Computing service model. A higher level of automation enables IT departments to define user policies for automated platform and infrastructure services, with line-of-business owners developing applications on their own to meet those requirements (Creeger, 2009; Liya Xi, 2014).

2.1.5. Role of Telecommunications in Cloud Computing

The telecommunications network is a central part of cloud architecture which delivering multiple services to the customers with defined quality of service and optimal resource allocation requirements. This role is well positioned to deliver a wide range of services including telecom grade cloud platform and services, integrating services, data centers and IT network infrastructures with end-to-end quality of services. The role of telecom in cloud computing eco system can be classified as operational roles and technical roles, as listed below (Binesh& Kumar, 2015).

1) Telecommunication operational roles:

- Control of networks.
- Operation and maintenance of assets.
- Maintain customer relationship
- Be a trusted partner.
- Act as cloud intermediary in the eco system.

2) Technical role of Telecommunications:

- Transport level virtualization & encryption.
- High speed transport technology
- Eco-friendly and power saver technologies
- Real-time monitoring and control technologies.
- Flexible and fast application development

2.1.6. Impact of the Cloud on the Information Technology ecosystem

In order to provide services in the Cloud environment, IT service providers would need to enhance their capabilities in areas where they lack the expertise. Capability enhancements could either occur through internal initiatives or externally through the creation of strategic alliances with other service providers.

The advent of the Cloud makes it imperative that IT service providers reassess their capabilities to ensure sustainable growth in the future. As the demand for the Cloud services keeps rising, IT service providers would need to renovation their business processes to not only reflect the impact of the Cloud but also to gain capabilities to provide the Cloud services .According to KPMG, 2011 evaluate the impact of the Cloud on various areas of the IT ecosystem.

2.1.6.1. Datacenters

Datacenters there are many challenges associated with the ownership and management of traditional data centers, some of which are provided below

2.1.6.1.1. Challenges associated with existing data centers

Power consumption: A report by the Environmental Protection Agency (EPA) on energy efficiency in data centers states that energy usage at data centers doubled between 2000 and 2006, 3 and is poised to double again by 2011 . The report also highlighted that the US used 61 billion kilowatt-hours of power (1.5% of total production) for data centers and servers 3 in 2006 a total cost of USD 4.5 billion.

Data center management: Adequate monitoring and management is the primary concern of data center managers. Data centers are getting increasingly difficult to manage on account of the complexity involved. As such, data center managers need to adopt a proactive approach to manage these facilities which requires investments in the form of time and money.

Storage management: A recent study on enterprise storage needs, highlights that structured data (financial information, inventory details, etc.) would grow at over 20 percent rate over

the next five years. At the same time, unstructured data (audio, video, images, etc.) is expected to grow at a 60 percent compounded rate during the same timeframe. In order to continue to meet the ever increasing storage needs of their organizations and customers, IT departments would need to either optimize existing storage or invest in new hardware.

Ensuring availability: Data center managers need to ensure that data centers are available for access 24x7. As such, significant investments are made in power backup, load balancing (for peak load management) and cooling systems. Broadly speaking it is essential to build redundancy in all systems needed to run a data center a reasonably high financial investment.

2.1.6.1.2. Benefits of using IaaS for data center requirements

An IaaS provides companies the option to outsource data center requirements to service providers. The IaaS model is highly scalable, provides for On-Demand services. As a result, the IT departments of companies no longer need to be concerned with the maintenance and up gradation of data centers. Using the Cloud model to fulfill data center requirements enables companies to realize a number of benefits

A cost effective model: IaaS service providers are making large investments in setting up state of the art data centers that would cater to the requirements of thousands of users. Outsourcing data center requirements to the Cloud service providers significantly reduces the outlay on capital expenditure.

Businesses are able to focus on core activities: Using the Cloud service providers for data centers ensures that Senior Executives are focused on activities related to the company's core business. Key IT management personnel that were earlier locked into managing data centers are thus able to focus on making innovative use of IT for business needs. Some of the tasks that are automated and managed by the Cloud service providers include the following:

- Storage, backup and archiving of data

- Security-related hardware and software implementation & up gradation
- Upgrade and the monitoring of hardware infrastructure
- Load balancing, remote access control and management tools
- Capacity planning and storage management

Management of peak loads: Peak demand can be easily managed through the use of IaaS without additional investment in resources. There are techniques that can be used to allocate computing resources on peak loads. The Cloud model ensures the mitigation of these issues while providing the ability to seamlessly scale services up and down

2.1.6.2. Application development

The traditional application development model has been serving organizations for a long time. However, there are several inherent challenges associated with this model.

2.1.6.2.1. Challenges associated with the traditional application development model

Software has traditionally been used by companies to meet the automation and reporting requirements of businesses. Developers using the traditional software development model are hard pressed to provide solutions that meet the continually changing requirements of today's users while keeping costs at a minimum.

Infrastructure requirements and associated costs: Computing infrastructure like servers, storage systems and application development tools are needed for software development. Most applications are developed in one environment, tested in another and then redeployed in an altogether different environment for production. As a result the investments needed for the creation of a suitable application development environment are extremely high.

Lead time for the setting up of development and test environments: There is typically a large lead time for creation of development and testing environments for applications. This

adds up to the overall time needed for application development which in turn may lead to the organization missing out on achievement of its business objectives.

Simple application development: Traditional application development required developer time even for simple applications e.g. Leave Management System. This led to avoidable development costs for even simple applications. Most of the traditional application development platforms did not offer simple interfaces to enable end users to develop their own applications.

2.1.6.2.2. Benefits of using PaaS for application development

Highly scalable and robust web-based applications can be built using PaaS. An Integrated Development Environment (IDE) consisting of hardware and software resources is provided by service providers for application development. Developers can easily choose and deploy the IT hardware and software environment they want to develop their solution in. Platform services are primarily used for:

Developing new software solutions / business applications

Modifying applications / interfaces that are made available by SaaS service providers – such applications have their own PaaS system

Infrastructure is managed by the service provider: PaaS providers make available a range of hardware and development software for software developers to choose from. PaaS can be used to either develop new solutions or to modify existing SaaS solutions. In the case of the former, developers can choose technologies and systems as required based on a Pay-as-you-go model. If an existing SaaS solution needs to be modified then the SaaS provider would have a PaaS platform that can be used to further develop / modify the existing features of the solution. The task of upgrading, and managing the hardware and software environment needed for solution development, is the responsibility of the PaaS provider.

Time to implement is shorter: PaaS provides application developers the flexibility to rapidly develop and deploy custom applications. Applications developed using PaaS have the

advantage of being developed and tested in an environment that is the similar to the production environment. As a result, developers can run test cases on the solution as soon as it is ready, debug it and then deploy the same. This significantly reduces the costs and time associated with testing and deployment

2.1.6.3. Solution delivery

Software has traditionally been used by companies to meet the automation and reporting requirements of businesses. Developers using the traditional software development model are hard pressed to provide solutions that meet the continually changing requirements of today's users while keeping costs at a minimum.

2.1.6.3.1. Challenges associated with the use of the traditional software delivery model

Software licensing fees: Software licensing is one of the major costs in IT Procurement. A software license permits users / businesses to implement one or more instances of an application based on a pre agreed fee. In the case of large businesses, the management of software licenses is a concern as they either tend to buy extra licenses for future requirements or underutilize the existing ones. Moreover, software licenses once bought cannot be returned. Consequently, changing business requirements and a need to cut costs is resulting in the demand for flexible pricing models that are based on monthly usage or any other similar metric.

Need for a hosting environment: Traditional software, also identified as On-Premise solutions, require a hardware and software environment to be deployed. The sourcing and management of this environment is an expensive proposition for most users especially for large businesses who need to invest in data centers.

Software maintenance requirements: Application or software maintenance is carried out to remove bugs or modify existing solutions based on changing business requirements. Companies either build in-house teams or outsource application maintenance requirements to IT solutions and services companies. In the case of large corporations, such outsourcing contracts are generally multi-year agreements that run into millions of dollars in fees.

Additionally, application maintenance also requires development and testing environments piling onto costs.

Need for in-house IT teams: Companies that have a large number of applications invest in employing trained personnel to manage the same. The costs of hiring, training, and managing IT personnel are significantly high for non-IT companies

2.1.6.3.2. Benefits of using the SaaS model for solution delivery

Economies of Scale: SaaS providers are able to make available solutions at more affordable rates as customers are being provided access to a single deployment of the solution. As a result, vendors experience cost benefits with regards to application deployment, maintenance, and hardware infrastructure which are passed on to the customer.

Multi-tenant architecture: Multi-tenant architecture signifies the use of a single instance / deployment of software to serve the application needs of multiple companies and multiple users within each company. The development of software based on multi-tenant architecture results in a highly scalable solution that optimizes the use of existing computing infrastructure resulting in cost benefits for the end user.

Rapid deployment: On-Demand solution is a term that is being increasingly used to identify applications made available through SaaS. The lead time (the time taken from requirement identification to actual solution deployment) in the case of SaaS solutions is very small in comparison to the lead time taken currently. Companies that intend to implement a SaaS solution go through a three stage process.

- Selection – Evaluation of existing solutions, selection and signing of SLAs
- Deployment – Customization of the selected application, if required
- Management – Monitoring SLAs signed with the service provider

Usage based metrics: The pay-per-use or pay-as-you-go pricing model of SaaS enables customers to scale up or down usage requirements without having to worry about IT

hardware and procurement of software licenses. In other words, companies only pay for the number of active users of the SaaS service. Companies would not need to invest in acquiring computing systems and bulk licenses to cater to the projected rise in the number of employees.

Access on the move: SaaS solutions are highly versatile and can be accessed through the internet from across the globe. A majority of SaaS solutions that are developed have user interfaces that are designed to work across screens of different sizes on computer or mobile systems.

2.1.6.4. Telecommunications

2.1.6.4.1. Impact on telecom service providers

Prior to the emergence of the Cloud, businesses were focused on developing and maintaining a strong internal network. Data centers hosted the applications and data necessary for day-to-day operations while access to the same was provided through the creation of robust internal networks. With the Cloud, the onus of providing connectivity to core business applications, real time information, Voice over IP (VoIP) services etc. has now shifted to external networks. As a result, telecommunication service providers who are primarily responsible for providing connectivity and maintaining external networks would play a key role in providing Cloud based services. The availability of a robust external network that provides for high bandwidth at low costs would be essential for the success of a Cloud implementation

Network related concerns for the Cloud

A shift to the Cloud is expected to reduce concerns related to the sourcing and management of IT infrastructure. At the same time, due to an increased dependence on external networks for the delivery of computing services it is expected that IT Managers would have to increase their focus on the services being provided by telecommunication service providers. Developing a network management strategy that recognizes the requirements of organizational users of the Cloud would be essential to ensuring seamless delivery of

services. Following are some of the key concerns related to the management of external networks:

Ensuring availability: A shift to the Cloud would require an increased monitoring of network traffic. Network managers would not only have to monitor internal networks to identify performance issues but also external networks in order to ensure the availability of service.

Governance of SLAs: Enforcing SLAs signed with the network service provider would be essential to ensure availability. SLAs are used to define expected bandwidth levels, availability, peak demand levels, pricing, service response time etc. Businesses would need to build internal teams or hire third party auditors to monitor SLAs signed with external network providers.

Prioritization of services: As users shift to an On-Demand environment, it would be essential to determine which applications and users get priority to receive bandwidth. A shift to the Cloud would not be beneficial, if a few users / non-core applications end up using a majority of the available bandwidth. Managing demand for increased bandwidth by sourcing more bandwidth from service providers would only drive up costs. IT Managers need to take a hard look at current / expected usage patterns in order to prioritize bandwidth access.

Dependence on service providers: The Cloud might not be accessible in case there is a fault in the external network. Financial losses experienced due to non-availability of core applications would be a serious concern as it could impact business processes and productivity. As such, businesses would be dependent on external network providers to ensure business continuity.

2.1.6.5. User

The mobile and dynamic access to content provided by Cloud-based services like social networking and content collaboration platforms (e.g. Facebook, Twitter, Google Docs, etc.) led to a large number of people using these services. Enterprise workers are now demanding a similar level of sophistication and flexibility from the business applications that they use.

Individual users: Private Clouds are an expensive proposition and as such the individual user would be primarily concerned with the public Cloud. Similarly, the use of SaaS services amongst the members of the general public is expected to be the highest. A majority of the Cloud services targeted at the individual user by service providers are provided under the freemium banner. Freemium is a business model wherein the basic features of an application are freely available while access to advance features is limited to subscribers.

Large organizations: Concerns related to data security coupled with the benefits of IaaS services could result in a majority of large organizations deploying their own private Clouds. Similarly, features of SaaS and PaaS services like Pay-as-you-go, On-Demand availability make SaaS and PaaS the other services that would be widely used amongst large corporations.

Government: Data Security requirements are stringent in the Government sector. Considering the type of requirements and the number of people that would be accessing services from a Government Cloud it seems imperative for Governments to deploy private Clouds, primarily to provide IaaS services. The importance of the other Cloud Services to be used by Governments would differ on a case-to-case basis.

Small & Medium Enterprises (SMEs): A lack of cost effective / quality applications in the market that would enable SMEs to better manage their businesses would result in SaaS applications being adopted by SMEs. Companies that belong to the SME category are expected to make the most use of public Clouds as they would lack the financial investments needed to setup and maintain private Clouds

2.1.7. Cloud Computing Challenges

Despite its growing influence, concerns regarding cloud computing still remain. In my opinion, the benefits outweigh the drawbacks and the model is worth exploring.

Data Protection

Data Security is a crucial element. Enterprises fear of losing data to competition and the data confidentiality of consumers. In the existing models, firewalls across data centers (owned by

enterprises) protect this sensitive information. In the cloud model, Service providers are responsible for maintaining data security and enterprises would have to rely on them.

Data Recovery and Availability

All business applications have Service level agreements that are stringently followed. Operational teams play a key role in management of service level agreements and runtime governance of applications. In production environments, operational teams support appropriate clustering and Fail over Data Replication, System monitoring, Maintenance, Disaster recovery Capacity and performance management if any of the above mentioned services is under-served by a cloud provider, the damage & impact could be difficult.

Management Capabilities

Despite there being multiple cloud providers, the management of platform and infrastructure is still in its infancy.

Regulatory and Compliance Restrictions

In some of the European countries, Government regulations do not allow customer's personal information and other sensitive information to be physically located outside the state or country. In order to meet such requirements, cloud providers need to setup a data center or a storage site exclusively within the country to comply with regulations. Having such an infrastructure may not always be feasible and is a big challenge for cloud providers.

