Addis Ababa University
College of Natural Sciences
School of Information Sciences

Cloud Computing Readiness Assessment of Selected Government Organizations in Ethiopia

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ABSTRACT

Cloud computing has caused a revolution in recent years, and it is now regarded as a new IT paradigm. Several studies have been conducted related to cloud computing technology adoption. While such studies focused more on private institutions and for-profit organizations, little attention was given to study cloud computing adoption in government organizations.

Cloud computing is one of the fastest growing and industry changing technologies, and its implementation is influenced by several factors. This study adopts Bakry's STOPE (strategy, technology, organization, people, and the environment) model as theoretical framework.

The purpose of this study is to assess the readiness level of government organizations using Bakry's the STOPE model. This model was chosen to assess the strategic agenda that among different government organizations in achieving cloud computing adoption. Because development goals can be achieved with critically stated strategic priorities of investment.

The researcher sought to answer the research question of whether the organizations are ready in terms of strategy, technology, organization, people, and the environment. Mixed method research methodology is employed by collecting both quantitative and qualitative data. The research focus is not only on collecting, analyzing, and interpreting quantitative and qualitative data, but also on reasonably incorporating the results of those analyses into a cohesive piece.

The survey approach was utilized to collect quantitative primary data, and interviews with managers or team leaders were also undertaken. The data was analyzed using SPSS version 25.

Managers, team leaders, and other ICT employees in Ethiopian government organizations are well-versed on cloud services and their benefits. However, due to commitment, security policies, infrastructure limitations and other several factors they are unobservant in the idea of cloud service adoption.

Cloud technology has numerous advantages in terms of increasing an organization's storage and computing capacity while lowering costs, and it is the main issue in developing countries when it comes to infrastructure development, as most Ethiopian government agencies are aware of this. However, for various reasons, all the organizations have taken no serious steps to use cloud services. As a result of a survey and interview, this article identifies the key barriers to using cloud services for Ethiopian government organizations. Furthermore, despite positive findings in cloud adoption awareness and people's readiness the paper revealed that these government organizations are not ready in 4 of the STOPE model domains.

Keywords: Cloud computing, Strategy, Organizational readiness, STOPE

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List of Acronyms

AASTA - Addis Ababa Science and Technology Agency
API - Application Programming Interface
BPaaS - Business process as a services
CC - Cloud Computing
CDS - Computerized Delivery Sequence
CGOA – City Government of Addis Ababa
DaaS - Desktop-as-a-service
EPSE - Ethiopian Postal Service Enterprise
ERA - Ethiopian Road Authority
IaaS - Infrastructure as a Service
IBM - International Business Machine
ICT - Information and Communication Technology
IT - Information Technology
MInT - Ministry of Innovation and Technology
NDCF - National Data Center Facility
MoT - Ministry of Transport
Mof - Ministry of Finance
PaaS - Platform as a Service
PDC - Planning and Development Commission
QoS - Quality of Service
SaaS - Software as a Service
SLA - Service Level Agreement
SLA ----Service Level Agreement

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1 Chapter One

1.1 Introduction

Currently, Computers, tablets, cellphones, the internet, cloud computing, email, text messaging, social media, and other computing devices are all around us. Computing technology is becoming more widespread in more people's jobs and daily lives. Cloud computing looks to be the century's most promising technical breakthrough. This method used to share a variety of dispersed resources and services that may be owned and operated by various companies (Vahid et al., 2016). Our daily lives has had hugely influenced by the dramatic advancement of information and communication technologies (ICT). For more than two decades individual acceptability of information and communication technology has been a key and recurring topic in information systems research. Economic growth ratio of an organization is highly influenced by the rate how much the organization believes to embrace and integrate a new technology. The expected advantages from integrating information communication technology innovations like an improvement of efficiency, effectiveness or productivity will not be achieved if a user refuses to accept the integrated new innovation (Thowfeek & Jaafar, 2010).

There are some key ICT innovations that has resulted in a remarkable evolution in the industry. Cloud computing is a third-generation platform that provides on-demand access to computing infrastructure and services. Some of its advantages include: lower prices, better availability, increased flexibility, and reduced time to market(Al-Hujran et al., 2018). Cloud computing is the synthesis of several advances in computer science, including hardware, parallel and distributed computing, systems management (autonomic computing), and Internet technologies(Verma, 2014).

A cloud is a location where IT resources including computer hardware, operating systems, networks, storage, databases, and even complete software programs are instantaneously and on-demand accessible. Cloud computing is a broad word that refers to any method of delivering hosted services through the Internet. You use a service rather than retaining data on your own hard disk or updating software to meet your demands(Srilakshmi et al., 2013).

The term "Cloud Computing" refers to the process of transferring data from a local computer to a remote server. All tasks related to the client is done locally and then sent to the cloud computing service. Users do not need to be bothered about hardware devices, system installation, or apps; simply they will open the cloud interactive page and execute a variety of data storage and computing tasks(Hung, 2018). Because of its software technology, which is centered on the online shopping platform, Amazon has been a pioneer in cloud computing for quite some time. Following in the footsteps of Google, Microsoft has followed suit, and this technology is already part of our daily lives, with applications continuing to grow and become an indispensable part of our existence(Hung, 2018).

Cloud Computing's core premise is to reduce the processing load on Cloud Service receivers. Cloud computing, which focuses on ‘on-demand' IT services and products, is one of the most essential and fastest expanding IT models for high performance computing. To access various cloud services, users utilize various electronic devices such as mobile phones, laptops, personal computers, and all other smart gadgets(Estamsetty, 2021). Different service models for delivering cloud computing services have been developed, but three are particularly popular: (SaaS) Software as a Service, (PaaS) Platform as a Service, (IaaS) and Infrastructure as a Service(Verma, 2014).

Behold to cloud computing the trend of owning computing resources as a product is being replaced by acquiring them as a service. Cloud computing is a model in which computing resources are made available as a service over the Internet(Workineh et al., 2019). Cloud computing has changed the way information technologies are delivered as a service to users. However, moving to the cloud is not a simple operation, and there are numerous considerations to be made(Jafari et al., 2020).

To get a general understanding of cloud service growth and trends Statista and Gartner reports can be basic examples. Statista report shows in 2021 the cloud system infrastructure services (IaaS) category is predicted to grow by more than 27% when compared to 2020. Only cloud business process services (BPaaS) are forecast to grow by double digits each year, while the public cloud services market as a whole is expected to grow by 18.4%.

Related with this Gartner also forecasts, as demand for apps necessitates a different sort of SaaS experience, software as a service (SaaS) remains the largest market sector, with a projection of $122.6 billion in 2021. Infrastructure-as-a-service (IaaS) and desktop-as-a-service (DaaS) will increase the most in 2021, with 38.5 percent and 67.7% growth, respectively.

Despite the advantages of cloud computing, the adoption is still limited in developing countries(Workineh et al., 2019). However, there are a number of challenges to overcome before reaping the benefits of cloud technology. Jónsson (2020) pointed out major challenges for cloud projects include the fundamentally high transformational nature of cloud adoption itself, as well as the related disruptive nature of such transformations, the requirement for a baseline of organizational maturity, and the human factor. Concerning government organizations, studies on cloud computing readiness received little attention. According to (Haywood, 2017), the majority of nonprofit organizations (NPOs) in the United States do not have plans to adopt cloud computing, and due to a lack of research in this sector, the factors influencing their decision are unknown. The same is true in Ethiopia, so this study attempts to assess the level of cloud adoption readiness of Ethiopian nonprofit government organizations. In addition to filling this gap, MInT is currently working on a project to build a government cloud datacenter. As a result, conducting this research at this time will provide significant benefits to practitioners and other stockholders.

The ministry Innovation and Technology is established as a government institution for the first time in level of commission. As a result, it has been reorganized and is now managed at the Ministry level under the name "Ministry of Innovation and Technology." The institution has been engaged in a variety of activities since its inception at the level of commission until now, with the goal of realizing the vision of building a bridge to transform our country into overall prosperity through the application of innovation technology knowledge and research skills.

The Ministry of Innovation and Technology (MInT) has begun the project to build a new Tier III National Data Center Facility (NDCF) to achieve this goal. According to the bid document, which was opened in December of 2019, MiNT intends to build a government datacenter that will provide cloud services primarily to government organizations.

Before initiation of MInT project, a readiness assessment can help to identify and overcome potential barriers as well as their solutions. What is most important is that organizations' readiness for cloud adoption and implementation benefits in the successful provision of government cloud services. Therefore, understanding the level of readiness of such government organizations for cloud technology is crucial. As a result, this study is aimed at identifying the challenges and opportunities associated with cloud adoption in Ethiopian government organizations.

1.2 Statement of the problem

Cloud computing services give IT service users and enterprise customer's new technological capabilities by making IT service acquisition easier. Allowing for faster implementation, and allowing for the cost-effective use of powerful software applications, data management, and infrastructure computing support are the major benefits of cloud computing service(Kauffman et al., 2014).