2.2. Theoretical Frameworks

Theory of Reasoned Action (1980)

The Theory of Reasoned Action (TRA) was developed by Fishbein and Ajzen (Hasan, Al-nashmi, Abdul and Shamsuddin, 2016). TRA is one of the most fundamental and influential theories of human behavior. It has been used to predict a wide range of behaviors. The intention to accept or reject a particular technology is based on a series of tradeoffs between the perceived benefits of the system to the user and the complexity of learning or using the

system. TRA proposes that individual beliefs influence attitudes, hence creating intentions that will generate behavior (Shamsuddinet al., 2016).

According to Kurland (T. Ramayah and M. Jantan, 2004) Theory of Reasoned Action (TRA) is concerned with consciously intended behaviors and links behavioral intention to the person's actual behavior. The person's attitude toward the behavior coupled with the subjective norm concerning the behavior (*i.e.*, assessing whether the respondent believes that others who are important to them think they should do X and whether they want to comply with these wishes).

There are many researchers applying Theory of Reasoned Action (TRA) in various academic disciplines. This researcher realized that this theory was not sufficient and there were several limitations. According to Kurland (T. Ramayah and M. Jantan,2004) TRA is limited because it assumes that actions are totally under volitional control. This assumption fails to acknowledge that individuals' behaviors may be directed.

According to Davis et al. (T.J. Madden, P.S Ellen and I. Ajzen,1992) Theory of Reasoned Action (TRA) is very general. According to Baraghani (F.D. Davis, R.P. Bagozzi and P.R. Warshaw,1989) TRA is a general model that does not specify the beliefs that are operative for a particular behavior. Researchers using TRA must first identify the beliefs that are salient for subjects regarding the behavior under investigation.

Technology Acceptance Models

The most common technology acceptance model reviewed by previous researchers is TAM. According to scholars (Hasan, Al-nashmi, Abdul and Shamsuddin, 2016) Technology Acceptance Model is one of the most popular research models to predict use and acceptance of information systems and technology by individual users.

According to Agrawal (Shamsuddinet al., 2016) Technology Acceptance Model is one of the most influential models widely used in the studies of the determinant of IS/IT acceptance.

Technology Acceptance Model (TAM), developed by Davis (Ajzenet al., 1992) is one of the most influential research model to determinate the level of IS adoption at the individual level. The main variables in TAM is perceived ease of use and perceived usefulness. Perceived usefulness was defined by Davis (Ajzenet al., 1992) as the degree to which a person believes that using a particular system would enhance his or her job performance. People tend to use or not to use an application to the extent they believe that it will help them to perform their job better.

Meanwhile perceived ease of use explains the user's perception of the amount of effort required to utilize the system or the extent to which a user believes that using a particular technology will be effortless (Ajzenet al., 1992)

Technology Acceptance Model (TAM) suggests that when a new technology is presented to the users, the users decide when and how they will use the technology based on a number of factors (perceived usefulness and perceived ease-of-use). Acceptance of the technology in some cases needs another factor such as information quality, top management support and computer self-efficacy etc. Research had used system usage and user satisfaction to measure system success and the TAM variables to predict usage of information systems. However, researchers later on suggested that TAM variables may be insufficient predictors of system usage and success. What is important is they used user performance or individual impact as an indicator to system success or system effectiveness.

Technology, Organization, and Environment Framework (1990)

Technology, Organization and Environment (TOE) Framework was developed by Tornatzky and Fleischer (1990). It identifies three aspects of an enterprise's context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context and environmental context. The Technology, Organization and Environment (TOE) provide a useful analytical framework that can be used for studying the adoption and assimilation of different types of IT innovation.

According to Tornatzky and Fleischer (Shamsuddinet al., 2016) the technological context includes the internal and external technologies that are relevant to the firm. Technologies

may include both equipment as well as processes. The organizational context refers to the characteristics and resources of the firm including the firm's size, degree of centralization, degree of formalization, managerial structure, human resources, amount of slack resources and linkages among employees. The environmental context includes the size and structure of the industry, the firm's competitors, the macroeconomic context and the regulatory environment.

Diffusion of Innovation (DOI) Theory (1995)

The theory of adoption and diffusion of innovations is a useful systemic framework to describe either adoption or non-adoption of new technology. Diffusion occurs progressively within one market (a system of users) when information and opinions about a new technology are shared among potential users through communication channels.

Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. Diffusion is the process in which an innovation is communicated through certain channels over time among members of a social system. It is a special type of communication in that the messages are concerned with new ideas. The four main elements in the diffusion of innovations are the innovation, communication channels, time and the social system (Shamsuddin et al., 2016).

According to (Shamsuddin et al.,2016) DOI theory focus solely on a product or innovation and ignore other factors that determine how the product is adopted, DOI have weaknesses in predicting the behavior of individuals, DOI theory does not offer adequate constructs to deal with collective adoption behaviors and DOI more related to educational environments.

2.3. Related work

Several studies and research works have been done on cloud computing for banking sectors, educational institution where as limited research work has been found on cloud computing for telecommunication.

Sewale (2012) examined the ICT utilization strategy in Ethiopian Higher Education Institution and analyze Cloud Computing is enhanced ICT utilization mechanism for
Assessment of Ethio Telecom Readiness for the Implementation of Cloud Computing Services

Education institutions teaching-learning and service delivery requirements and also it enables wise and strategic use of technology which significantly reduces cost. The paper briefly discuss the advantage of cloud computing for educational institution and also propose alternative solution Hybrid Cloud Computing model to solve the current IT utilization limitation in Ethiopian Higher Education Institution.

According to Alemayehu (2012) his study focused on banking sector regarding the problem of providing necessary IT support to deliver services to customers, partners, and employees anytime, on their referred device, through the optimum channel. The author use design science methodology for the research and proposed Hybrid Cloud Computing model. The result shows that the proposed cloud computing service framework can have a capabilities for reducing IT investment cost and management complexity, efficient IT utilization for delivering banking services and improve collaboration among partners. The aim of the study was to explore the internal and external factors that have influenced IT executives and expert's decision on the adoption of cloud computing focusing on Ethiopian banking sector. The result indicates that some of the internal factors and external factors were found to have a positive influence on decision to adopt cloud computing. However, other factors were found not to have an influence on the adoption of cloud computing technologies in Ethiopian banking sector.

Fasil & Fekade (2014)proposed cloud Readiness assessment framework and recommendation system. The main objective of this research was to propose a cloud readiness assessment framework and an expert system that assesses cloud readiness and to recommend which cloud deployment and service model to adopt. They used Technology Organization Environment framework (TOE), Diffusion of Innovation (DOI) and Technology Acceptance Model (TAM) as a conceptual framework to build the model. The paper focus on the factors that affect cloud computing without the management and planning issues.

A works on “Cloud Computing Readiness of Some Selected Organizations in Ethiopia: Towards a Strategic Guideline”, this research is based on the Technology Organization Environment (TOE) framework which only focus on three aspect. Technological context

describe internal and external technologies related to the firm. Organizational context describe descriptive measures such as scope, size and managerial structure. And environmental context is conducting its business (Alemayehu ,2015).

Author [year]	Objectives	Method	Key finding
Sewale (2012)	examined the ICT utilization strategy in Ethiopian Higher Education Institution and analyze Cloud Computing is enhanced ICT utilization mechanism	Design science methodology	Propose alternative solution Hybrid Cloud Computing model to solve the current IT utilization limitation in Ethiopian Higher Education Institution.
Alemayehu (2012)	to explore the internal and external factors that have influenced IT executives and expert's decision on the adoption of cloud computing focusing on Ethiopian banking sector	design science methodology	Result indicates that some of the internal factors and external factors were found to have a positive influence on decision to adopt cloud computing. However, other factors were found not to have an influence on the adoption of cloud computing technologies in Ethiopian banking sector.
Fasil & Fekade (2014)	to propose a cloud readiness assessment framework and an expert system that assesses cloud readiness and to recommend which cloud deployment and service model to adopt	Technology Organization Environment framework (TOE), Diffusion of Innovation (DOI)	a cloud readiness assessment framework and an expert system
Alemayehu E. (2015)	The factor and challenge of cloud computing adoption	Technology Organization Environment (TOE)	Produce a strategic guideline that could be used by Ethiopian organizations for successfully adopting cloud computing

Table 2.2 Summary of related work

CHAPTER THREE

3.1. The Research Model

Research model is used to describe the overall frame work to look at reality. This paper intention on assessing the readiness of Ethio telecom on implementing cloud computing by using Barky's framework which is called STOPE (Strategy, Technology, Organization, Environment and People) and based on the framework hypothesis will be developed in related to Ethio telecom.

What is Readiness Assessment?

Readiness assessment is the act of measuring how prepared your organization is for a major change. In order to conduct thorough readiness assessment, you need to evaluate the culture, leadership styles, performance, processes and resources of your organization. It is important to assess organization's readiness for change before taking any major steps to improve quality. A readiness assessment will help determine if the organization's existing environment is prepared for change (Akande A, 2014). It will also predict how change may impact staff and its performance. By conducting a readiness assessment, organizations can identify their needs and major gaps. In order to ensure a successful implementation of Cloud Computing and properly manage changes that arise as a result of Cloud Computing, organizations need to prepare themselves and be ready before implementation. This is because "more than half of all unsuccessful large-scale organizational change efforts are as a result of failure to establish sufficient readiness" (Weiner, 2009; Akande A, 2014)

According to Akande, 2014 once an organization decides to implement Cloud Computing, the organization should determine their level of readiness for Cloud Computing to determine their suitability for a successful adoption. Once the readiness level is known and the organization Cloud Computing readiness is good enough, only then can the organization decide to adopt Cloud Computing.

The purpose of readiness assessment is to help the organization prevent from obstacles before it occurred. By identifying barriers, the organization can address issues before they

escalate to major problems; therefore it save time and increasing the likelihood of successfully improving quality. The main goal of readiness assessment is to help an organization achieve its aims without any sudden surprises that could possibly affect the organization.

3.2. The STOPE Approach

The cloud readiness assessment framework used for this paper is STOPE framework. This framework is developed by Bakry it integrates the various factors considered in previous studies. STOPE stands for (strategy, technology, organization, people, and environment). The STOPE framework has been developed and used for the evaluation of different ICT problems, including e-business, e-government planning, information security management, and the emerging enterprise resource plan. The STOPE framework for e-readiness assessment built according to a “multi-level integrated approach” based on five main distinct domains. The framework enjoys the feature of “comprehensiveness” in integrating the various related factors of such assessments over the main domains of STOPE.

The framework is also “flexible” in allowing modifications of the factors under STOPE to match with the requirements of the case-study considered, whether a country or an organization associated with a specific field, such as banking, education or other different fields. It is also “flexible” with regards to responding to change, that is to emerging new factors that need to be incorporated within the framework in the future.

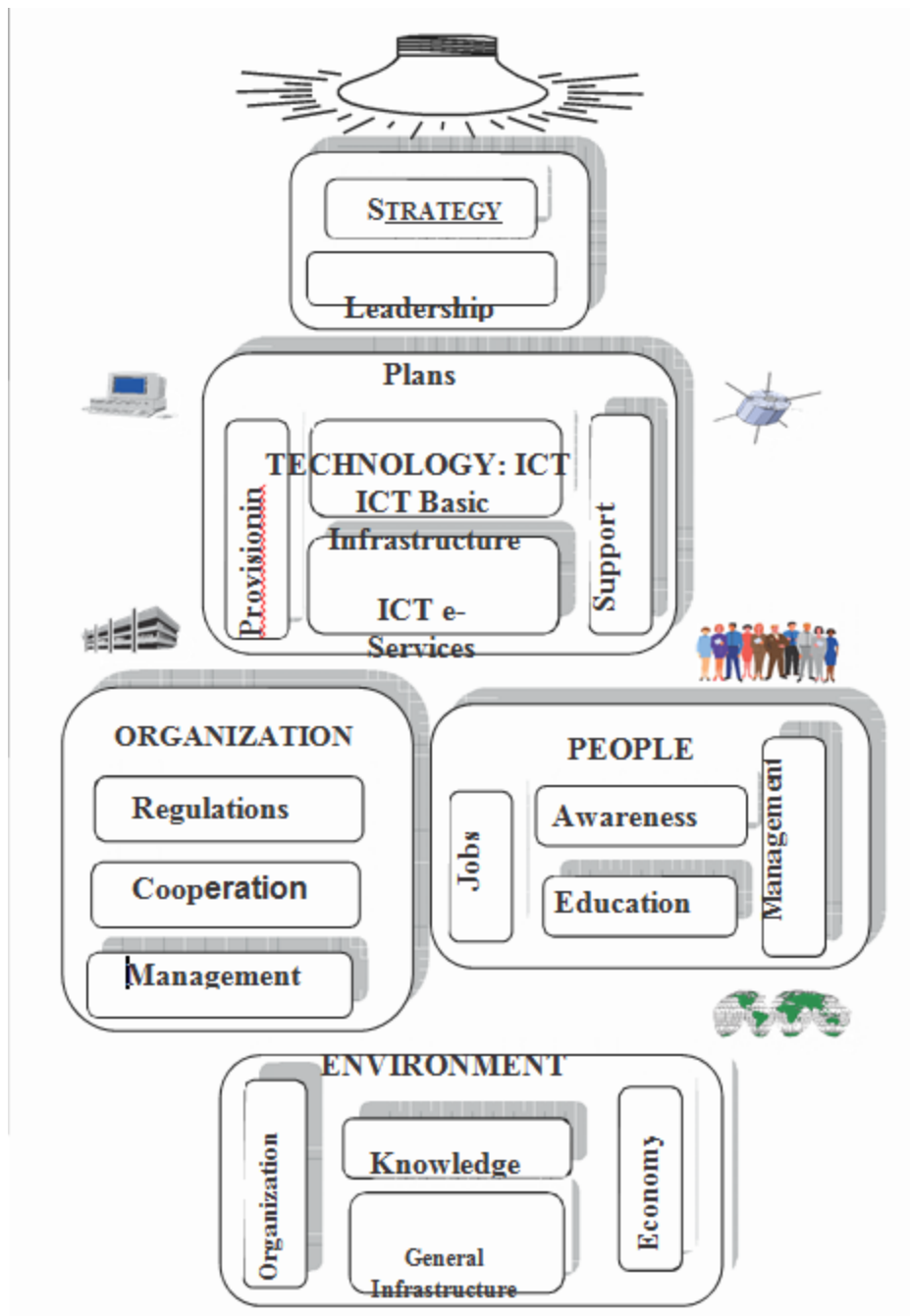


Figure 3.1 The STOPE framework for e-readiness assessments

(Khalid A., Abdulmohsen A. and Bakry, 2006)

Strategy issues: The “strategy” domain integrates the factors concerned with “future directions, commitments and plans toward ICT development and utilization”. Two sub-domains are considered to be associated with this domain: “ICT leadership” and “future development plans”.