In previous years various national capacity-building projects have been launched in Ethiopia. EthERNet, schoolNet, and WoredaNet can be an example of cloud service which are developed by the government authorities(Gebremariam, 2015). These projects are intended to create and deliver highly integrated and high-performance networks for universities, schools, and local governments. The government's ICT project implementation process is complicated, and it usually demands simultaneous attention to a number of factors and roadblocks. ICT projects are dynamic, including the participation and ideas of a diverse range of experts and professionals with varied degrees of ICT knowledge. ICT activities in government organizations require special attention to be successful. Despite the fact that ICT efforts have undergone extensive analysis, (Kebede, 2018) maintains that they yet have a high failure rate. This was revealed to be owing to elements that contributed to success.

Enterprise resource planning (ERP) software may transform businesses by improving production and increasing consumer interaction. Since the 1990s, companies all over the world have been using ERP systems to create a standardized information system and reengineer their business processes(Boltena & Gomez, 2012). In recent years, many organizations have improved their use of ERP systems in Ethiopia. The system requires a large computational infrastructure on its own. Transitioning the IT infrastructure for ERP necessitates a significant investment of both time and money. As a result, organizations must decide whether to reinvent their datacenter or build a new one.

Based on this extra luxury investments by many government organizations the Ministry of Innovation and Technology (MInT) plans to construct tier III cloud datacenter which will minimize government budgets which will assigned for this kind of projects. This study aims to identify the main challenges cloud technology adoption and to assess readiness level of government organization in the adoption of cloud services.

Many businesses acquire technologies without taking into account their level of preparation for that technology, which results in sloppy implementation and in some cases failure have been resulted. This is due to a lack of awareness and a legislative framework or model for cloud computing implementation in most circumstances(A. O. Akande & Van Belle, 2013).

Ethiopian government organizations suitability for Cloud computing should be thoroughly analyzed before mass adoption. According to (Ben-ner, 2004), organizations can be classified as nonprofit, for-profit, or profit in his quest to determine the best way to deliver various goods and services in the advanced complex economy. A nonprofit organization is one that its mission and purpose are to further a social cause and provide a public benefit. This paper purposefully selects government organizations whose primary goal is not profit maximization, and it conducts a cloud computing readiness assessment.

To support the above paragraph, IsaaS cloud service would represent a new service delivery paradigm for Ethiopia, but some thesis research's reveals that government software and ICT projects are failed at a high rate. For example, the Ethiopian government has invested a substantial amount of money on the SchoolNet initiative, which is a link of two important areas education and ICT. However, there are a number of concerns with how the SchoolNet initiative is being implemented(Aklog, 2019).

A government agency is normally distinct from private organizations, and other types of profit making organizations established by government. These government organizations are responsible for the oversight and administration of specific functions. Based on this, the way how these organizations manage their technology adoptions is different from the others. So, variables that are barriers in other sectors may not be barriers in government sectors.

Previous studies on government organizations' readiness for software and system initiatives have been done and reveals some great insights, but cloud adoption assessments have received less attention. Cloud computing service adoption is in its early stages in Ethiopia. Similarly, there are no evaluation results in Ethiopian government organizations for cloud computing services adoption. As a result, prior to project execution it is preferable to conduct a pre-implementation measures. Furthermore, past research on cloud computing readiness have concentrated on diverse sectors, and government organizations have received insufficient attention in these studies. Previous research has concentrated on the banking and other profit-making industries. The purpose

of this study is to analyze the readiness of government entities to embrace cloud computing technology.

The following research questions are prepared in order to identify the challenges of cloud computing adoption and assess the readiness of Ethiopian government entities:

Question 1: What are the key barriers to Ethiopian government organizations from adopting cloud technology services?

Question 2: What is the current state of readiness for cloud technology adoption in Ethiopian government organizations?

1.3 Objective of the study

1.3.1 General Objective

The main objective of this study is to assess whether Ethiopian government organizations are ready for cloud adoption and to identify the major impediments to cloud adoption for Ethiopian government organizations.

1.3.2 Specific Objectives

The following are the specific objectives that derive from the research questions:

- To choose the appropriate assessment framework from previous works.
- To identify and explain the specific barriers to Ethiopian government organizations cloud computing adoption.
- To determine the elements that influence the successful implementation of cloud computing in a government organizations.
- To determine the Ethiopian government organizations extent of readiness for the cloud computing service adoption.
- To analyze the various models, guidelines and recommendations for cloud computing adoption given by various researchers, and to draw conclusion in Ethiopian government organizations readiness to adopt cloud computing.

1.4 Significance of the study

Organizations will enhance their readiness level and be ready for future cloud computing usage as a result of this study's findings. The building of MInT government cloud datacenter will reduce the extra investments that were previously allocated to the construction of various datacenters in various places.

The importance of this research for practitioners is that it allows them to assess the organization's or clients strengths, problems, and goals, as well as whether the entity has any requirements that need be addressed before proceeding with the project execution. Similarly from the academician perspective the study will add its own value. Some researchers have observed the cloud adoption assessment in prior studies, although they are restricted to a certain area. Organizational structure, management style, and other characteristics differ by sector, so this research will offer value by examining the topic from the perspective of government entities.

Furthermore, this study will be able to determine the adoption trend in Ethiopia and will play a significant part in the success of the MInT government cloud datacenter project.

1.5 Scope and limitation

This research focus area is limited to government organizations, with the goal of determining the factors and challenges that influence cloud adoption success as well as determining the organizations' readiness level. This study attempted to identify the main obstacles of cloud adoption in Ethiopia.

Only six Ethiopian government organizations were chosen based on specific criteria to assess the readiness status for cloud technology adoption.

1.6 Thesis structure

The thesis is divided into five chapters, with the first chapter serving as an introduction to the study. The remaining chapters of this dissertation are organized as follows:

Chapter 1: The first chapter can be considered as an introductory chapter, as it gives a quick overview of the topic. The issue statement, research questions, and research objectives, as well as the study's significance, scope, and limitations, are all included in this chapter.

Chapter 2: The literature study on cloud computing and its adoption is the topic of this chapter. It explains the definitions and key properties of cloud computing, as well as the various cloud computing delivery and adoption models.

Chapter 3: This chapter introduces the research model, which outlines the research framework and technique, as well as the data collection method, sampling size, and population size, as well as data interpretation and validation.

Chapter 4: This chapter present the analysis of finding and their discussion.

Chapter 5: This chapter will present conclusion and recommendations based on the survey and interview results.

2 Chapter Two: Literature review

2.1 Introduction

This chapter summarizes the findings of the literature review, which cover the history of cloud computing, as well as the characteristics, business models, deployment models, and benefits of each model. It gives a broad overview of cloud computing and why its services are appealing to public sectors. Following that, the readiness of strategically, technological, organizational, people, and environmental markers of cloud-computing adoption is identified and analyzed, with a focus on a selected governmental organization in Ethiopia.

2.2 Cloud computing

Even before the idea of the Internet the concept of cloud computing was perceived. Professor Ramnath Chellapa originally mentioned the term "cloud computing" in 1997. Salesforce.com was the first company to utilize cloud computing in a practical way and becoming the first enterprise level application provider to deliver its services over the Internet(Farid, 2013).

Cloud computing is a phrase that refers to a group of IT technologies offered as a service which radically change the way IT services are delivered, accessed, and paid for(Panda & Mehta, 2018). Cloud computing has caused a revolution in recent years, causing it to be seen as a new IT paradigm. Cloud computing is one of the fastest growing and industry changing technologies since the invention of computing(Alenezi et al., 2019). The phrase "cloud computing" encourages a new way of thinking about everything as a service. This service shifted the trend away from outright purchases to pay-per-use.

Cloud computing systems can provide significant processing power, storage capacity, and a wide range of services.

2.3 Characteristics and Benefits of cloud computing

Cloud computing has several advantages for your business. It allows the business to set up a virtual office which gives the freedom to connect from anywhere at any time. Thanks to the growing

variety of cloud services and smart technologies available today accessing your data is much easier.

Cloud computing has a variety of characteristics that have been noted by many researchers. According to NIST (2011) Cloud computing models should have five key features: on-demand self-service, broad network access, resource pooling, rapid flexibility, and measured service(Mell & Grance, 2011). There are certain characteristics and benefits of cloud computing that can be seen from the non-functional, economic, and technical capabilities perspective(Gebremariam, 2015). The key features stated by NIST and the categories mentioned by (G/MARIAM, 2015) are simply mentioned as an example to show the perspective of cloud computing characteristics by different researchers. This paper will explore the characteristics and benefits of cloud computing from the perspective of previous researcher, and show the distinction features and advantages of cloud computing. Aspects of a product or a service that are either technical or descriptive are referred to as features. Benefits are the reasons why that feature is important to the consumers or the business. In other word it is the importance how that feature improves their business.