ICT leadership: This subdomain explains the vision, government support and commitment expected from ICT managers and Future development plans includes the future ICT, organization, HR and non ICT plan.

Technology issues: The “technology” domain integrates the factors concerned with the “current state of issues concerned with ICT facilities”. Four sub-domains are considered to be associated with this domain:

- The Availability and Performance of ICT basic information infrastructure
- ICT e-services infrastructure for Government and business organizations
- ICT provisioning
- Standards operation and maintenance ICT support

Organization issues: The “organization” domain integrates the factors related to the “current state of issues concerned with ICT regulations and management”. Three sub-domains are considered to be associated with this domain:

- ICT government regulations include basics ICT regulations, ICT business regulation, internet service regulation and E-business services regulations.
- ICT cooperation among organizations (knowledge sharing for innovation and partnerships)
- ICT management : the evaluation measures, change , quality and cost of ICT facilities

People issues: The “people” domain integrates the factors associated with the “current state of issues concerned with ICT users and skills”. The domain is considered to consist of four sub-domains:

- ICT awareness includes understanding ICT advantages, internet use, media support and adaptability of ICT change
- ICT education and training
- ICT qualifications and jobs
- Management of ICT skills (performance and satisfaction)

Environment issues: The “environment” domain integrates the factors associated with the “current state of the basic non-ICT issues surrounding and affecting the current state of ICT”. The domain has four sub domains:

- Knowledge (culture ,education and training)
- resources and the economy
- Organization including general regulations, cooperation and management
- Non-ICT infrastructure (basic services like electricity, transportation, postal system and health care).

According to (Bakry, 2006) recommendation the framework represents a “potential standard” for e-readiness assessments both for countries, and for organizations in different fields. The use of the framework would not only provide e-readiness assessments based on “sound features”, but it would also help “fair comparisons” between different studies. The framework is recommended for consideration by organizations concerned with “ICT standards” that support “sustainable development” through enhancing “preparedness for the networked world”

3.3. Identify hypothesis

According to (dictionary.com online, 2016) Hypothesis is a proposition made as a basis for reasoning without the assumption of its truth, a belief made as a starting points for further investigation from known facts. Hypothesis don’t have to be certain, it is a starting points to a statement that hope to prove true after more research and investigation. In this paper the work of (Azab, Kamel and Dafoulas, 2009; Amare A.) on how they develop their research model and hypothesis is taken and companied with STOPE framework domains.

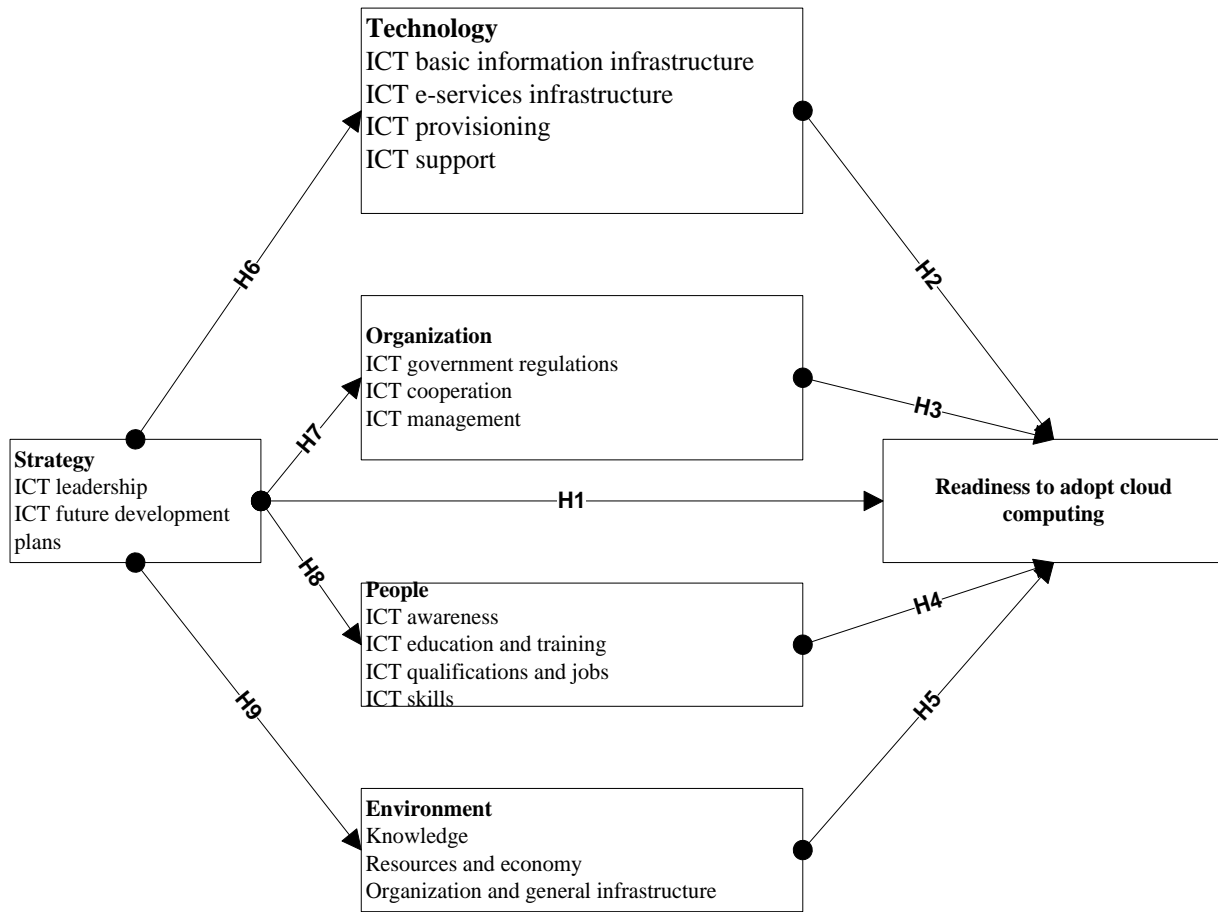


Figure 3.2 Theoretical Framework of the Study using STOPE

Source: Extracted from Amare (2011).

Strategy readiness

The leadership sub domain integrates the vision and support of government towards telecom implementation and utilization. The ICT development and plan contains the supporting variable that supplement the fulfillment of the category model preparedness towards telecom adoption since strategy for e-Government is a major factor in reaching a successful e-Government adoption (Reffat, 2003; Fletcher, 1999; Amare, 2011). From “Strategy” and its sub-domains. The following hypothesis is developed:

Hypothesis 1 (H1): Strategy's related with telecom readiness in adoption of cloud computing.

Technological readiness

Research on sub-Saharan Africa suggests that sustainable adoption of technology is conditioned on meeting some precursors (Musa, Meso, and Mbarika, 2005; Amare, 2011). Scholars (Al-Qirim, 2006; Awa & Ojiabo 2015; Jeyaraj, Rottman & Lacity, 2006; Sabherwal, Jeyaraj & Chowa, 2006; Tornatzky & Fleischer, 1990; Zhu 2003) opine that technology describes adoption in terms of the pool of technologies internal and external to the firm as well as their perceived usefulness, technical and organizational compatibility, complexity and learning curve, pilot test/experimentation, and visibility/imagination. Technology readiness will be checked based on the following hypothesis.

Hypothesis 2(H₂): Technological readiness level is related with cloud computing adoption.

Organizational readiness

When technological innovations are not accepted or implemented properly, the failure may be traced to a poor fit between the nature of the innovation and the vested interests, resources and expectations of its major gatekeepers. Senior management commitment may be important for successful implementation. Involvement of personnel is important for change process (Tachinardi, 1998; Amare, 2011). The scholars (Zhu et al., 2003) explain that organization captures descriptive measures such as firm's business scope, top management support, organizational culture, complexity of managerial structure measured by centralization, formalization, and vertical differentiation, the quality of human capital, and size and size-related issues such as internal slack resources and specialization. Thus, organizational readiness will be checked based on the following hypothesis.

Hypothesis 3 (H₃): Organizational readiness level is related with cloud computing adoption.

People readiness

According to (Ewa&Iwona, 2013) Employees of the IT Company should have experience and competence in implementing a system in general and especially in public administration. Government agency employees, who are a part of a design team, should have knowledge about government processes which will be supported by the system and about information which it will provide. Their knowledge should cover the functional scope of the system. The government agency team should benefit from the knowledge of business analysis and information system implementation consultant. It is important to provide appropriate training for employees on how to use the technology prior to deployment and approval the new technology. Organizational cultural affect the people's readiness to adopt new technologies. Therefore People readiness will be check based on the following hypothesis.

Hypothesis 4 (H₄): People readiness is related with cloud computing adoption.

Environmental readiness

The external environment readiness is the government commitment, the top management support and supporting industries (Croteauet, 2005; Amare,2011). Environment readiness will be tested based on the following hypothesis. Scholars (Zhu et al., 2003) Environmental context relates to the operational facilitators and inhibitors; significant among them are competitive pressure, trading partners' readiness, socio cultural issues, government encouragement, and technology support infrastructures such as access to quality ICT consultants

Hypothesis 5 (H₅): Environmental readiness level is related with cloud computing adoption.

Strategy affects readiness of Technology, Organization, People and Environment

A study by (Azab, Kamel and Dafoulas, 2009; Amare,2011) argues that all five factors: strategy, technology, organization, people, and environment are affected by e-Government strategy since this strategy comprises a number of aspects that cause major changes in these

factors. This shows that e-Strategy has a positive impact on Technology and People readiness to adopt technology.

Everything a firm does involve technology of some sort (Porter, 1985; Ongonge J,2013). The technological environment is the fastest changing environment. If organizations are not capable of coping with the pace of technological change they may disappear, or suffer significant losses. New technologies should be accepted only if the technological change itself lowers cost or enhances differentiation and technological lead is sustainable. If the technology is pioneering, the technological change should bring the first-mover advantages besides those inherent in the technology itself (Porter, 1985; Ongonge J,2013).

Strategic planners must be interested in new technologies not to solve an instance of a problem by technology; rather they should be interested in long-term positioning for leverage (Boar, 1993; Zijad P,2007). New technology sweeps away potential advantages therefore organizations must compete harder for enduring their competitive advantages. On the other hand, a flexible and reusable IT platform have the ability to respond quickly to competitor moves as well as support new process designs or business initiatives in strategic manner (Ward, Peppard, 2002; Zijad P,2007). Thus, technology is both, an enabler and implementer of process change (Galliers, 1991; Ongonge J,2013). Technology can also influence information system strategic plan processes by making them more efficient. It is empirically confirmed that technology helps planning sophistication (Sabherwal, 1999; Zijad P,2007). Based on the above scholars reasoning the strategy of the organization have direct relation with the readiness of the organization to accept new technology and also to upgrade the current technologies and also the strategy of the organization have relation with the readiness of the organization. Thus we can develop the following hypothesis.

Hypothesis 6 (H₆): strategy affects technology readiness.

Hypothesis 7(H₇): strategy affects organization readiness.

Strategic leadership has to do with the organization's ability to influence its internal and external stakeholders so that they will support organizational directions. Strategic leadership needs to empower its members to create the changes that are necessary for an organization

to perform and survive (Byrd, 1987; Ongonge J,2013). Organization's strategic leadership involves developing ways of inspiring organizational members and stakeholders to perform in ways that attain the mission of the organization

Hypothesis 8(H₈): strategy leadership level of readiness is positively related to people readiness.

Organizations are open for the environment in which they operate. And they need support from their environment if they are to survive and perform well. According to (Thompson, Strickland and Gamble ,2007 ; Ongonge J,2013) Environmental uncertainties affects the development of long range plans, scarce resource-strategic planning should be aligned to use scarce resources effectively, legal forces legislative changes introduce new dynamics in an industry thus affecting strategic planning, size and complexity of an organization, as size and Complexity of an organization increases, so does the degree of formulating of planning activities. The extent of involvement in operating issues compromises the attention paid to management functions, as organizations move through different phases, the competitive environment changes and influences the way they plan and execute strategy. Based on this reasoning the following hypothesis is developed

Hypothesis 9(H₉): Strategy is positively related to external environment readiness

3.4. Readiness Survey

According to Everett M. Rogers' diffusion of innovation theory provides a theoretical background for these factors. The factors are titled as: (1) technology; (2) innovation; (3) people; and (4) self-development. In addition to these factors, it has been suggested that each factor might have three different constructs: (1) resources (2) skills (3) Attitudes.

Technology is one of the factors that can be effectively used to adapt a technological innovation in an organization. Technology has two components: hardware and software. Hardware is the part of technology that includes the physical components, while software is the part that consists of the information aspects that help to use it to perform certain tasks. A company that wants to adopt cloud computing should have at least the minimum hardware

requirements and the Software required. Cloud computing does require a huge infrastructure and a well working Internet connection. Any assessment instrument should include identification of the hardware available in a company. Thus, the instrument used in this study asks managers about the hardware capabilities of their companies, in particular the questions relating to hardware focus on easy access to computers and the Internet/Intranet. Yet, having easy access to hardware is not enough consequently, identification of employees' attitudes toward use of technology is also should be taken into account in the process of developing the assessment instrument. This consideration is not only limited to employees but also covers identification of managers' attitudes, as well.

Innovation as a factor mainly involves examination of past experiences. According to Rogers (2003), past experiences in a system about an innovation may also affect the adoption of a new one. Likewise, past experiences of employees, as well as managers, about an innovation in any or similar previous management procedures in a company may be influential on results of an e-learning initiative. Total quality management(TQM) is one of the innovations that have been introduced to the companies all around the world recently. Some of the companies have been able to easily adopt TQM, while others are still struggling. Information on acceptance or rejection of this innovation in a company might be used as a predictor of readiness. For this reason, several questions about the acceptance of TQM among employees, managers, and human Resources department staffs are included in the readiness instrument. Another question considered under innovation factor is barriers to implementation. Internal or external, legal and/or politic barriers might influence the applicability of e-learning. Managers should always take into account any barriers they may face in implementation when planning for e-learning in their organizations.

People deals with the characteristics of all human resources of a company. The proposed instrument asks managers the average educational level of their employees, whether their companies have skilled human resources or personnel or training- department specialist, and a champion (leader), and whether there are enough e-learning vendors and external e-learning experts.

Self-developments the last factor identified for use in assessing the organizational readiness of companies. Diffusion of innovation theory also shows that companies those are open to organizational and individual development, those actively seek for information about innovations to improve themselves, and those have higher self-efficacy beliefs for the achievement can adopt innovations earlier than others (Rogers,2003; Aydin,2005).To meet this criterion, the instrument asks users if the employees are able to manage their spare time in order to find occasions in the day for completing cloud computing assignments.

CHAPTER FOUR

4.1. Methodology

Methodology refers to the formulation of the method used to achieve knowledge via the entire research process (Bryman, 2008; Liya Xi,2014). It is used to explore different types of methods or procedures and to find out the research assumptions. A research methodology addresses the question of ‘how’ the study is conducted and it is normally governed by the research questions (Williamson, 2002; Zijad P,2007).Methodology use for this study is to assess Strategic, Technological, Organizational, People and Environmental readiness to adopt cloud computing readiness for Ethio telecom. Beside the above e-readiness assessment frame work a real assessment is done based on four perspectives Technology, Innovation, People and Self Development. This assessment model will help to get a real assessment result because these questions are free from terms, phrases and organizational norms. In this study descriptive research will be used. Descriptive Research is a study which is concerned with describing the characteristics of a particular individual or a group. According to (yogesh, 2006) Descriptive research is concerned with the present and attempts to determine the status of the phenomenon under investigation. It includes identifying present conditions and point to present needs, studying immediate status of a phenomenon, Facts finding and examine the relationships of traits and characteristics (trends and patterns).

4.2. Target population

A population can be defined as including all people or items with the characteristics one wishes to understand. Because there is very rarely enough time or money to gather information from everyone or everything in a population, the goal becomes finding a representative sample of the population. The target populations for this study are employees of Ethio telecom. The main purpose for this assessment is to study the readiness level of Ethio telecom to implement Cloud Computing.

In Ethio Telecom there are 19 divisions. Among 19 divisions, the system initiation and also after implementation it'll be fully managed under the Information system division. Therefore, employees who are working in this division are primarily considered as the major

parts of the targeted populations. Next to information system division employees of Customer service division will be part of target population by give support to the user after implementation. At last, based on the researcher preliminary survey observation employees who are working in marketing and communication divisions will be the promoters & customer contact thus they will be included as parts of the targeted populations for this study.

In information system division there are around 343 employees where 1 chief information officer, 6 officer, 30 managers and the rest 306 are staffs.

In customer service division there are around 1476 employees where 1 chief information officer, 3 officer, 10 managers and the rest 1462 are staffs.

In marketing and communication division there are 120 employees where 1 chief information officer, 5 officer, 10 managers and the rest 104 are staffs.

Division	Number of top manager	Number of manager	Number of staff	No. staff total no of staff
Information system division	7	30	306	343
Customer service division	4	10	1462	1476
marketing and communication division	6	10	104	120
Total target Population				1939

Table 4.1 target population

4.3. Sampling technique

In order to appropriately represent the characteristics of the entire population for the purpose of the study a process of sample selection is required. Samples are a collection of various entities chosen for the purpose of analyzing their potential relevance to the research problem, which include “objects, text materials, and audio-visual and electronic records” (Leedy , Ormrod, 2013; Liya Xi,2014). Sampling is concerned with the selection of a subset from the population to estimate the whole population, minimized cost and also data collection can be faster than measuring the entire population.

Sample designs are basically of two types: non-probability sampling and probability sampling. Probability sampling is based on the concept of random selection, whereas non-probability sampling is ‘non-random’ sampling. Under probability sampling design, every item of the universe has an equal chance of inclusion in the sample. Under non-probability sampling each item in the population has of being included in the sample (Kothari, 1990).for this research non-probability sampling will be used.

4.4. Data collection

Data collection is a term used to describe a process of preparing and collecting research data. It is important to choose the right data collection method as this will allow data to be collected to meet the objectives of the research. Data collection can be derived from a number of methods, which include interviews, focus groups, surveys, telephone interviews, field notes, taped social interaction, questionnaires, and from various publications. Data collected to this study could be a base to understand and identify the readiness of the company to implement Cloud Computing.

Data collection consists of either primary or secondary data. Primary data is information that is collected a fresh by the researcher to answer his current research questions. There are several methods of collecting primary data; it can obtain either through observation or through direct communication with respondents in one form or another or through personal interviews (Alemayehu A, 2014). Secondary data is use of information already collected by someone else. Secondary data may either be published data or unpublished data. Usually

published data are available in various publications of the organizations, governments, researchers, individuals, and others sources of published information. The sources of unpublished data are many; they may be found in diaries, letters, unpublished biographies and autobiographies and also may be available with scholars and research workers, trade associations, and other public/private individuals and organizations. The already available data should be used by the researcher only when the data are reliable, suitable and adequate (Kothari, 1990; Alemayehu A,2014).

The decision of which information acquisition method to use depends on the research goals and the advantages and disadvantages of each method relative to those goals. Because it is worth remembering that one method of data collection is not inherently better than another method (Nyaora, 2012; Alemayehu A,2014). This research has preferred to use primary data for different reasons. Firstly, primary data is up to date/fresh, and this is vital where the research is looking at issues in an environment with a rapidly changing landscape such as the cloud computing environment. This original data is important for identifying the real requirements of banks. Secondly, scarcity of finding secondary data that are suitable for this study; because cloud computing is an emerging technology in the developing country

For this study interview and questioner will be used as a primary data that contained close ended questions and semi-structured interview. Secondary data sources will be used including journals, books, and the internet.

Questionnaire

In order to get primarily data about readiness of the organization to implement cloud computing it is good to collect data through direct connection with the employees of the organization by preparing questionnaire. The questionnaire is the primary tools in collecting necessary information from the respondents of a survey. There are three type of question Close-ended, open-ended questions.

A closed-ended question limits the answers of the respondents to response options provided on the questionnaire. But these types of questions are time efficient and easy to code and interpret. In Open-ended questions there are no predefined options or categories. The

participants can respond to the questions exactly as how they would like to answer them. The researcher can investigate meaning of the responses but this type of questions are time consuming and difficult for the researcher to interpret. For this research close ended question are developed.

Before applying this method Pilot Study for testing the questionnaire will be conducted this reveals the weaknesses. The pilot study will be effective in collecting the relevant information and will lead the response from the questionnaire to be helpful in answering the research questions. In this research two type of Questionnaire was designed the first one based on the STOPE model. It contains personal profile questions and questions developed from five standpoints Strategy, Technology, Organization, People and Environment. The questions are Likert scale numbers range from 1-5 (1= strongly agree, 2= agree, 3=uncertain, 4= disagree, 5= strongly disagree). The first questionnaire was developed for Information System, Customer service and marketing and communication staffs only.

The second Questionnaire was aimed to get a real assessment survey from top managers who are able to judge their companies readiness for cloud computing. The questionnaire contains four perspectives which are Technology, Innovation, People and Self-development .The questions are Likert scale numbers range from 1-5 (1= strongly agree, 2= agree, 3=uncertain, 4= disagree, 5= strongly disagree).

Interview

The second primary data collection method used for this study is interview. There are different types of interview Structured, semi-structured and unstructured interviews.

In structured interview the aim is for all interviewees to be given exactly the same context of questioning so that their replies can be aggregated. Questions tend to be closed ended, pre-coded, or of fixed choice. Structured interviews make probing a problem area difficult because they introduce some rigidity to the interview (Corbetta, 2003; Alemayehu A,2014). Nevertheless, the common format utilized within these types of interview makes it easier to code, analyze and compare data (David, Sutton, 2004; Alemayehu A,2014).

Semi-structured interviews, on the other hand, are non-standardized and are frequently used in qualitative analysis. The interviewer does not do the research to test a specific hypothesis. Instead he has a list of key themes, issues, and questions to be covered (David, Sutton, 2004; Alemayehu A,2014). Semi-structured interviews give the researcher flexibility to establish own style of conversation depending on the direction of the interview. This flexibility enables probing, which is a way for the interview to explore new path which are not initially considered (Corbetta, 2003; Alemayehu A,2014).

The unstructured interview or in-depth interview takes a further step towards a more open discussion where no predetermined question is needed. The interviewee is encouraged to speak freely about events, behavior, and beliefs, with reference to the subject. The problem with this is that the researcher may not know what to look for or what direction to take the interview especially if his interviewers are inexperienced. Respondents may talk about irrelevant and inconsequential issues and also it may be difficult to code and analyze the data. The unstructured interview would be highly disadvantageous for this research especially when one considers the limited research time and resource that study's offer.

For this research semi-structure interview method was selected because it is most suitable considering the nature of the subject. Semi-structured interviews give the researcher flexibility to establish own style of conversation depending on the direction of the interview. This flexibility was important to obtain rich information systematically from the interview about the subject. Interview questions were adopted from (Sewale, 2012).

4.5. Sample size

The actual sample size has been determined from total targeted populations through online calculator (sample size calculator using software¹). With 95% of confidence level and 10% of confidence interval (margin of error), the sample size is 92. For the simplicity of calculations the sample size taken by the researcher was 100 Ethio Telecom permanent employees.

¹ (<http://www.surveysystem.com/sscalc.htm>), visited on 3/05/17, 3:05 PM.

Determine Sample Size

Confidence Level: 95% 99%

Confidence Interval:

Population:

Sample size needed:

Figure 4.1 determine sample size

Also sample from each stratum is selected using purposive sampling a non-probability sampling technique. This involves nothing but purposely selecting individuals from the population based on the researcher's knowledge and judgment.

The system will be managed by information system division but 80% of the target population has been taken from customer service division. Due to this, the researcher has observed and convinced at least to take 50% (50 employees) of the sampled population size from customer service division. For the rest of the targeted sampled sizes, the researcher has taken 40% (40 employees) from Information system division and 10% (10 employees) from marketing and communication division by considering the discussion part (target population for this study) above.

There are 61 top level management from the three selected division but 50% are from information system division based on the researcher's knowledge and judgment 10 managers from information system division, 3 from customer service and 1 from marketing and communication will be selected for interview using purposive sampling method

4.6. Data Presentation and Analysis

Data analysis involves putting in order what the researcher has read, seen and heard, in order to make sense of the data, and hence to answer the research question. It enables a researcher

to obtain valuable information from the raw data (Christensen, Johnson & Turner, 2011; Liya Xi, 2014).

The collected data are clearly presented by using tables and charts which have been expressed in the form of frequency, percentage and mean. Then, descriptive analysis technique has been applied to manipulate the organized data. Meanwhile, SmartPLS software was used as the main tool to manipulate the data.

SmartPLS is software with graphical user interface for variance-based structural equation modeling (SEM) and partial least squares method (PLS). In this case the validation process focused on two components of structural equation modeling (SEM) which helps us to show the measurement and the structural model.

4.7. Pilot Testing

A pilot study was conducted with a sample of 35 in order to test the validity and reliability of the questionnaire. Moreover, it helps to ensure whether the instruments are free of ambiguity and irrelevant items. Pilot study is also valuable for controlling bias in data interpretation prior to disseminating the survey to the actual full-scale group. All of the participants filled the questionnaire, which indicated 100% response rate of the pilot study. Once the questioner was filled, the feedbacks were gathered from the participants. In accordance with the pilot test feedbacks, the questionnaire was amended to improve the clarity of the questions, minimize data interpretation bias and increase the likelihood of success. Further, to measure the internal consistency of the questionnaire, reliability test was conducted by composite reliability. Composite reliability varies from 0 to 1, with 1 being perfect estimated reliability. In a model adequate for exploratory purposes, composite reliabilities should be equal to or greater than .6 (Chin, 1998; Hock& Ringle, 2006: 15; wong,2013); Hence, the Composite reliability test is an indication that the survey questionnaires reliability and internal consistency to use for the study as can be seen in table 4.2.

	Composite reliability
Readiness	0.952
Strategy	0.877
Technology	0.889
Organization	0.798
People	0.848
Environment	0.760

Table 4.2 Composite reliability for pilot test

4.8. Validity

Validity is the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure. Validity can also be thought of as utility. In other words, validity is the extent to which differences found with a measuring instrument reflect true differences among those being tested (Kothari, 2004; Ongonge ,2013).As stated above, questionnaire and Interview was used to collect the primary data. Therefore, to assure validity of the questionnaire and interview questions was validated by the advisor

4.9. Reliability

Reliability refers to the repeatability of findings. The test of data reliability is another important test of sound measurement. A measuring instrument is reliable if it provides consistent results, (Kothari, 2004; Ongonge ,2013). Reliability as mentioned in the above refers to repeatability of a study, i.e. ability to deliver non-random results (Nyaoro, 2012; Ongonge ,2013). This research is reliable because it used valid strategies and techniques appropriate to the research objectives. It has a detailed record of research plan and its implementation. The purpose of the research and the use of the collected data were discussed to the interviewees to collect unbiased response and some questionnaires were distributed as a pilot test and then make some adjustments accordingly. The composite reliability indicated that the survey questionnaire is reliable since it is greater than 0.7 which

is the minimal alpha value. Hence, it is found relevant to test the reliability of each of themes (strategy, technology, organization, people and environment) in order to get more reliable result. Accordingly, further reliability analysis was conducted with composite reliability alpha result of strategy (0.877), technology (0.889), organization (0.798), people (0.848) and environment (0.760). Thus, the study is reliable based on the obtained result of the reliability tests.

4.10. Ethical Issues

- The study was in line with the organizations policy in relation to any intellectual property rights of the organization.
- Regarding privacy of the respondents, their responses are strictly confidential and only used for academic purposes.
- It could not be ethical to access some confidential documents of the organization. So, the organization's code of ethics taken in to account without significantly compromising the findings of the study.
- Concerning references, all the materials and sources are properly acknowledged.

CHAPTER FIVE

5.1 Data Analysis and Findings

In this chapter, data obtained from various sources are presented, analyzed and discussed based on the specific objectives and in line with the existing theory. The first section incorporates quantitative data presentation, analysis and discussion using Both assessment of measurement model (reliability and validity test) and structural model (significance test, path analysis, R-squared and Q-squared) and the second part consists of the qualitative data analysis and discussion is presented according to the data obtained through the interview which was conducted based on the interview questions outline.