Cloud Computing has a number of characteristics that make it one of the fastest-growing platform today. The rapid growth of a collection of tools and techniques is accelerating the adoption of cloud computing throughout the business. Cloud Computing has the following characteristics:

- **Scalability**: Cloud computing scalability refers to the capacity to scale up or scale down IT resources as needed to cope with the users demand. Scalability is one of the key features and the major driver of cloud computing growing popularity among organizations(Omwansa et al., 2014).
- **Reliability**: The capacity to assure uninterrupted system functioning referred to as reliability. Users may fully forget about the other concerns of their data being protected and accessible in the cloud without risking personal loss because of reliability. The system reliability is the likelihood that a system will be operational in a certain time span without any failure(Mesbahi et al., 2018).
- **Availability:** The probability that a system is up and running correctly at time‘t’ is referred to as its availability. Cloud service availability must be high in order to preserve client confidence and avoid revenue losses. High availability and reliability are some of the most key pressing issues in cloud computing services(Mesbahi et al., 2018).

- **Accessibility:** The process of making your service usable to as many people as possible is known as accessibility. The cloud is a constantly accessible resource that allows users to customize their consumption to meet their unique requirements.
- **Quality of service:** Quality of service is the description or measurement of the overall performance of a service. Quality should always be linked with requirements which means there should be requirements in place to ensure quality. So if there is no requirement there is no quality measure. Flexibility, maintainability, and readability, performance and efficiency, scalability, availability, and robustness, usability and accessibility, platform compatibility, and so on are all aspects that influence the quality of a system or a service(Ramadan & Kashyap, 2017).
- **Agility:** In this continuously changing IT environment cloud computing agility refers to the ability of rapidly developed, tested, and launched apps that promote business development. Agile methods may be applied to the day-to-day operation and continuous enhancement of existing services, as well as the concurrent creation of new services to expand capabilities, in the context of cloud service delivery(McConnon & Chowdhury, 2020).

Understanding the different aspects of cloud computing and selecting which cloud computing service or model is best for the organization are both essential steps in the implementation of cloud computing. Here is some major benefits of cloud computing:

- **Cost effectiveness:** Cloud computing allows technology users to conceive computing as virtually infinite and low-cost. Cloud computing saves both time and money. By putting data on the cloud it may be accessible more readily and widely, and typically at a cheaper cost. Especially for small to mid-sized applications all resources including expensive networking equipment, servers, IT personnel, etc. are shared and it results reduced service delivery costs(Rajan, 2012). Cost effectiveness is a key characteristic of cloud systems which is the ability to calculate costs based on actual resource use. Pay per use is intimately linked to the quality of service support.

- **Service oriented:** Cloud computing is not a single product or technology rather it is a method of delivering IT resources in a way that allows for self-service, on-demand, and pay-per-use consumption(Rajan, 2012).
- **Loose coupling:** The flexible coupling connection makes it easier to expand or contract the system. The hierarchical architecture guarantees that control and execution are separated, which makes each layer focusing only on its own task. Cloud computing enables Loose coupling to joining components in a system or network such that the components/ elements which are as independent as possible. The degree of direct knowledge that one element has of another is referred to as coupling(Cui et al., 2018)(Estamsetty, 2021).
- **Strong fault tolerance:** Based on the scale at which cloud computing services operate their performance is held up by their inherent vulnerability to failures. Only if cloud service providers properly address performance-related concerns such as reliability, availability, and throughput cloud computing services can perform with their full potential(Kumari & Kaur, 2018)(Estamsetty, 2021).
- **Ease of Use:** Related with the ever-increasing need for computer applications as well as the desire to create business insights and gain a competitive edge, businesses are finding it cheaper and easier to use cloud services and keep up with constantly expanding data processing requirements. Cloud computing usability is a term that refers the ability to deliver a useful service to users which allows them to complete tasks safely, productively, and efficiently while having fun(Miyim & Muhammad, 2017)(Estamsetty, 2021).
- **Virtualization:** The term "virtualization" refers to the creation of a virtual copy of anything rather than the real one. Virtualization is a technique for digitally duplicating a version of something actual in cloud computing. It lets several customers and organizations to share a single physical resource or application. Virtualization is software that allows a single hardware device to be partitioned into single/multi assumed devices automatically(Shukur et al., 2020). Virtualization is a key cloud technology feature that hides the technological complexity from users while allowing for more flexibility(Gebremariam, 2015). Nowadays clouds along with virtualization are transposing Information Technology. Virtualization is a reflective layer that separates the physical equipment from the working system in order to increase the usefulness and adaptability of IT assets. An application running on a virtual machine might be remote as a basic tool resources(Payal, 2019).

2.4 Cloud computing Models

A model is a detailed description of an object or phenomenon that has major characteristics with its real-world counterpart. Models are frequently shown as a visual representation of a set of postulates, facts, and conclusions in the form of a computer simulation(Borner et al., 2012). This section provides a general overview to different cloud computing models together with their discussion, basic definitions, and an overview of major implementation. Three service and four deployment techniques are among the most popular cloud computing service models from researchers perspective. The following is a brief overview of the models in this category(Shimba, 2010).

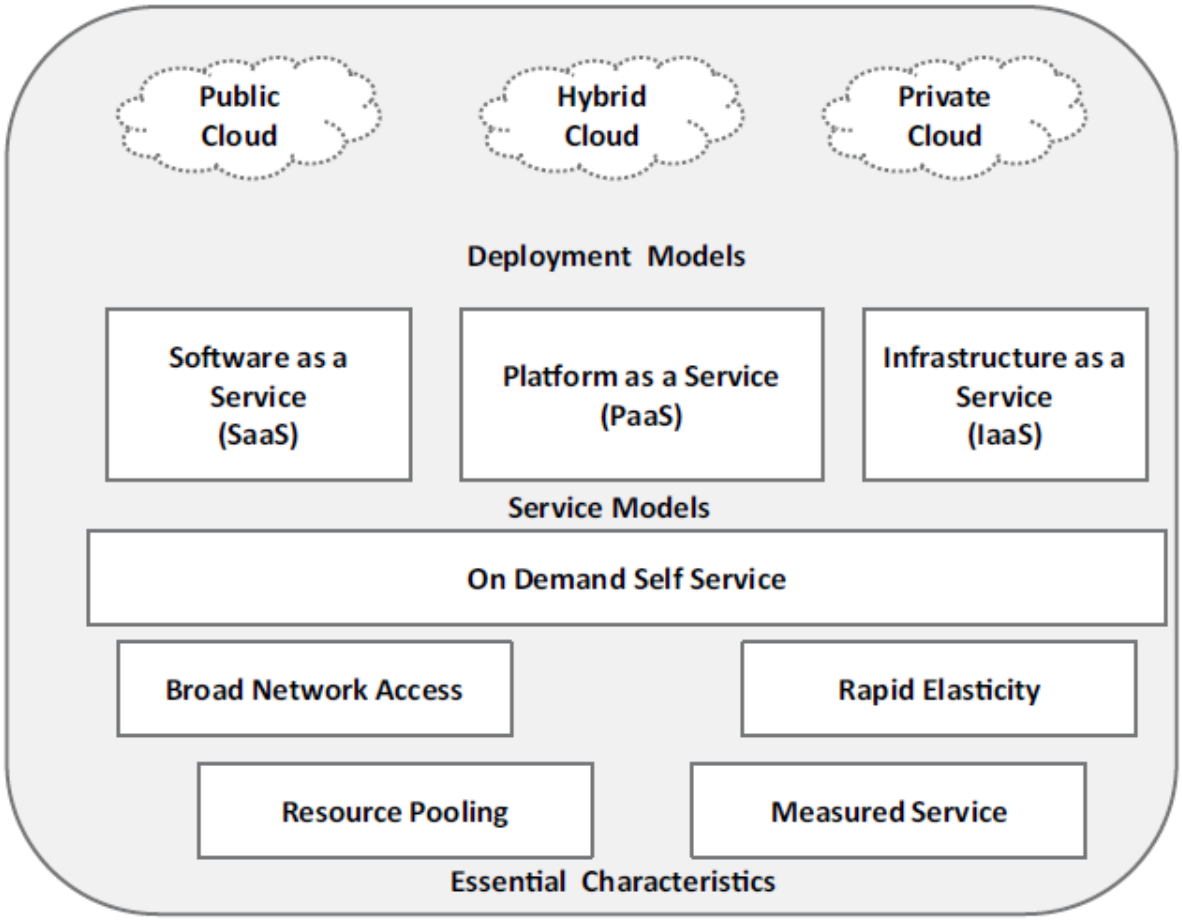

Figure 1: Cloud computing models

The above picture shows the typical models of the cloud computing(Rajganesh & Ramkumar, 2016).