5.2. Quantitative Data Presentation, Analysis and Discussion

5.2.1. Demographic Presentation

This portion of the survey is concerned with background of the respondents to understand the employees or respondents who participate in filling the questionnaire for this research. Respondents are requested to fill their sex, age and their work experience in the organization. When we look the respondent gender wise, 58% of the respondents are males whereas only 42% of the respondents are females. This shows that more of the respondents are male.

When we see the respondent by age range 22% respondents are categorized in age range between 20-25years, 56% in the age range 26-35. 21% of the respondents are categorized in age range between 36-45. And 1% of the respondents are categorized in range of 46-55. This shows that most of the respondents are below the age range of 35 years.

The job experience of the respondent is included in the questionnaire since It can show how familiar the respondents are with their work operation and how experienced they are with different systems When we see the respondent work experience in the company 24% of the respondent experience is under 5 years, 58% of the respondent are between 5-10 years of work experience and only 17% are between 11-15 years of work experience and 1% of the respondents have work experience grater thank 15 years. This shows that more of the

respondents of this study are above 5 years' experience, which shows that participants of this study are experienced employees.

Demographic Object		Frequency	Percent
Gender	Male	58	58.0
	Female	42	42.0
Age	20-25	22	22.0
	26-35	56	56.0
	36-45	21	21.0
	46-55	1	1.0
Work Experience	< 5 years	24	24.0
	5-10 years	58	58.0
	10- 15 years	17	17.0
	>15 years	1	1.0

Table 5.1 Demographic Data for the respondent

5.2.2. Evaluation of Measurement Model

To assess measurement model reliability and validity test were conducted. For testing reliability, the researcher uses composite reliability value of the SMARPLS. This value is similar with Cronbach's α reliability coefficient which was used to check the internal consistency reliability of the instrument. For testing validity, convergent validity average variance extracted (AVE) and discriminatory validity were implemented.

Reliability was calculated using PLS algorithm with maximum iteration of 300. Some authors consider items whose Alpha coefficient is 0.7 as reliable; (Joseph F. Hair et al., 2014; Nils Urbac and Frederik Ahlemann, 2010; Chin, 2010; Ibrahim, 2016). Based on the outer loading value of those who has less than 0.7 are deleted and values greater than 0.7 are considered adequate for this research.

Tables 5.2 shows those deleted and retained items based on the above criteria for further analysis. As indicated in Table 5.2. 5 items from Strategy, 4 items from Technology, 2 items from Organization, 4 items from people, 3 items from Environment are removed further analysis.

Construct	Indicator	Loading	Status
Strategy	QS1	0.818	Retained
	QS2	0.834	Retained
	QS3	0.586	Deleted
	QS4	0.878	Retained
	QS5	0.330	Deleted
	QS6	0.886	Retained
	QS7	0.590	Deleted
	QS8	0.858	Retained
Technology	QT1	0.602	Deleted
	QT2	0.658	Deleted
	QT3	0.646	Deleted
	QT4	0.800	Retained
	QT5	0.806	Retained
	QT6	0.832	Retained
	QT7	0.634	Deleted
Organization	QO1	0.739	Retained
	QO2	0.510	Deleted
	QO3	0.671	Deleted
	QO4	0.847	Retained
	QO5	0.670	Deleted
	QO6	0.667	Deleted
People	QP1	0.466	Deleted
	QP2	0.745	Retained
	QP3	0.675	Deleted
	QP4	0.894	Retained
	QP5	0.258	Deleted
	QP6	0.769	Retained
	QP7	0.924	Retained
Environment	QE1	0.779	Retained
	QE2	0.891	Retained
	QE3	0.855	Retained
	QE4	0.493	Deleted
	QE5	0.357	Deleted
	QE6	0.222	Deleted

Table 5.2 First Iteration outer loading value

5.2.2.1. Composite reliability

Reliability is a measure of the extent to which a research instrument yields consistent results after repeated trials. Reliability refers to the degree to which a measurement scale or a test is dependable, consistent, predictable and stable. Reliability tests checked inner consistency of the questions against the test items bringing on board the idea of replicability (Chin and Newsted, 1999; G. David Garson, 2016).

Composite reliability is a preferred alternative to Cronbach's alpha as a test of convergent validity in a reflective model. It may be preferred as a measure of reliability because Cronbach's alpha may over or underestimate scale reliability. For this reason, composite reliability is preferred among researchers in PLS-based research. The acceptable cutoff for composite reliability is the same as for any measure of reliability, including Cronbach's alpha. Composite reliability varies from 0 to 1, with 1 being perfect estimated reliability. Construct reliability coefficients should all exceed the 0.70 lower limits (Hair et al., 1998; Rossiter, 2002; wong,2013). For this study a cutoff point of 0.7 and above was considered adequate. As shown in table 5.3 all values are close to 1 thus it can be concluding that this research is perfectly reliable.

	Composite reliability
Readiness	0.957
Strategy	0.945
Technology	0.899
Organization	0.844
People	0.920
Environment	0.895

Table 5.3 Reliability Test

Construct Reliability and Validity

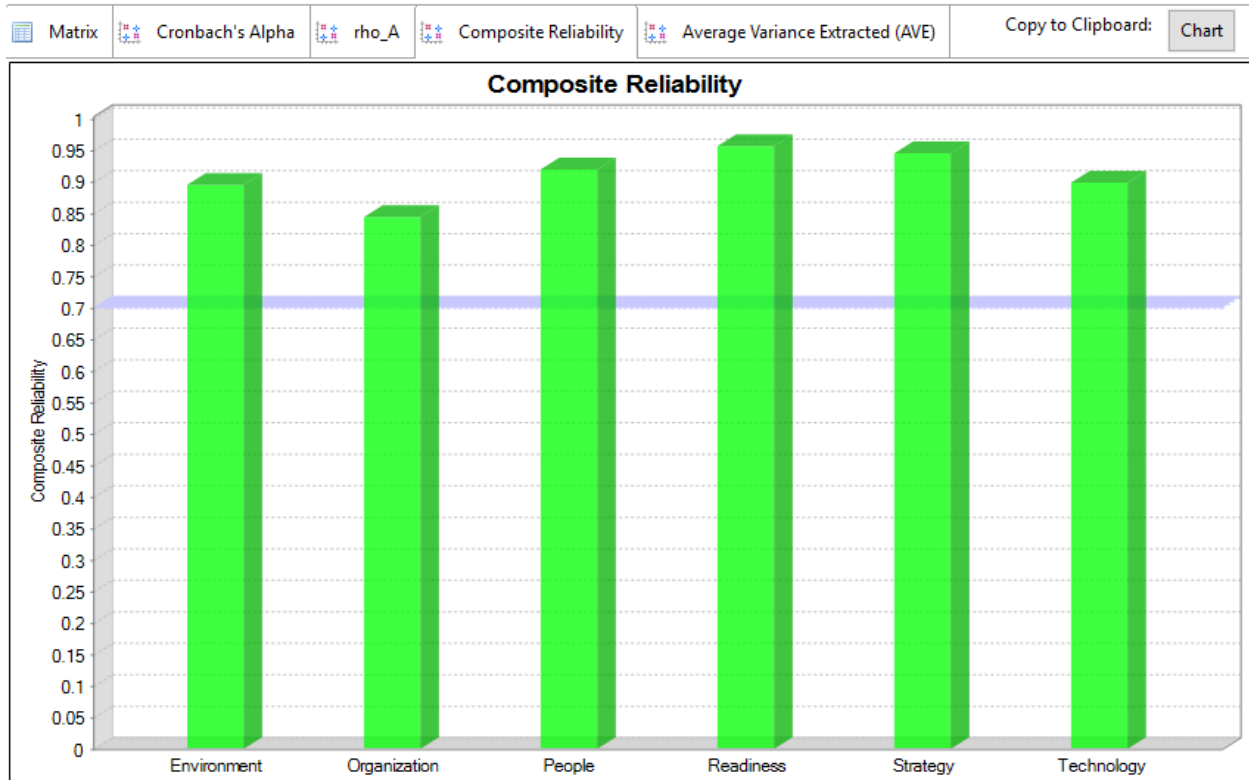
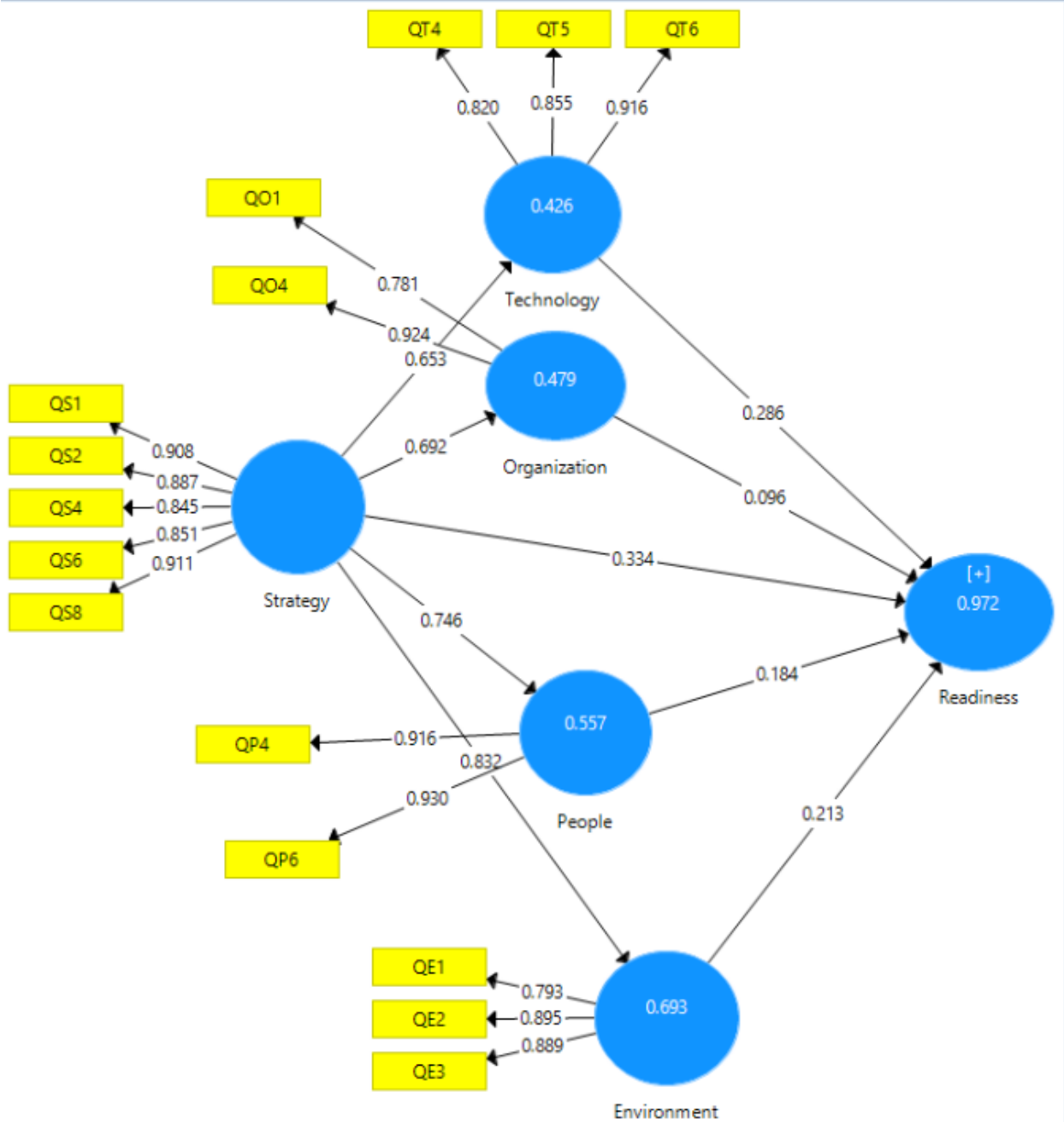


Figure 5.1 Composite Reliability

As indicated in fig 5.1 indicators of the strategy factors construct ranged from 0.845-0.911, indicators of the technology factors construct ranged from 0.820-0.916, indicators of the organizational factors construct ranged from 0.781-0.924, indicators people factors construct ranged from 0.916-0.930, indicators of the environment factor construct ranged from 0.793-0.895. The composite reliability as shown in Table 5.3 and Graph 5.1 the five frameworks: Strategy (0.945), Technology (0.899), Organization (0.844), People (0.920) and Environment (0.895) had relatively high composite reliability, which showed all values fall within the acceptable range to conclude good reliability.



Graph 5.1 Revised paths Estimation

5.2.2.2. Validity

Validity refers to “the extent to which the empirical measure adequately reflects the real meaning of the concept under consideration” (Nils Urbac, Frederik Ahlemann, 2010; Ibrahim, 2016) it concerns the accuracy of inferences. Construct validity was ensured since the questionnaire was developed based on tools used in prior studies with modifications so as to address the objectives of this study. Content validity was ensured through the guidance of the expert opinion (Chin, 1998; Ibrahim, 2016). In this research to insure content validity discriminate validity implemented.