2.4.1 Service/Delivery model

The cloud service models explain how much of your resources you manage yourself and how much you delegate to your cloud service providers. Cloud computing service models are divided into three layers based on the computing requirements of end users.

Software as a Service (SaaS): Cloud service provider's use Software as a Service (SaaS) model to provide an application services to the users based on their needs. Installations, updates and maintenance of the application is all the responsibilities of the cloud provider(Rajganesh & Ramkumar, 2016). Cloud provider manages everything in this model because of this user has very little management overhead(Suryateja, 2018). Video conferencing, mail services and information sharing, Google docs, Accounting, internet analytics, web content management are all examples of this service model. SaaS offers excess of advantages to cloud users. According to (Suganya et al., 2021) here are some benefits of SaaS:

- Minimize human resource
- Easy use and customization
- More reliable service by server redundancy
- Secure Socket Layer (SSL)
- High speed service delivery

Platform as a Service (PaaS): Operating systems, program developing environments, web servers and database systems are by this model for cloud users. The main point of PaaS model which makes it different from SaaS is that resources will be shared and reused. This model offers a package which include all the necessary resources that can satisfy user's requirement from all dimension. Application design, enhancement, testing, deployment and web hosting are all services provided by this model. Management is split between the consumer and the supplier. Rather than SAAS, PAAS users have more freedom in configuring operating systems and other components(Suryateja, 2018). Google AppEngine and Microsoft Azure are an examples on this model(Suganya et al., 2021). Here are some benefits of PaaS:

- Collaboration between remote developers
- Combining online services from a few different sources
- To grasp the financial benefits of utilizing integrated infrastructure service for security
- Scalability
- Failover
- To grasp the cost reductions that may be realized by using higher-degree programming abstractions

According to (Suganya et al., 2021) SaaS have some key drawbacks:

- The major cause for PAAS' demise is that structures provided by different carriers are frequently not well suited.
- Customers are unable to travel from one dealer to another due to a lack of interoperability and portability among carriers.

Infrastructure as a Service (Iaas): Within the Cloud Computing Stack IaaS is the withdrawal from Platform as a Service (PaaS) and Software as a Service (SaaS). This version is used to get access to essential information technology resources, rather than ready-to-use apps or services, development tools, databases, and other resources are available(Suganya et al., 2021). Basic storage and computing capabilities are provided as standardized services across the network with IaaS. With IAAS service model servers, storage systems, networking equipment and other Infrastructure based computing resources are offered by the service providers to handle user's workloads. It provides basic infrastructure on-demand services and interacts with switches, hosts, and routers via an Application Programming Interface (API). It also considers the importance of virtual machines in addition to its various characteristics such as bandwidth and memory(Panda & Mehta, 2018). In IAAS, customers have a lot of control over the virtualized cloud architecture in this model(Suryateja, 2018). In order to fulfill cloud users requests for decreasing resources virtualization is utilized to integrate and decompose resources. The cloud service provider uses virtual machines to deliver services and storage capacity to all users in order to improve business efficiency. In general, Infrastructure as a Service (IaaS) is a cloud computing delivery model that includes physical machines, storage, networking, and other resources for the deployment of user

operating systems and application software. So that, users will be able to own the peripherals and customize them as they see fit(Rajganesh & Ramkumar, 2016).

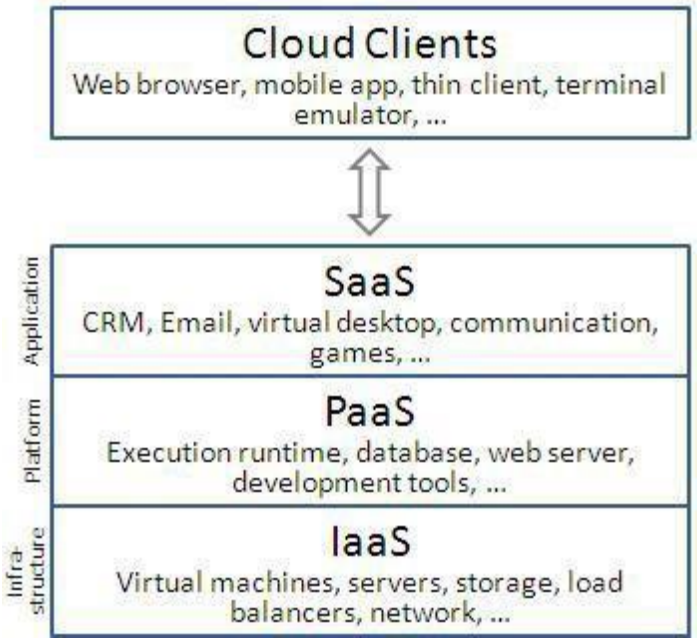

Figure 2:Cloud computing models layout

The above Picture shows packages, information operating gadget, middleware, runtime and the service infrastructures(Suganya et al., 2021). According to (Rajganesh & Ramkumar, 2016) the core services provided by any cloud computing architecture are computational, storage, and operating system (OS) level services. With the Anything as a Service concept, cloud customers may get any sort of cloud service (XaaS).

2.4.2 Deployment model

The user groups are categorized as follows based on the kind of consumption:

Public Cloud: The term "public cloud" refers to cloud services that are available to the entire public for free(Rajganesh & Ramkumar, 2016). This service is mostly owned by companies which are built to provide cloud service. Public clouds are designed to be accessible to the majority of people or a large industry institution. Cloud infrastructure is available to the majority under this model and is held by a third-party cloud service provider (CSP). This service is hosted on the internet and meant to be utilized by anybody who has access to the internet. Cloud service provider

supply this service either for free or on a pay-per-user basis. This approach is particularly well-suited to commercial needs, as it makes use of temporary infrastructure for building and testing applications(Suganya et al., 2021).

Private cloud: where cloud services are provided only for the use of a single person or a company with many business units(Rajganesh & Ramkumar, 2016). A private cloud is a cloud that exists within an enterprise and sometimes it is known as an "internal cloud" or "business cloud". In this model, cloud infrastructure is managed only for the benefit of a single firm. Private cloud is controlled internally or through a third party, and it may be hosted either in internal or external infrastructure.

Community cloud: Based on the desired of a group of clients a community cloud model lies between public and private clouds. It's quite similar to a private cloud, but the architecture and computing resources are tailored for two or more agencies with a shared privacy, security, and regulatory concerns. From grid computing the network cloud seeks to combine provisioning of distributed useful resources. Leveraging this cloud computing use cases even improves self-management from autonomic computing. Changing supplier clouds by forming a community cloud out of the underutilized resources of user PCs, with nodes likely fulfilling all functions.

Hybrid Cloud: A hybrid cloud is one that incorporates both public and private clouds(Rajganesh & Ramkumar, 2016). Hybrid clouds are more complicated than other deployment styles (private, community or public), because it is an aggregate of those models. A group bound together by a standardized era which allows utility and statistics transfer between every distinct entity/member. Organizations whose human resources (HM) and customer relationship management (CRM) data is kept on a public cloud but their secure information is housed in a private cloud are a better example of this. Hybrid clouds combine the cost and scalability advantages of public clouds with the security and control of private clouds(Suganya et al., 2021).

As (Suganya et al., 2021) states on their paper the pros and cons of cloud computing service models are shown in the table below.

Deployment Model	Advantages	Disadvantage
Public cloud	- 24/7 technical support from CPS side	- Data security - Privacy - Reliability

	- On-demand scalability - Simple and low-cost - Resources utilization	
Private Cloud	- Better data security and privacy - Better management on the server - Cloud Bursting is possible - Cost and energy efficiency - Improved Reliability	- Expensive infrastructure setup
Community Cloud	- Setting up a community cloud can be less expensive than private cloud because costs are shared among all users - A cloud issuer can take over control of the network cloud.	- More expensive than public clouds - All community cloud members share a fixed amount of bandwidth and data storage
Hybrid Cloud	- The aggregation between Private and Public clods make Hybrid clouds more scalable - Provides a secure and scalable public resources. - As it combine Private cloud, it provides highest level of security. - Cost is flexible with the requirements.	- Infrastructure dependency - Security compliance - Networking

2.5 Related work

Several studies on cloud computing adoption and its readiness assessment have been conducted in prior years by various academics. Those research focused on a variety of industries, however there is a restriction on publications which are focused only about government entities. Here is an overview of previous related works.