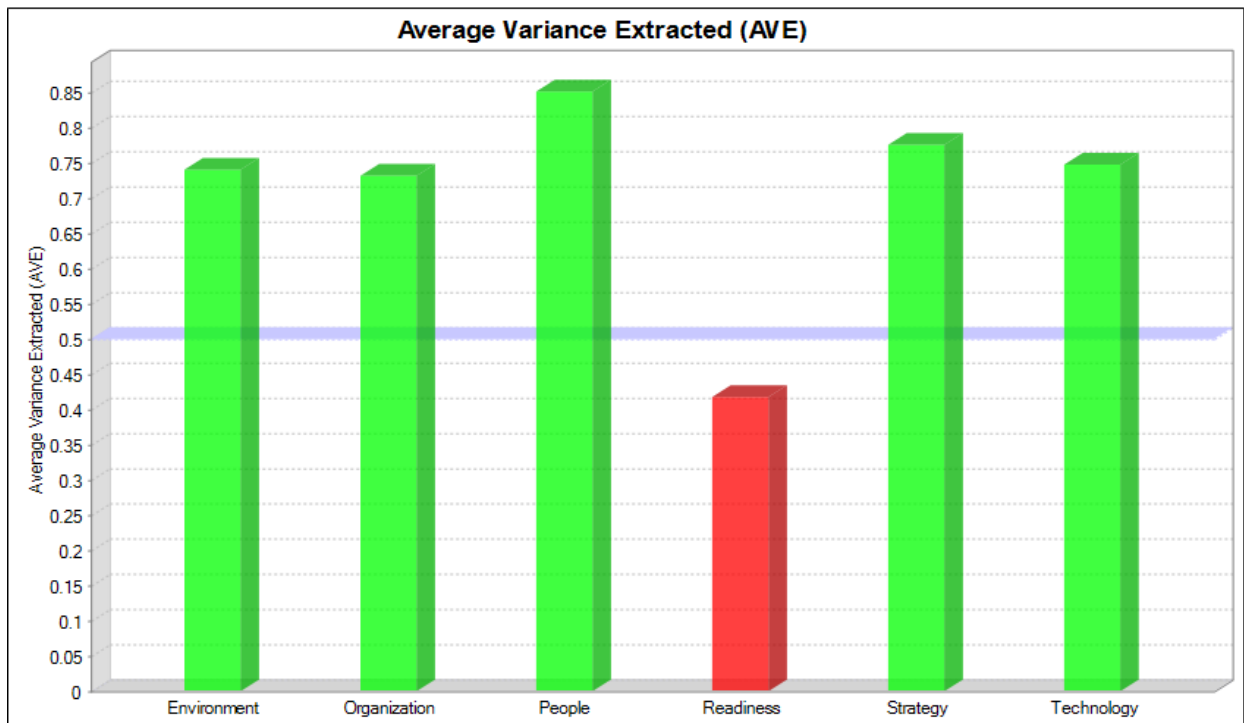
Average variance extracted (AVE)

AVE is a measure of the amount of variance that is captured by a construct in relation to the amount of variance due to measurement error. AVE may be used as a test of both convergent and divergent validity. AVE reflects the average communality for each latent factor in a reflective model. In an adequate model, AVE should be greater than .5 (G. David Garson et al., 2016) as well as greater than the cross-loadings, which means factors should explain at least half the variance of their respective indicators. AVE below 0.50 means error variance exceeds explained variance. For the seminal paper on AVE (Fornell & Larcker ,1981; G. David Garson, 2016)

Table 5.4 and Graph 5.2 show that AVE value of this research. The value of Readiness (0.418), Strategy (0.776), Technology (0.748), Organization (0.732), People (0.851), and Environment (0.740) are above the threshold value of 0.50. Thus the measures of all construct have high level of convergent validity but readiness has threshold value of 0.418 which shows low level of convergent validity.

	Average variance extracted (AVE)
Readiness	0.418
Strategy	0.776
Technology	0.748
Organization	0.732
People	0.851
Environment	0.740

Table 5.4 Average Variance Extracted (AVE) Value



Graph 5.2 Average Variance Extracted (AVE)

Discriminatory Validity

The next step in the construct validation process is the assessment of discriminant validity. Discriminant validity reflects the extent to which the measure is unique and not simply a reflection of other variables (Peter and Churchill 1986; wong,2013). Each dimension of a construct should be unique and different from the other even though each reflects a portion of that construct. There are several ways to evaluate discriminant validity. Average Variance Extracted (AVE) is a common method of testing discriminant validity (Gerbing and Anderson, 1988; wong, 2013). Discriminate validity was evaluated by examining the cross loadings of each item in the constructs and the square root of AVE calculated for each construct. All the items should have higher loading on their corresponding construct than the cross loadings on the other constructs in the model. The square root of AVE for all factors should be greater than all the correlations between that construct and other constructs.

To check discriminatory validity the researcher uses Fornell-Larcker Criterion and cross loading value.

According to Fornell-Larcker Criterion, the square root of the AVE of each construct should be higher than the construct's highest correlation with any other constructs in the model. Table 5.5 shows that the result of Fornell-Larcker Criterion. Readiness has a value of 0.803. Environment (0.927), Organization (0.924), People (0.960), Strategy (0.938), Technology (0.930)

	AVE	Environment	Organization	People	Readiness	Strategy	Technology
Environment	0.740	AVE=0.860 $\sqrt{AVE}=0.927$					
Organization	0.732	0.634	AVE=0.855 $\sqrt{AVE}=0.924$				
People	0.851	0.811	0.583	AVE=0.923 $\sqrt{AVE}=0.960$			
Readiness	0.418	0.897	0.756	0.880	AVE=0.646 $\sqrt{AVE}=0.803$		
Strategy	0.776	0.832	0.692	0.746	0.902	AVE=0.881 $\sqrt{AVE}=0.938$	
Technology	0.748	0.684	0.650	0.762	0.853	0.653	AVE=0.865 $\sqrt{AVE}=0.930$

Table 5.5 Fornell-Larcker Criterion

Diagonal terms (**in bold**) are square root of the average variance extracted. Off-diagonal terms are the correlation of latent constructs

Cross Loadings

	Environment	Organization	People	Readiness	Strategy	Technology
QS1	0.788	0.651	0.673	0.779	0.908	0.612
QS2	0.755	0.536	0.644	0.754	0.887	0.492
QS4	0.692	0.618	0.598	0.813	0.845	0.582
QS6	0.740	0.659	0.748	0.881	0.851	0.682
QS8	0.678	0.565	0.600	0.724	0.911	0.476
QT4	0.612	0.478	0.642	0.753	0.690	0.820
QT5	0.560	0.759	0.642	0.714	0.461	0.855
QT6	0.593	0.466	0.687	0.735	0.514	0.916
QO1	0.433	0.781	0.353	0.549	0.349	0.631
QO4	0.623	0.924	0.602	0.724	0.757	0.525
QP2	0.520	0.312	0.462	0.601	0.306	0.601
QP4	0.607	0.552	0.916	0.817	0.608	0.789
QP6	0.821	0.526	0.930	0.809	0.762	0.625
QP7	0.916	0.628	0.831	0.929	0.806	0.721
QE1	0.793	0.496	0.470	0.646	0.503	0.505
QE2	0.895	0.562	0.738	0.797	0.865	0.542
QE3	0.889	0.573	0.738	0.797	0.865	0.542

Therefore as shown in Table 5.5 the AVE and cross factor loading extracted for all latent variables. All the items is having higher loading on their corresponding construct than the cross loadings on the other constructs in the model. The AVE for each latent factor exceeded he respective squared correlation between factors, thus providing evidence of discriminant validity (Fornell and Larcker, 1981; wong, 2013).

5.2.3. Evaluation of Structural Model

Structural model assessed using, significant testing, coefficient of determination (R-square), effect size (F- Squared), and predictive relevance (Q-square) (Wong et al., 2013). A structural model defines the causal relationships between the latent constructs, thus the assessment of the structural model is based on the meaningfulness and prediction of the proposed relationships.

5.2.3.1. Significance test

Bootstrapping conducted to generate T-statistics for significance testing of the outer model. In this procedure, a large number of subsamples (5000) are taken from the original sample with replacement to give bootstrap standard errors, which in turn gives approximate T-values for significance testing of the structural path.

In this researcher two-tailed t-test with significance level of 5% conducted. Using a two-tailed t-test with a significance level of 5%, the path coefficient will be significant if the T-statistics is larger than 1.96 (Wong, 2013). In this bootstrapping result as indicated in table 5.7 all T-statistically significant On the other hand T-statistics result of the outer model are larger than 1.96, thus the outer model loadings are highly significance.

	T-Statistics	P value
H1 Strategy → Readiness	6.593	0.000
H2 Technology → Readiness	5.468	0.000
H3 Organization → Readiness	3.324	0.000
H4 People → Readiness	2.954	0.000
H5 Environment → Readiness	3.924	0.000
H6 Strategy → Technology	9.906	0.000
H7 Strategy → Organization	14.388	0.000
H8 strategy → People	11.060	0.000
H9 Strategy → Environment	23.021	0.000

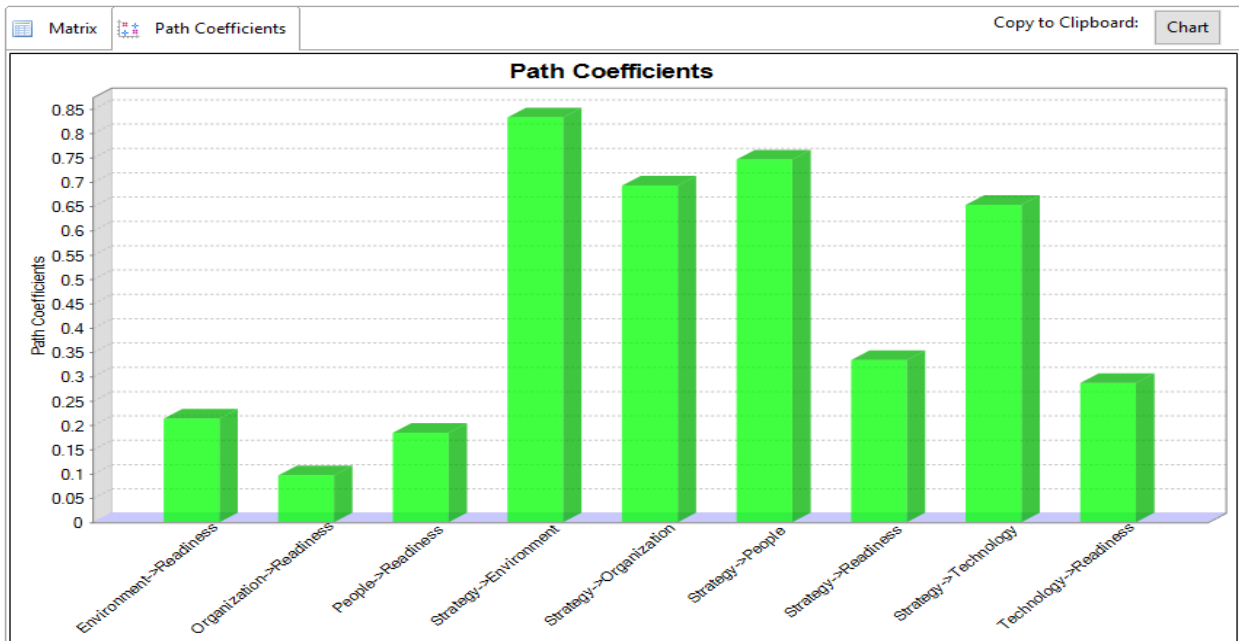
**Table 5.7 T-statistics
Path Analysis (Path coefficient)**

The path coefficient explains the relative importance of exogenous construct (Strategy, Technology, Organization, People and Environment) on endogenous construct (Readiness). Then value of path coefficient range between -1 to +1. Estimated path coefficient close to +1 represents strong relationships and that is statistically important. Conversely, when the value close to -1 represents strong inverse relationship between exogenous and endogenous constructs. This value also statistically important. On the other hand if the value closer to 0 implies that weak relationship between the construct. As shown in table 5.8 hypothesis 1,2,3,4,5 has weak relationship and hypothesis 6,7,8,9 has strong relationship.

	Path coefficient
H1 Strategy → Readiness	0.334
H2 Technology → Readiness	0.286
H3 Organization → Readiness	0.096
H4 People → Readiness	0.184
H5 Environment → Readiness	0.213
H6 Strategy → Technology	0.653
H7 Strategy → Organization	0.692
H8 strategy → People	0.746
H9 Strategy → Environment	0.832

Table 5.8 path coefficient

Path Coefficients



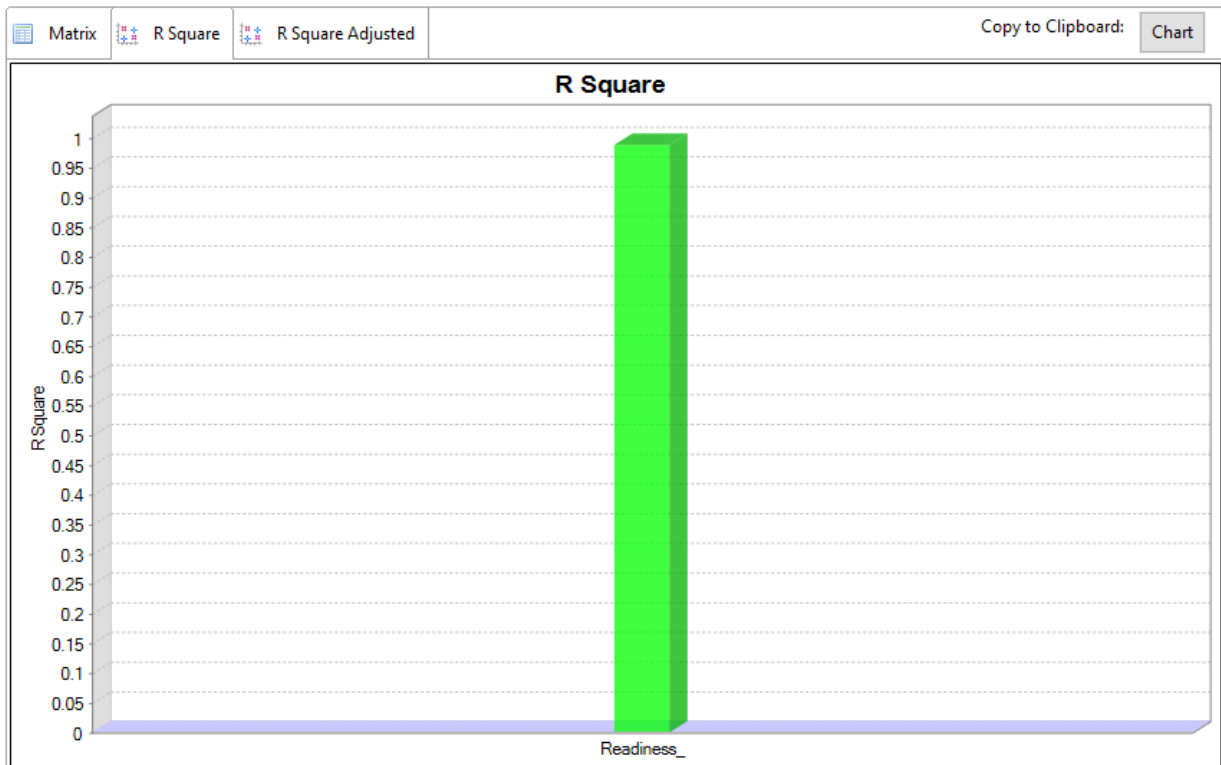
Graph 5.3 path coefficient

R- Squared Value

To evaluate the structural models predictive power, R squares (R^2) were calculated. R squares (R^2) indicates the amount of variance explained by the exogenous variables (Chin, 1998; wong, 2013).