Local Researches			
Author	**Title and Objective of the study**	**Methodology**	**Key findings and Remark**
Sewale B. (2012)	**Title:** A cloud computing Framework for Ethiopian Higher Education Institute **Objective:** Design a prototype cloud computing framework for Ethiopian Higher Education Institutions to adopt cloud computing technology.	Design science methodology, mixed method approach, Purposive sampling	A Hybrid Cloud Framework has been proposed for EHEI's to host different services.
Alemayehu A. (2014)	**Title:** A Cloud Computing Framework for Ethiopian Banking Industry **Objective:** develop an integrated cloud computing framework for Ethiopian banking industries	Design Science Methodology, Purposive sampling	The proposed framework offer powerful capabilities to address both services and resources management
Selamawit B. (2014)	**Title:** Exploring factors that affect the decision to adopt cloud computing technology in Ethiopian banking sector **Objective:** To discover the variables that affect Ethiopian	Exploratory research method, TOE framework, mixed method approach,	Identify key factors from TOE perspective and also filter out factors which are not influential on the decision to adopt cloud computing

	banking executives' and experts' decisions to adopt cloud computing.	Purposive sampling	
Alemayehu E. (2015)	**Title:** Cloud Computing Readiness of Some Selected Organizations in Ethiopia: Towards A Strategic Guideline **Objective:** analyze the readiness of selected Ethiopian organizations for cloud computing adoption and provide a strategic guideline for cloud computing adoption.	Technology Organization Environment (TOE), purposive sampling, Qualitative methodology	A strategic guide line is proposed
Lensa B. (2017)	**Title:** Cloud Computing Readiness Assessment for banking sector in Ethiopia **Objective:** to assess the banking sector's readiness for cloud computing in Ethiopia	Descriptive research, Technology Organization Environment (TOE), Simple random sampling and purposive sampling	The adoption trend in the Ethiopian banking industry is low since security and privacy are among the top worries regarding Cloud Computing.
Ruth L. (2017)	**Title:** Assessment of Ethio Telecom Readiness for the Implementation of Cloud Computing **Objective:** To assess readiness level Ethio Telecom for cloud computing adoption	STOPE framework, Non-probability sampling, mixed method approach	Ethio Telecom's readiness level in terms of strategy, technology, and environment is good, with additional work needed to prepare the organization and

			people to adopt cloud computing.
A.A. Dahiru and H. Abubakar (2016)	**Title:** Cloud Computing Adoption: A Cross-Continent Overview of Challenges **Objective**: this study examines and analyzes the obstacles of cloud computing adoption from a geo-regional perspective.	institutional theory perspective	The findings reveal the significant impact of normative and coercive forces on adoption decisions in Norway, as well as the lack of such constraints in Nigeria appears to have a positive impact on adoption.

- "*A cloud computing framework for Ethiopian higher education institutions*"

Ethiopian Higher Education Institutions current ICT usage strategies and cloud computing principles have been examined on this study. The researcher propose a cloud computing framework that may be utilized by all Ethiopian Higher Education Institutions. Hybrid cloud computing is proposed to tackle Ethiopian Higher Education Institutions existing IT utilization problems(Belachew, 2012). The researcher attempted to build a cloud computing framework in 2012 with the intention of assisting Ethiopian higher education institutions in adopting cloud computing technologies.

The study focuses on how Ethiopian higher education institutions can benefit from ICT in an efficient and cost-effective manner.

- "*A cloud computing framework for Ethiopian Banking industry*"

In this paper, the study oversee the existing ICT infrastructure and usage in Ethiopian Banking industry. Mainly, the study explores the internal and external factors that affected IT executives' and experts' decisions on cloud computing adoption in Ethiopian banking industry.

Findings demonstrate that Hybrid Cloud Computing service architecture has the potential to reduce IT infrastructure initial costs, administrative complexity, increase IT usage for banking services, and improve partner cooperation(Abera, 2014).

- "Exploring factors that affect the decision to adopt cloud computing technology in Ethiopian banking sector"

Factors which has an impact in Ethiopian bank industry have been explored in this study. In addition, the study looked at a variety of factors that influenced decision-makers' adoption decisions in this sector, but the study main analysis focused on the primary factors that influence adoption decisions. The findings shows that complexity, compatibility, consistency, employee skills, fear of failure, management support, cost, customer demand, and external pressure are the major factors which affect expert's decision in cloud computing adoption(S. Bekele, 2014).

- "Cloud computing readiness of some selected organizations in Ethiopia: Towards a strategic guideline"

The research examines the computing adoption readiness of selected Ethiopian organizations and proposes a strategic guideline. The advantages and challenges of cloud computing as well as the factors that influence cloud computing adoption, were explored in this article. The paper assessed some selected firms' cloud computing readiness using the TOE framework. According to this research the main obstacles to cloud computing adoption are data security and confidentiality issues, privacy and regulatory compliance concerns, and service provider reliable delivery. Finally, the study propose a strategic guideline that can be used to reduce the negative impact of cloud computing adoption and to provide a safer and more reliable transition to the cloud computing(Gebremariam, 2015).

- "Cloud computing readiness assessment for banking sector in Ethiopia"

The study examines the extent of cloud computing technology awareness, willingness, and readiness in Ethiopia's banking industry. The outcomes of this study revealed that Ethiopia's banking sector is not ready for cloud computing adoption. Similarly the study also discovered that cloud computing usage in Ethiopia is typically in its minimum stage. As a solution for this problem the paper recommends government should invest in ICT infrastructure development to help the

banking sector. The researcher also believe if top managers Understanding of cloud computing systems increases the readiness level of the firm will also improve(Lensa, 2017).

- "Assessment of Ethio Telecom Readiness for the implementation of cloud computing services"

The study examine Ethio Telecom's readiness to adopt cloud computing services. Bakry's e-government assessment approach and the STOPE model was utilized in this study. The findings of this study indicates that strategy is strongly linked to technology, organization, people, and the environment. This study also demonstrates how a lack of preparation to deploy cloud computing impacts all areas, particularly the readiness of organizations and people to adopt cloud computing. Technology, organization, people, and the environment all are supported by readiness, although Ethio telecom's Organization and People readiness to adopt cloud computing is lower than the other STOPE domains(Leulseged, 2017).

In summary, with different degrees of reasoning all of the above related articles attempt to explore important factors impacting cloud computing adoptions and try to assess the readiness level of their respective sectors. However, they are limited to a single sector. Various studies in different sectors may yield different results. Previous studies have not attempted to examine factors impacting cloud computing service adoption in government organizations and to measure their readiness level.

Only (Gebremariam, 2015) made an attempt to add Addis Ababa Information Communication Technology Development Agency on his list of research participants and samplings. However, he conclude from the point where there is only a single government sector representative included in his selection, so the findings may differ significantly from the reality. And also as the selected agency is a technology government agency the degree of awareness and readiness may imply a favorable response.

2.5.1 Remark on related local works

This section describes previous related local cloud computing research works and their assumptions in chronological order.

In remark, with varying degrees of reasoning, all of the above-mentioned studies concerned on three major cloud computing issues. Such as conducting an assessment on a specific sector, researching factors affecting cloud computing challenges, and proposing a cloud computing framework.

Three of them were attempted to assess the readiness level of their respective sectors. However, they are limited to a single sector. Various studies in different sectors may yield different results. Previous studies have not attempted to identify the key factors impacting cloud computing service adoption in Ethiopian government organizations and to measure their readiness level. A non-profit organization is created for the goal of serving the public good or mutual gain rather than for the owner or investor's profit. In our country, the majority of government entities fall into the non-profit sector.

Three of them attempted to assess the level of readiness in their respective sectors. However, they are limited to a single sector. Only (Gebremariam, 2015) includes Addis Ababa Information Communication Technology Development Agency on his target population. However, he draws his conclusion from the fact that he selected 2 organizations representative from the government sector form the whole population. As a result, the findings may differ significantly from reality. Various studies in various fields may produce different results. Previous research has not attempted to identify and the key factors influencing cloud computing service adoption in Ethiopian government organizations.

So, the focus of this research is to identify the important factors influencing the adoption of cloud technology specifically in government organizations, as well as to assess their current state of readiness.

2.6 Challenges of cloud computing

Some difficulties and obstacles are there with cloud computing adoption and implementation that must be considered in order to keep the data safe and secure. Accessibility problems, fear of marketing or information lock-in, data privacy concerns, cost, integrity challenges, and insufficient bandwidth are some of the barriers that hinder businesses from adopting and using Cloud Computing. Here is some factors in the adoption of cloud computing(Bashari Rad et al., 2017).

2.6.1 Challenges related to Security

Data confidentiality, privacy, integrity, and availability are all components of security that contribute to the creation of a safe system. In the Cloud Computing context, security issues are the key points of concern.

Confidentiality and Privacy: "Confidentiality" refers to the fact that information may only be accessed by those who have been given permission to do so. The feature of Cloud Computing allows several users to use the same resources and because of that the possibilities of an unauthorized individual accessing the data may increase.

Integrity: The ability of only those who are allowed to make modifications to information, software, and hardware is referred to as "integrity." Concerns regarding Cloud Computing's integrity have also an impact for a businesses to adopt cloud computing.

Availability: The word “Availability” refers to readiness of the service, data, and infrastructure to be provided for permitted clients. Companies should be able to rely on services, data, and infrastructure to be available at all times.

Data Lock-in: The possibility of data lock-in having to a lack of standards is another reason why businesses are cautious to adopt Cloud Computing. Fears about unpredictability, such as a cloud service provider leaving the firm and boosting expenses, and also concerns about reliability due to information lock-in are all some of the reasons why businesses are uncertain to use Cloud Computing.

Jurisdictional Issues: Most importantly, safety and security of organizational data is a major topic that should be considered before using Cloud Computing, because itis critical to their long-term success. So, there should be some legal jurisdictions and a wide range of security-related laws.

2.6.2 Absence of SLA (Standard Service level Agreement)

The overall contractual services and the agreed-upon expected reliability, the penalties in the case of a service failure, and other service-related information will be clearly stated on the SLAs. Another barrier to widespread Cloud Computing adoption is the absence of defined service level agreements (SLAs). To manage their business relationships and secure the distribution of shared assets, cloud service providers and clients must standardize SLAs.

2.6.3 Lack Job Satisfaction

The number of support and technical engineers, as well as marketing and advertising employees will be decreased because the cloud service provider would be in charge of the majority of official jobs. And because of that technical engineer's duty will be limited on the reporting tasks.

Employee reluctance to accept cloud computing might be a key problem for certain businesses, as they believe that it would reduce job satisfaction or force some employees to lose their jobs(Bashari Rad et al., 2017).

2.6.4 The need for experienced technical engineers

Cloud Computing is a specialist platform that necessitates the engagement of professional personnel's. So, organizations must ensure that they have the appropriate talents and aptitude in their structure. The migration to the cloud would be extremely risky if the support engineers had no prior knowledge or expertise with cloud computing(Bashari Rad et al., 2017).

2.6.5 Technology Bottlenecks

According to (Bashari Rad et al., 2017) organizations fail to deploy cloud computing because their business departments are concerned about their time to market demands. Organizations should engage their information technology branch in their cloud computing to assist them in their readiness for cloud computing adoption.

2.6.6 Strategy related issues

In order to achieve organizational goals most of the businesses will prepare a strategy that includes integrating organizational activities as well as using and allocating scarce resources within the organizational environment. The adoption of cloud computing will cause a change in the organization of information technology departments in enterprises(Bashari Rad et al., 2017).

This are a few key questions that must be answered correctly in order to overcome strategy challenges following the adoption of cloud computing(Marston et al., 2011)(Bashari Rad et al., 2017).

- What would be the social change that the company requires?
- Which method is better to address the changes?
- What kind of policy should we prepare to prevail the staffs contrary to cloud computing?

2.6.7 Change Management

The use of a systematic process and set of tools for guiding implementing change in both internal and external operations is called "Change Management". Implementation of cloud computing has resulted in a transformation in how organizations conduct their everyday operations. Related to this change updating the workflow is a crucial management challenge, because it has its own big impact in the organizations successful use of Cloud Computing. To resolve the challenges that occur as a result of the changes appropriate change management practices must be planned(Bashari Rad et al., 2017).

2.6.8 Issues through implementation process

Most businesses faces a significant challenge in determining which information and data should be transferred to the cloud server and which should be maintained as private. The other challenge that organization will face also to figure out the way how migrate their data to cloud computing without disrupting operations throughout the process.

2.6.9 Dependence on the Internet

The internet is the basic tool for proper delivery of cloud service, but the dependency of cloud platform in this technology is a major challenge. Cloud computing services are immediately terminated if the internet connection is disrupted, and even a poor or inconsistent internet connection blocks the efficient delivery of the service(Chauhan et al., 2012).

2.6.10 Integration with the service provider Infrastructure

In order to keep total control over their important and sensitive data and infrastructure, most organizations choose hybrid cloud strategy in their cloud computing adoption. But during the migration of some data into the cloud storage and putting away the critical and sensitive data in the local infrastructure a big issue will arises. . It would be challenging for managers to connect

their local infrastructure with the infrastructure of cloud service providers since there are various APIs which may be incompatible with cloud architecture(Canedo et al., 2012)(Bashari Rad et al., 2017).

2.7 Cloud adoption and readiness

The success of cloud computing adoption is important to obtaining the benefits that the cloud computing environment offers. When businesses demand high processing power, large storage capacity, IT resource scalability, and high availability at the lowest possible cost, cloud computing becomes an attractive choice. So, Cloud adoption is a strategic decision that businesses made for a variety of reasons.

A cloud readiness assessment is a procedure for determining if a company's resources and IT infrastructure are ready to transfer to the cloud. A cloud readiness assessment is a recommended technique for any company moving its whole IT infrastructure to the cloud in order to streamline the migration process and create a cloud environment that fulfills the company's requirements. We should conduct a symmetric analysis by measuring readiness before embarking on a transformational process or change. This enables us to identify potential challenges that may occur during the transformational change's implementation(Lalic & Marjanovic, 2010).

This is crucial since cloud migration is a large investment that requires a substantial amount of time and effort from IT professionals. An organization that has determined that it is ready to move and created a migration plan can reduce the amount of time and money it takes to do so.

In order to conduct studies of this type, it is necessary to employ a lens through which we can view the phenomena in organizations and identify the factors that may limit cloud technology adoption. As a result, several theories and models have been reviewed, the most relevant of which are depicted in the next section.

2.8 Theoretical Framework

The Ministry of Innovation and Technology is currently working on a national cloud datacenter project with the goal of providing an Infrastructure as a Service cloud computing. The targeted

entities' readiness and awareness of the benefits of cloud computing services will be critical to the project's success. This research focuses on two key points: examining the factors that influence cloud computing adoption and proposing a solution to those problems of government organizations.

On technological innovation and adoption, there are several theories and studies. Many of this theories and models are explaining the occurrences of technology adoption and suggest unique reasons in all feasible areas. The next table shows previous theories and frameworks(Ahmed, 2020).

Previous studies have utilized a number of approaches or frameworks to address related problems, with various motivations in choosing their framework. This research examines several theoretical frameworks and chooses a customized approach with detailed justifications for why the tailored frameworks were chosen. One framework have been selected to support the theory of the study. Here is a review of some frameworks.

Adoption Models	Publication Year	Parameters
Diffusion of Innovation (DOI), (Everett Roger)	1960	Individually/Organizationally
Technology Acceptance Model (TAM), (Davis, Bagozzi and Warshaw)	1989	Individually/Organizationally
Technology Organization Environment (TOE), (Fleischer and Tornatzky)	1990	Individually/Organizationally
Extended TAM, (Venkatesh and Davis)	1996	Individually/Organizationally
Unified Theory of Acceptance and Use of Technology (UTAUT), (Venkatesh and Morris)	2003	Individually/Organizationally

2.8.1 Diffusion of Innovation (DOI)

Diffusion of Innovation (DOI) is one of the oldest social science theory which is developed in 1962 by E.M. Rogers. According to Rogers Diffusion the process through which an innovation is spread among members of a social system over time and through specific channels(Ismail, 2016). Diffusion happens gradually within a system of users when information and ideas about a new technology are communicated among potential users through communication channels. Examining the adoption and diffusion trend to explain the acceptance of a new technology is one of the finest approaches in the area. Knowledge, persuasion, decision, implementation and confirmation are the

five stages of technology adoption process. Innovation, Communication Channels, Time and Social System are also the four Main elements in the Diffusion of Innovations(Ismail, 2016).

The adoption process may be hampered by a variety of circumstances and/or external impediments. Personal constraints of the potential user and/or inadequate communication methods are examples of variables that influence adoption. Relative advantage, compatibility, complexity, trial ability, and absorbability can make a big difference in adoption rates(Al-Mamary et al., 2016).

The complex social, cultural, economic, and other factors that have had an impact in the diffusion of the innovation are left behind in this theory, DOI only focus just on a product or innovation. When it comes to forecasting individual and organizational behavior, DOI has certain limitations(Al-Mamary et al., 2016).

2.8.2 Technology Acceptance Model (TAM)

The Technology Adoption Model (TAM) is a tool for predicting system acceptance and identifying design problems, which was created by (Davis, 1989).

Based on the theory of TAM user acceptance of any technology is defined by two beliefs: perceived ease of use and perceived usefulness, in other word the acceptance of any technology can be affected by a person's desire to utilize the technology(Tao, 2008). The impacts of external factors on usage intention are mediated by these two parameters.