The value of R^2 is between 0 and 1 .If the value is closer to 1 the exogenous variable explain the dependent variable well and it is closer to Zero it is week (Wong et al., 2013). R^2 readiness value of this research is 0.989 which is closer to 1 therefore according to scholars exogenous variables of readiness have high dependency

R Square



Graph 5.4 R Square

Assessment of predictive Relevance (Q^2)

The quality criterion for the structural model is the Stone–Geisser’s Q , conducted to determine predictive relevance using the blindfolding procedure in SmartPLS. Q^2 measures the extent to which the model’s prediction is successful. A value of $Q > 0$ confirms the presence of predictive relevance (Urbach and Ahlemann 2010; G. David Garson, 2016). The blindfolding Q^2 value as shown in below Table 5.9 all of these values are above zero confirming that the structural model exhibits predictive relevance for Readiness.

	Q^2
Environment	0.440
Organization	0.232
People	0.441
Readiness	0.352
Strategy	0.614
Technology	0.453

Table 5.9 Q^2 value

5.2.3.2 Hypotheses testing

Using a bootstrapping technique with a re-sampling of 5000, the path estimates and t-statistics were calculated for the hypothesized relationships. The researcher derived nine hypotheses for this research based on literature review. Now it is time to check these hypotheses based on the data collected from the respondent. T- Value is used to test the hypothesis. Parameters whose t-values were greater than 1.96 were considered statistically significant at the 0.05 level.

Hypothesis 1 (H_1): Strategy’s related with telecom readiness in adoption of cloud computing.

Hypothesis 2(H_2): Technological readiness level is related with cloud computing adoption.

Hypothesis 3 (H_3): Organizational readiness level is related with cloud computing adoption.

Hypothesis 4 (H_4): People readiness is related with cloud computing adoption

Hypothesis 5 (H_5): Environmental readiness level is related with cloud computing adoption.

Hypothesis 6 (H_6): strategy affects technology readiness.

Hypothesis 7(H_7): strategy affects organization readiness.

Hypothesis 8(H₈): strategy leadership level of readiness is positively related to people readiness

Hypothesis 9(H₉): Strategy is positively related to external environment readiness

	Path coefficient	T-Statistics	Decision
H1 Strategy → Readiness	0.334	6.593	Supported
H2 Technology → Readiness	0.286	5.468	Supported
H3 Organization → Readiness	0.096	3.324	Supported
H4 People → Readiness	0.184	2.954	Supported
H5 Environment → Readiness	0.213	3.924	Supported
H6 Strategy → Technology	0.653	9.906	Supported
H7 Strategy → Organization	0.692	14.388	Supported
H8 strategy → People	0.746	11.060	Supported
H9 Strategy → Environment	0.832	23.021	Supported

Table 5.10 Hypotheses testing

As shown in the above table 5.10 all nine hypotheses show path coefficient value range between -1 to +1 and t-values greater than 1.96. Thus all nine hypotheses proven to be valid.

5.3. Readiness Survey

The aim of this assessment was to allow managers to ask themselves the readiness of their company and the employee. A separate readiness assessment instrument was developed and distributed for 10 top manager of Ethio Telecom.

In order to help the managers (users of the instrument) of the company an assessment model must be generated. Assessment model of “e- Learning Readiness Survey” were designed in a way that provides easy coding and assessment for the users. The alternatives can easily be coded as 1, 2, 3, 4, and 5, as in a five-point Likert type scale. Therefore, the 3.41 mean score can be identified as the expected level of readiness with the item, while other responses enable organizations to show higher or lower levels of readiness. The 3.41 mean average was determined

after identifying the critical level: $4 \text{ intervals} / 5 \text{ categories} = 0.8$. As a result of this analysis, the levels of readiness were determined as depicted in Figure 5.2.

In this research to assess the readiness of the company and employee based on the managers' perception, 10 top managers of Ethio telecom have been considered to provide response to the questionnaire. All managers' responded to all questions and the data was analyzed using SPSS version 20. The assessment model has 4 intervals Technology, Innovation, People and Self-development.

For this research their mean value as showed in the below table 5.11 range between 4.4-4.8 base on e- Learning Readiness Survey instrument the result shows that the company is ready to implement Cloud Computing.

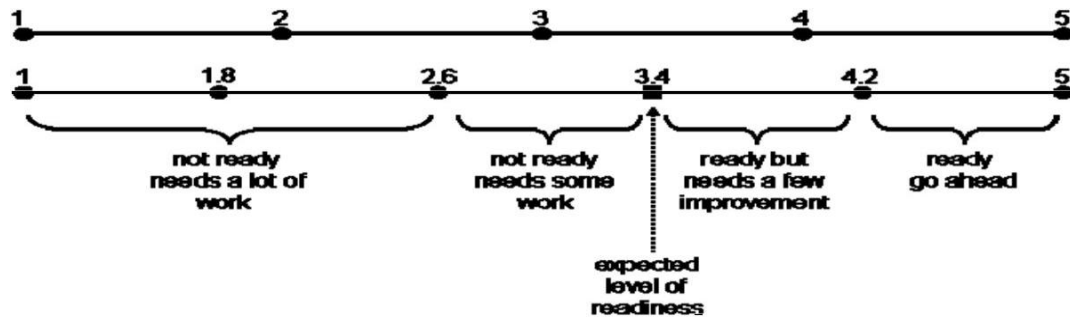


Figure 5.2. Assessment model of the e-LRS

	Mean	Level of readiness
Technology	4.8	Ready go ahead
Innovation	4.5	Ready go ahead
People	4.6	Ready go ahead
Self- development	4.4	Ready go ahead

Table 5.11 e-readiness assessment result

5.4 Qualitative data analysis

Qualitative data analysis is the process in which we move from the raw data that have been collected as part of the research study and use it to provide explanations, understanding and interpretation of the phenomena which we are studying. Accordingly, interviews have been conducted with 10 Top management members, to gather data regarding cloud computing implementation. Moreover, it also helped to discuss system related issues that Ethio telecom encountered during implementing other systems in the dimensions of strategical, technological, organizational, people and environmental themes. Accordingly, the interview output has been analyzed by conducting open coding as presented below.

Strategic

ICT for leadership and for future development plan

Mission of Ethio telecom

‘To provide world-class, modern and high quality telecom service for all citizens equitably so as to transform the multifaceted development of the country to the highest level’

Vision of Ethio telecom

‘To become a world- class provider of Telecom services’

All managers have similar perspectives in using ICT for leadership and for future development plan to achieve the organization mission and vision. Some of the interviewee replies as follow: ‘Ethio telecom is a telecom service provider its mission and vision is to provide world class telecom service by using Information technology like cloud computing to support its day to day activity. Implementing cloud computing is not sufficient to achieve Ethio’s vision and mission. Other modern technologies should be considered along cloud computing.’

‘Ethio telecom is a telecom service provider its core business is to provide telecom service for its citizen. Information technology is a supporter for it day to day activity in order to meet its mission and vision Ethio telecom should consider new technologies not only cloud computing.

‘To be a world class telecom service provider Ethio telecom should move by using new technologies and bring new technologies for its company and its citizens but ICT is a supporter for the company not core business so its strategy, mission and vision should be focus on its core business.’

‘As our company's vision is to be a world class telecom service provider it needs to have a strong financial status with cost effective strategies. In line with this the company needs to have as much as possible lower running or operational costs likewise Cloud computing provides this unique opportunity while comparing with our current operational costs.

Technology

ICT basic information infrastructure, e-service infrastructure, provisioning, support

‘Current Ethio telecom infrastructure doesn’t support cloud computing but a new data center is under construction which will improve the traditional data centers Power consumption, Data center management or storage management, insuring availability of all services 24/7, easy application upgrades’.

‘Implementing cloud computing have financial impact specially the initial cost is very difficult for organization like Ethio telecom which have an infrastructure that doesn’t support Cloud Computing. From financial perspective it is recommended if the implementation is parallel through long run.’

‘The current infrastructure is not capable to implement cloud computing. As a Strategic plan the organization is planning to implement cloud computing in 2019 GC. This plan is based on the current applications life cycle. Most of Ethio telecom current systems life cycle end at the end of 2018 GC. So that the new application which will be deployed after 2019 will have a capability to support cloud computing and the new data center which is under construction will be expected to be operational at that time’

Organization

ICT government regulation, cooperation, management

‘The structure of IS division, which is aligned to ITIL framework, promotes service improvement through service lifecycle phases. The need for new technology is assessed in strategy phase based on customer demand, and passes through design, transition and operation phase. Currently implementing cloud computing is in initiation phase after it pass this phase policies and procedures will be developed.’

‘Implementing cloud computing is in strategic plan level, the proposed implementation year is in 2019 GC. After the strategic plan is approved policies and procedure for implementing cloud computing will be developed.’

‘The organization has policy and procedure to implement new systems which are required for the performance and day to day activity of the organization. Most of the company systems has life cycle of 5 years. Before the life cycle starts to end requirement and design team starts to assess the customer demand and move through the cycle. At present this team has identified this need and all systems which will be deployed from now on will have a capacity to support cloud computing.’

People

ICT awareness, education and training, qualification and skill

One of the main drawbacks of the company is involvement of its employee in planning for new project and communication. There is a department under information division which is called IT Service requirement and design. This departments’ duty is assessing customer demand and based on the demand proposing anew project. When new project is initiated this team will assess the customer demand and need through interviewing the users and also the management team will propose their requirement.

‘Our experience is training will be given before implementation so I hope this trained will continue.’

‘The company have availed a well-established training center which shows the strong believe towards training and development for its employees.’

‘In most cases trainings are considered as an incentive rather than making an employee more equipped and qualified to perform his/her duty per the standard . As a result mostly the right people don’t take the appropriate training. I hope the company will learn from it past experience and will give an effective training for the right people at the right time ’

Environment

Knowledge, resources and economy, organization and general infrastructure

‘It is known that implementing cloud computing in Ethio telecom will need a significant paradigm shift on all current operational systems. So it will be a difficult economic decision not only for the company but the country as well. I suggest the company needs to implement a smooth and slow transition from the current traditional way to the modern cloud computing.

‘In order to implement cloud computing on 2019 the company needs to upgrade the current awareness and skill of its employees with well-planned international training so that the employees can successes in making the company's vision a reality.’

‘The current Ethiopian network infrastructure needs significant investment to be upgraded to the level that it could support and make cloud computing operational.’

➤ **As an Ethio Telecom Manager what benefit will your company get from implementing Cloud computing**

‘As a service provider, Ethio can provide cloud services to customers. This is one advantage and as a user of cloud computing, Ethio can benefit from infrastructure, service and software cloud services.’

‘One of the problems that I face as an operational manger is the current data center infrastructure is very traditional and there is high network interruption and failures related to power are frequent and they affect the operation and most equipment are damaged because of power fluctuations .so that there is no doubt that implementing cloud computing brings many benefit for Ethio telecom like improving the traditional data centers

- Power consumption
- Data center management / storage management
- Insuring availability of all services 24/7
- Easy application upgrades

- But to get the above mentioned benefits Ethio telecom should invest in its network and Data center infrastructure. And also the companies power usage should be consider.

As Ethio Telecom manager by implementing cloud computing my organization will add to its business processes like Scalability and speed of deployment of needed infrastructure, Reliability and failover i.e. most cloud services have business continuity and disaster recovery plans which are critical for every organization. From costing perspective, the capability of cloud computing to reduce cost and change operational model of the organization makes it attractive to organizations. Other reasons are:

- Being more agile. You have availability to resources on the go or on demand.
- Cloud availability i.e. service providers have more space available and you can buy more when you need it.
- Flexibility i.e. you only buy what you need and
- It gives organizations' the ability to be more innovative.

CHAPTER SIX

6.1 Discussion

Results of the data analyses presented in chapter Five are discussed in this chapter to address the research questions outlined in Chapter 1

This study used survey questionnaires to assess major factors that may facilitate implementation of cloud computing in Ethio Telecom. We considered key issues such as ICT infrastructure, leadership, affordability and availability of ICT, regulation of government and organizations, and the external environment. This and similar studies on readiness are expected to provide key readiness indicators for cloud computing adoption and for implementing new work processes and systems. As known, cloud computing implementation requires a significant investment because various backbone and support technologies and facilitating systems are prerequisites for their successful implementation and use. In addition to these, behavioral and psychological issues can potentially affect the implementation process. These issues either positively or negatively impact implementation of new technologies.

Ethio telecom is currently in the initiation phase for implementing cloud computing. Based on researcher observation and also the result from data analysis Ethio telecom have the financial capacity to implement cloud computing but there is a big communication gap and the current infrastructure is not capable to implement cloud computing though there is a new infrastructure which is under construction, the organization should be sure that the entire infrastructure should support cloud computing. According to kotze Organizations should ensure that the whole infrastructure supports Cloud computing before deciding to implement. This includes the availability of necessary technologies and expertise to operate those technologies (Carroll, Van der Merwe & Kotze, 2011; Olumide, 2014).

Organizations with large data centers and large IT infrastructure should decide to implement the type of cloud and also they should determine the size of the IT resources of the organization, the number of servers the company maintains in its data centers, the size of the customer base of the company, the annual revenue from IT, and the number of countries

across which the company has branches should be considered (Misra & Mondal, 2011; Olumide, 2014).

One of the draw backs of Ethio telecom is in its communication and awareness creation with its employees. In many organizations, when there is a change the focus is always on the technology and not on managing the changes that it brings in the process, structure and culture of the organization but it should be consider before moving into the implementation. The knowledge and awareness of an organization about a technology is important for the success of implementation. If the employees are aware of the technology, they will be able to make necessary preparations before adoption and this will increase the success of their implementation (Olumide et al., 2014). It is important to communicate the desired changes and the reason why the change is needed for everyone across the organization. This will help to reduce the resistance as people often feel that they are part of the change and they will be willing to help in implementing change when it is well communicated. The people who are expected to resist the change should be involved in designing and implementing the change. This will also assist in reducing resistance as they would want to be a part of success. It will help to increase their commitment to the change. Necessary arrangements should be made to provide training and emotional support for all the staffs that might be affected by the change in order to provide them with skills which will help them cope with the change.