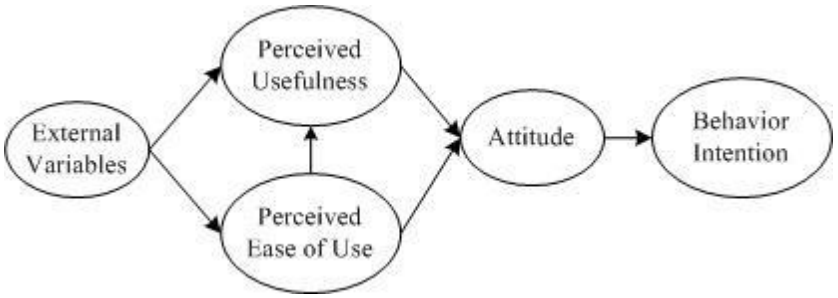

Figure 3: Technology Acceptance Model (TAM)

Perceived usefulness is the degree to which a person feels that using the system would improve his or her performance, whereas perceived ease of use is the degree to which a person believes that using the system will be simple. The theory also states that Perceived usefulness is also impacted by perceived ease of use, because a system's usefulness is proportional to how user-friendly it is.

Perceived usefulness has consistently been a major driver of usage intentions throughout the numerous empirical testing of TAM, with 0.6 average standardized regression coefficient (Venkatesh & Davis, 2000). The Technology Adoption Model (TAM) has shown to be a useful framework for analyzing why many other technologies are successfully utilized(Martinez, 2021).

The Technology Acceptance Model (TAM) proposes that when consumers are confronted with new technology, because they select when and how they will utilize it depending on a variety of variables. In certain situations, another elements such as information quality, top management provision, and computer efficiency is required for technological acceptance. System utilization and user satisfaction were used to quantify system success, while TAM factors were utilized to predict information system usage(Leulseged, 2017).

2.8.3 Technology organization environment framework

Company's surroundings that impact the acceptance and implementation of technological advances will be observed in this framework. Technological innovation adoption trend is monitored using three primary perspectives: technical context, organizational context, and environmental context. Tornatzky and Fleischer formed the TOE Framework (Technology, Organization, and Environment) in 1990. The TOE model (Technology, Organization, and Environment) is a useful analytical framework for analyzing the adoption and acceptance of various types of IT innovation(Al-Mamary et al., 2016).

The utilization of technical advances can be studied using the Technological Organizing Environmental (TOE) model. This model construct based on the thought that environmental and organizational factors and technological qualities can influence the choice to accept technological innovation.

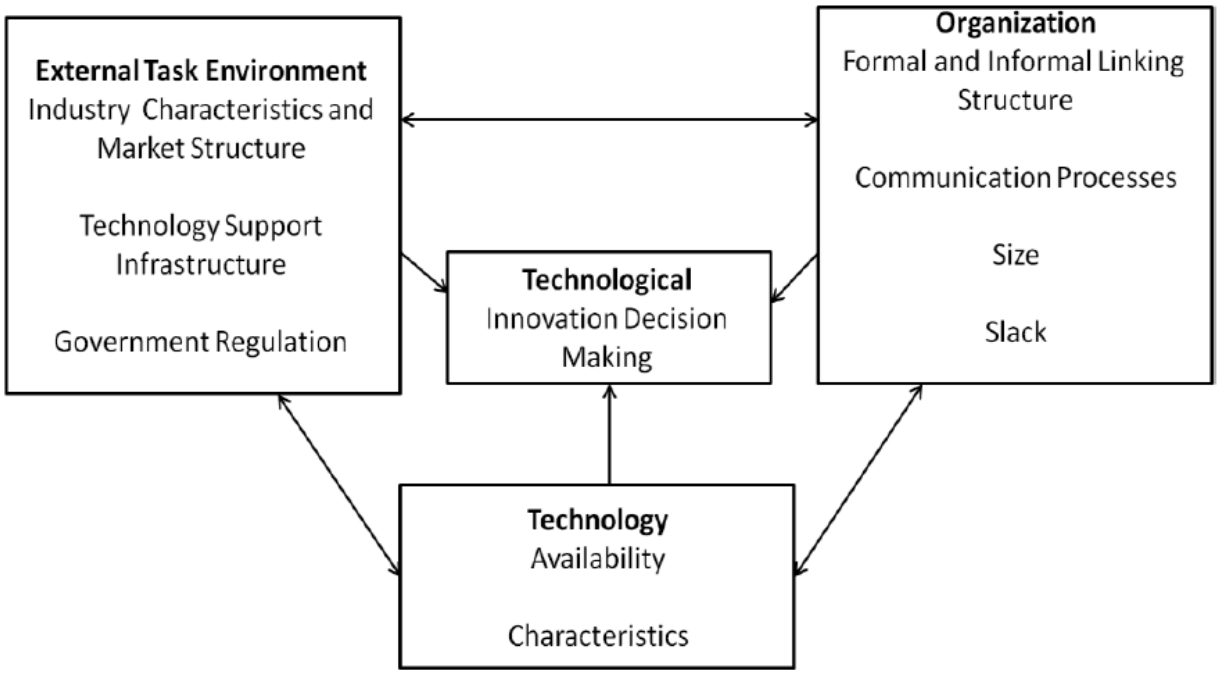

Figure 4: Tornatzky and Fleischer TOE Framework (Al-Mamary et al., 2016)

Using this framework particular characteristics discovered within this three contexts may vary among researches. TOE has become increasingly accepted due to its solid theoretical base, consistent empirical support, and the ability to be applied to IS innovation areas. DOI emphasizes human behaviors as well as organizational internal and external factors which can impact in organizational adoption decision, relatively this theory is consistent with TOE framework. TOE framework additionally contains a new and crucial component which is environment context, but the technical and organizational contexts of the TOE framework is identical to of DOI framework. Limitations and possibilities for technological innovation exist in the context of the environment(Oliveira & Martins, 2010).

2.8.4 STOPE Framework

The five domains in the STOPE framework used to analyze the current issue from Strategy, Technology, Organization, People, and Environment perspectives. (Bakry, 2004) identify and develop the fundamental elements of STOPE framework(Susanto et al., 2012).

The STOPE development framework has provided a foundation or a map for describing how the fundamental elements are changing. As a result, the framework helps to understand monitor and manage the development process(Bakry, 2004).

Many scholars have used the STOPE framework to address issues linked to the adoption and usage of information and communication technologies. This framework has been used to plan, create, and analyze several e-government initiatives as well as network security regulations policies(Bakry, 2004)(Saleh et al., 2007). Collective and individual evaluation should be conducted for the combined factors of STOPE framework. A number of sub-domains are explored for each of the five STOPE domains, which are also further subdivided into sub-subdomains. Depending on the case study for which this framework was used these measurable entities may change. So, the elements of the sub-subdomains would need to be polished further into "measurable entities" for practical evaluations. (Al-Osaimi et al., 2006) describes and explains the framework based on these key five domains/categories.

Strategy

Future directions, commitments and plans toward ICT development and utilization are all included in the “Strategy” domain. "Leadership" and "future growth plans" are believed to be two sub-domains of this category.

Technology

All components of the present situation of problems pertaining to ICT facilities are included in the "technology" category. "ICT basic information infrastructure," "ICT e-services infrastructure," "ICT provisioning," and "ICT support" are believed to be the four sub-domains of this domain.

Organization

ICT regulations and management related state of issues are included in the aspect of the “organization” domain. "ICT government rules," "ICT collaboration among organizations," and "ICT management" are believed to be the three subdomains of this category.

People

Aspects of the current state of ICT users and skill linked to the “People” domain. ." "ICT awareness," "ICT education and training," "ICT qualifications and jobs," and "ICT skill management" are the thought to be included as a four subdomains of the category.

Environment

The present status of basic non-ICT concerns surrounding and impacting the current state of ICT is included in the "environment" category. Knowledge, resources and economy, organization (which includes general norms, cooperation, and management), and non-ICT infrastructure are the sub-domains included in this category.

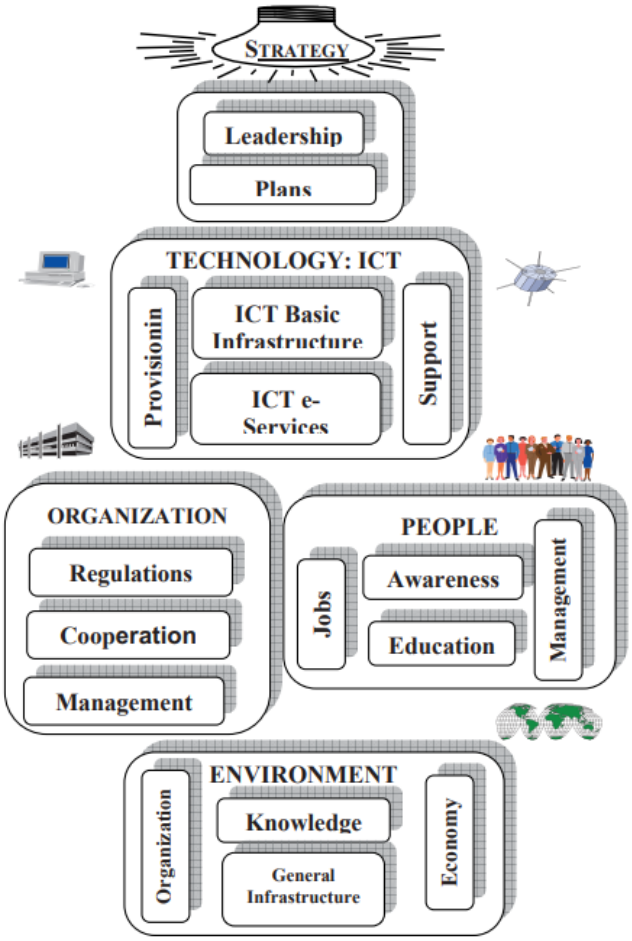

Figure 5: Bakrys' STOPE Framework

STOPE methodology approaches have been widely used to analyze an organization's information distributed activities based on information security issues, and many readiness assessment studies have been conducted using this framework.