According to Olumide, 2014 to ensure that Cloud Computing implementation is successful, there are some necessary skills that organizations must struggle to help them to properly implement Cloud Computing to achieve the assurances. Cloud computing requires a number of new skills which may require the organization to either train some of their staff in-house or send them to cloud training providers for training in order to equip them with these skills. Some of these skills include technical skill, security, business and financial skill, data integration and analysis skill, project management and change management skill.

6.2. Conclusion

This study assessed readiness of Ethio telecom to implement could computing. This study covers most internal factors affecting implementation of cloud computing. The e-government Readiness assessment model developed by Bakry was used. This model has five

domains: Strategy, Technology, Organization, People, and Environment. A number of factors were addressed under each domain. The study observed the level of readiness of each of the five domains impacting the adoption of cloud computing technology and the relationships between them. It revealed that almost all domains involved in the model need improvement to support adoption of cloud compute in Ethio telecom.

The result from the study concludes that the research hypotheses are supported and they have strong relationship among each other. Strategy has a strong relationship with Technology, Organization, People and Environment moreover Readiness support all domains but the result of Organization and People readiness to adopt cloud computing shows lower than the others. Therefore it can be conclude that readiness level of Ethio Telecom from Strategy, Technology and Environment is good and more work is expected in making Organization and People ready to implement cloud computing. These domains can be considered critical domain that requires improvement priority. This research concludes that Ethio telecom needs to invest both in finance and time in its employees to make cloud computing a success in the company.

As we can see the interviewee response from Strategy, Technology, organization, people and environment point of view all Managers agree that to achieve the company vision and mission the organization should consider new technologies and using cloud computing can be one way to make Ethio Telecom mission and vision a reality and the company strategy and policies also promote to have new Technologies to support its core business. The organization has a smooth way of analyzing and identifying the gap to fill the customer demand. However there is a good initiation, but the company needs a strong financial decision to implement cloud computing and the implementation should be parallel in order to avoid financial crisis and to protect the employee from facing difficulties in the dramatic change. Implementing parallel will give them time to interact with the new technology. And also the company should use its training center effectively at right time to the right people and help its employees to get the required knowledge by considering the gap they face in their day to day activity and make Ethio telecom mission and vision a reality.

This study also using an Assessment model of “e- Learning Readiness Survey” that shows the companies surveyed are overall, ready for cloud computing in terms of resource, skill and attitude. But the researcher believe that the employees need to continuously improve and update themselves with new Innovations, in order to be able to successfully implement cloud computing. Moreover, the study confirmed that based on the Assessment model of “e- Learning Readiness SurveyEthio telecom is ready to implement cloud computing.

Finally it's this research's conclusion that Ethio Telecom is not ready to implement cloud computing until the time this paper is submitted. But if Ethio Telecom gradually changes its current systems that doesn't support cloud computing not all at one's but rather slowly as the transition needs to be smooth it will be possible for the company to be ready for the successful implementation of cloud computing. In addition as for Cloud computing in Ethio Telecom to take place not only the company but also the country needs to arrange proper infrastructure and that plan should start soon as both the investment and complexity of the work needs proper planning. Ethio Telecom needs to invest in employee development and really preach the idea of the cloud computing as the current awareness on over all the employees is limited. Therefore it's this research's conclusion that Ethio Telecom could be ready with the necessary recommendations implemented could be ready to adopt cloud computing.

6.3. Recommendations

This research was developed using STOPE framework, I believe that if Ethio Telecom utilize this framework and use it as a guide to determine and improve their level of Cloud Computing readiness; it will improve their chances of successfully implementing Cloud Computing. Once an organization has attained sufficient Cloud Computing readiness level, it is important to make the right choice of cloud provider as it may not be easy to move across platforms of different provider due to integration issues. I recommend that organizations should try and achieve a high level of Cloud Computing readiness before adopting Cloud Computing to improve their chances of success. It is also advice for Ethio Telecom and also for other organization to begin their adoption in stages i.e. they should

start by moving their non-core applications to the cloud and experiment with those before moving their core applications.

The results of this research has shown that there are limited research on the area of readiness assessments for cloud computing. This research is one of the few researches that have attempted to assess cloud computing using STOPE frame work and also the data analysis tool which is SMARTPLS 3. Moreover this study also uses a real assessment instrument called e- LRS to assess the readiness of the company readiness from their managers' perspective. Due to this fact I strongly suggest and recommend that other researchers to use this combination of assessment and analysis tool for effective problem identification as well as improving areas.

There is a wide range of research area on Cloud Computing because it is still in its early stages. In future, Researchers could apply different framework on organizations that are planning to adopt Cloud Computing and observe and document any improvements in their Cloud Computing readiness level. Since this research focused specifically of readiness assessment for Ethio Telecom specifically, future research could focus on another industry or organization as the result of this research cannot be generalized. The results from different research across several industries could be combined in future in order to come up with solution that could be applied across several industries.

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APPENDIX 1 Interview

1. Does your organization have a clear articulated mission, vision or both about implementing Cloud Computing? If Yes Do you think implementing cloud computing is enough to achieve your mission and vision, in improving quality service to customers, reducing cost and IT complexity, optimizing ICT usage efficiently, dynamic scalability of resources, increasing competitive advantage and modernizing your company.
2. Do the company policies promote to have Cloud Computing? If yes in what way the organizations do the promotion?
3. Do you think all the user groups among staff and other stakeholders in your organization have been involved in planning for the new cloud computing project? In what way do they involve?
4. Is there a plan to give training to adopt cloud computing? Is it before or after implementation?
5. Do you think implementing cloud computing has financial impact? If yes how?
6. What is the technical advantage of implementing cloud computing?
7. Is the current infrastructure capable and secure to implement cloud computing?
8. As an Ethio Telecom Manager what kind of services do you think your company will benefit from the cloud-based technology?

APPENDIX 2 Questionnaire 1

Dear sir/madam I am a graduate student in School of Information Science, Addis Ababa University. Currently I am conducting a research on “Assessment of Ethio Telecom Readiness for the Implementation of Cloud Computing Services”. The research is undertaken as academic requirements of **partial fulfillment of the requirements for the Degree of Master of Science in Information Science.**

Please assist me in giving correct and complete information to present a representative finding. Finally, I confirm you that your response will be kept confidential and only used for academic purpose. Thank you in advance for your kind cooperation and dedicating your time

If you have any inquiry, please feel free and contact me at ruthle12@yahoo.com

Yours sincerely

Ruth Leulseged

Email: ruthle12@yahoo.com

Tel: +251911454842

Part 1

Personal Data

1. Your age group? A, 20-25 B, 26-35 C, 36-45 D, 46-55 F, Above 55
2. Sex A, Male B, Female
3. Your work experience in Ethio telecom
 A, less than 5years B, 5-10 years C, 11-15 years D, greater than 15 years

PART 2

Hint: Likert scale numbers range from 1-5 denote as follow 1= strongly agree 2= agree
 3=uncertain 4= disagree 5= strongly disagree

The following statements and questions are intended to measure the extent to which the **Strategy readiness** of Ethio Telecom impact on Cloud Computing implementation. Please select the correct answer by putting tick sign (√) on the scale ranging strongly agree through Strongly Disagree in the appropriate space provided.

No.	Strategy construct measures	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1	Your organization has a clear articulated mission, vision about implementing Cloud Computing					
2	Your Organization policies promote have to use Cloud Computing					
3	Your organization provides support on ICT					
4	Does your organization have a direction, commitment and plan towards Cloud Computing development and utilization					
5	Your organization involves staff and other stakeholders in planning for the new cloud computing project.					
6	Your company have a future development					

	plan for basic ICT and information infrastructure, e-service infrastructure and ICT support to adopt cloud computing					
7	Your company strategic resource plan and basic infrastructure service for the surrounding environment					
8	Your company have appropriate plan for implementing cloud computing.					

The following statements and questions are intended to measure the extent to which the **Technology readiness** of Ethio Telecom impact on Cloud Computing implementation. Please select the correct answer by putting tick sign (√) on the scale ranging strongly agree through Strongly Disagree in the appropriate space provided.

No.	Strategy construct measures	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1	Your organization have internet access					
2	Your organization Quality of internet connections is suitable					
3	Hardware and Software required for cloud computing are readily available at your organization.					
4	The Hardware and software required for the proposed project are readily affordable.					
5	Your organization have adequate operation and maintenance persons					
6	Your organization has adequate local support to address most of the problems related to proposed use.					
7	Your organization has security options that are strong enough to fulfill the current security demand.					

The following statements and questions are intended to measure the extent to which the **Organization readiness** of Ethio Telecom impact on Cloud Computing implementation. Please select the correct answer by putting tick sign (√) on the scale ranging strongly agree through Strongly Disagree in the appropriate space provided.

No.	Strategy construct measures	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1	Your organization level of agreement with the legal vendors					
2	Do you agree that cloud computing encourages individuals and investors to participate in demand and supply Telecom services					
3	Your organization accept cloud computing technology					
4	Your organizational policies are in place to promote and manage use of cloud computing in the organization					
5	Your organization's vision of planning of adoption cloud computing is widely communicated throughout the facility					
6	Your organization has high bandwidth connectivity to speed up downloading and attaching files.					

The following statements and questions are intended to measure the extent to which the **People readiness** of Ethio Telecom impact on Cloud Computing implementation. Please select the correct answer by putting tick sign (√) on the scale ranging strongly agree through Strongly Disagree in the appropriate space provided.

No	Strategy construct measures	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1	Awareness of implementation of cloud computing exist among senior level managers in your agency					
2	The level of training and education quality for ICT in your organization is adequate.					
3	Your organization propose training for the proposed project (Cloud Computing)					
4	The capacity of ICT is adequate to make business decisions in your organization					
5	Do you believe that cloud computing will solve the problem regarding datacenters in your organization					
6	Your organization has technical and managerial skills on the use of technological innovation					
7	Your organization has programs in place to train the users for cloud computing					

The following statements and questions are intended to measure the extent to which the **Environment readiness** of Ethio Telecom impact on Cloud Computing implementation. Please select the correct answer by putting tick sign (√) on the scale ranging strongly agree through Strongly Disagree in the appropriate space provided.

No.	Strategy construct measures	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1	Your agency communicate with its stakeholders electronically					
2	The technology infrastructure of other institutions is capable of supporting cloud computing					
3	The Telecommunication infrastructure is reliable and efficient					
4	Your organization covers international training expenses.					
5	Educational institutions can contribute to the quality of ICTfor the society					
6	Inconsistency of electric power supply affects the use and adoption of Cloud Computing in your organization.					

APPENDIX 3 Questionnaire 2

ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL SCIENCE

SCHOOL OF INFORMATION SCIENCE

Dear sir/madam I am a graduate student in School of Information Science, Addis Ababa University. Currently I am conducting a research on “Assessment of Ethio Telecom Readiness for the Implementation of Cloud Computing Services”. The research is undertaken as academic requirements of **partial fulfillment of the requirements for the Degree of Master of Science in Information Science.**

The purpose of this research is to assess the real readiness of the organization and how Ethio telecom top management perceive their organization readiness to implement cloud computing. This questionnaire is developed based on four contexts Technology, Innovation, People and Self – development.

Please assist me in giving correct and complete information to present a representative finding. Finally, I confirm you that your response will be kept confidential and only used for academic purpose. Thank you in advance for your kind cooperation and dedicating your time

If you have any inquiry, please feel free and contact me at ruthle12@yahoo.com

Yours sincerely

Ruth Leulseged

Email: ruthle12@yahoo.com

Tel: +251911454842

Hint: Likert scale numbers range from 1-5 denote as follow 1= strongly agree 2= agree
 3=uncertain 4= disagree 5= strongly disagree

Technology

No	construct measures	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1	Do your employees have access to computers to be able use individually at work?					
2	Do you think your employees are able to access Internet and/or Intranet outside the workplace (from home, Cafe, etc.)?					
3	Do your employees have the basic Internet skills (such as e-mail, chat, list serve, surf, etc.)?					
4	Are your employees able to read and learn, or follow the direction on a computer screen to accomplish a task?					
5	Are the majority of your employees willingly using technology (computers) in routine/daily tasks					
6	Did the majority of your employees accept any technological innovation (e.g. start using digital documents instead of hard copies) in routine/daily tasks?					
7	Do your high and mid-level managers think positively toward the technological interventions in daily/routine tasks?					
8	Has any change that required the use of technology in daily/routine task been accepted by the majority of high and mid-level managers?					
9	How would you call your company in terms of investing on technology according to past experiences?					

Innovation

No.	construct measures	Strongly agree	agree	uncertain	disagree	Strongly disagree
1	Did the majority of your employees accept any organizational change or any change in a daily task occurred in your company (e.g. start implementing total quality management, etc.)?					
2	Has any organizational change (e.g. total quality management) been accepted by the majority of high and mid-level managers?					
3	Has your human resources (or personnel or training) department adapted the past changes easily?					
4	Are there any internal or external politic or legal issues that might be barrier to the adoption of an innovation (such as cloud computing).					

People

No	construct measures	Strongly agree	agree	uncertain	disagree	Strongly disagree
1	Do you have experienced human resources, or personal, or training department that organize and evaluate trainings and help your employees about career development?					
2	Is there an employee who can facilitate the acceptance and implementation of new technologies initiative in your company?					
3	Are majority of your employees experienced about technology-based/or assisted training?					
4	Are majority of your human resources (or personnel or training) department personnel experienced about technology-based/or assisted training					
5	Are there enough external vendors or specialists such as content experts, project managers, graphic artists, instructional designers, computer programmers that will help you to implement an new project?					

Self-development

No.	construct measures	Strongly agree	agree	Uncertain	disagree	Strongly disagree
1	Are your employees willingly joining trainings?					
2	Do you think your employees are able to spend a few time (15, 30 or 60 minutes) for improving themselves during any part of the day (morning, afternoon, evening, or night)?					
3	Do your high and mid-level managers believe that self-development of employees may strengthen the position of the company in the market?					
4	Is it possible to create a budget for implementing cloud computing in your company?					
5	Have you ever discussed that cloud computing might be able to help the company achieve current or future goals and a budget should be arranged for a cloud computing initiative?					
6	Do you think the organization of your company is appropriate for implementing cloud computing?					
7	Do the majority of your employees in human resources (or personnel or training) department believe that training may strengthen the position of the company in the market?					
8	According to your instincts, do you think your company is ready for cloud computing?					
9	According to your instincts, do you think your employees are ready for cloud computing?					