2.8.5 Remark

The frameworks mentioned above were chosen and reviewed because they were frequently used in previous studies that attempted to assess the use of technologies. The second reason is that they

provide a method for reasoning from various perspectives and measures. Among those considered, the STOPE model is chosen.

The STOPE model is chosen because it allows to analyze the case from five basic perspectives. This framework has laid the groundwork or provided a road map for describing how the fundamental issues are occurred in the selected case. So, this framework is selected to understanding, and analyze the readiness level of government organizations.

3 Chapter Three: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research approach and methodology used to assess government organizations' readiness for the adoption of cloud computing. The goal of this research is to determine whether Ethiopian government organizations are ready to adopt cloud computing services or not in terms of strategy, technology, organizational structure, people, and environmental variables as MinT plans to provide IaaS cloud service to them. The research design, study location, target population, sampling techniques and sample size, research instruments, pilot study, Ethical considerations, validity, data collection procedure, and data analysis methodology used in this study are all declared in this chapter.

This part will also cover how the researcher intends to guarantee that the tools and approach chosen are appropriate for addressing the study questions appropriately.

3.2 Research Methodology

A researcher must devise an approach for the problem they have chosen. It is critical for the researcher to understand not only the research methods but also the methodology used in the study.(Rajasekar et al., 2021)

Basic research and applied research are the two primary categories of research. The study of the fundamental principles and causes of a certain event, activity, or occurrence is known as basic research. Theoretical research is also another name for it. Well-known and accepted theories and ideas are used in applied research to solve specific issues. The term "applied research" refers to a research that has a direct application as a result of its findings. Quantitative, qualitative, or a combination of quantitative and qualitative research can be used in basic and applied research. Quantitative research aims to determine how much of what we've been looking for is actually there. In this methodology a process is described or stated in terms of quantities or numbers. Qualitative research is concerned with qualitative phenomenon involving quality. Qualitative research/methods are non-numerical, descriptive, reasoning-based, and verbal. (Rajasekar et al., 2021)

3.2.1 Mixed-method methodology

Observation studies, correlational research, developmental designs, and survey research all generate quantitative data that can be statistically summarized(Leedy & Ormrod, 2015). We attempt to make sense of the world through quantitative research by using measurement and numbers. Numbers can sometimes represent observable physical world aspects. Numbers can also be used to represent nonphysical phenomena such as what people believe about contentious issues. Generally data can then be summarized and interpreted using statistics.

Qualitative research entails gathering and analyzing non-numerical data. Qualitative researchers rely heavily on personal observations of people as a source of data(Leedy & Ormrod, 2015). Primary data collection methods used in qualitative research include observation, unstructured interviewing, group interviews, documentary material collection, and so on. Field notes, interview transcripts, documents, photographs, sketches, video or tape recordings, and so on are examples qualitative sources from which data was derived(Dey, 2005).

Many research questions include both quantitative and qualitative elements to fully address them, with an acceptable range of data for reasoning. As a result, quantitative and qualitative methodologies are more–or–less, rather than either–or (Leedy & Ormrod, 2015).

According to Leedy & Ormrod (2015), in some research problems, we should use both quantitative and qualitative data. Mixed-methods research is required to address these kind of issues. This type of research entails not only gathering, analyzing, and interpreting quantitative and qualitative data, but it requires to reasonably incorporating the results of those analyses into an interrelated piece.

The conclusion that this research seeks at the end of the study necessitates relatively mixed-method research. The assessment of cloud-computing adoption readiness within government organizations is a look at how government officials and employees perceive the current cloud-computing environment and its readiness. So, the mixed-method is selected as the most effective method for eliciting in-depth interpretive meaning.

3.3 Sampling Design

For those who want to draw conclusions from a large population, the researcher should pay close attention to the sampling methods he chooses. In most cases, researchers do not study the entire population of judgments. They choose a subset or sample from the population reasonably. However, if the sample is typical representative of the population, they can make generalizations about the entire population based on the results of their sample. A survey conducted with a subset of the population should be qualified with qualifiers such as selected, representative, typical, certain, or a random sample of(Leedy & Ormrod, 2015).

According to Leedy & Ormrod (2015) A careful consideration of the population's parameters determine the specific sampling procedure to be used. Incorrect conclusions may be drawn from distorted data as a result of negligently followed sampling procedures. In different situations and for different research questions, different sampling designs may be more or less appropriate.

Mixed-method techniques are more being used by researchers to broaden the scope of their studies and to get a depth insights. Sampling method, data collection and data analysis are concurrently operationalize in mixed-method (quantitative and qualitative). According to (Sandelowski, 2000) “Mixed-method studies are not mixtures of paradigms, but rather paradigms are reflected in what techniques researchers choose to combine, and how and why they desire to combine them”.

The type of sampling used distinguishes what is commonly referred to as qualitative and quantitative method. Purposeful sampling is most likely used in qualitative research to obtain rich information. Quantitative research, on the other hand, employs probability sampling for statistical inference(Sandelowski, 2000).

Purposive sampling is a non-probability sampling technique that is also known as judgmental, selective, or subjective sampling. Units are seriously investigated based on the researcher's judgment in purposive sampling as like all non-probability samplings. Purposive sampling techniques include maximum variation sampling, homogeneous sampling, typical case sampling, extreme case sampling, expert sampling, criterion sampling and so on(Lawrence et al., 2013).

Purposive-sampling approach is used in this study to select a representative sample of the total population. Leedy & Ormrod (2015) noted that Purposive sampling involves the selection of

people or other units for a specific purpose. For example, we could select individuals who we believe are "typical" of a group or those who represent opposing viewpoints on a particular issue.

Lawrence et al. (2013) stated that Criterion sampling is one of the purposeful sampling techniques which is based on predetermined criteria. When using criterion purposeful sampling Researchers may need additional data for triangulation purpose. So the may conduct interviews or observations for this purpose. In addition, Lawrence et al. (2013) distinguishes two criterion sampling techniques in purposive sampling: criterion-i and criterion-e. Criterion-i helps to identify cases that meet with some predetermined conditions, and criterion-e is a technique which helps to identify cases that exceed or fall outside a specified condition.

As a result, this study attempts to select appropriate sample based on their current state of information system development. According to *Logistics Capacity Assessments (LCAs)* (2021) and the Prime Minister Office report, there are 22 Ministry offices and a number of agency offices within them.

Employees in security, software, network, and database areas, as well as management staffs, will be involved implementation phases or in the adoption decision of cloud technology. As a result, personnel in those positions will be considered primary participants during data collection. Because the employees in the specified roles are the most significant in this study, the study chose to focus only on them. The samples participated in this study fulfil this two criteria's:

- Employees in management level who will participate in the adoption decision of cloud technology
- ICT staffs who will participate during and after the implementation of cloud technology

3.4 Data collection

There are various layers of truth-revealing facts on a researcher's quest to discover the truth. Primary data are found in the layer closest to the Truth because they are frequently the most valid and revealing. A higher layer is made up of secondary data, which is derived from primary data rather than the Truth itself(Leedy & Ormrod, 2015). Obtaining Information in Quantitative

researchers typically investigate only a few variables and collect data on those variables only. The validity and reliability of the measurement instruments that go through the process of identifying, developing, and standardizing the variable will be carefully considered. Data are frequently collected through a sample survey that is assumed to represent a specific population in order to make generalizations.

STOPE framework was chosen for assessing Ethiopian government organizations' readiness for cloud service adoption in this study. The STOPE framework is the most suitable model for assessing Ethiopian government organizations from five perspectives. The model was originally created for e-Readiness Assessment, but the framework was employed in this study because of the close association between e-Readiness and cloud readiness. Furthermore, Leulseged (2017) used the STOPE framework to assess Ethio telecom's cloud readiness. As a result, the analysis results of the collected data will determine the decision to adopt cloud services within the context of this framework. Based on this, the data collection tool for this mixed-method approach is built on the Strategy, Technology, Organization, People, and Environment (STOPE) framework.

There are two types of data collection: primary and secondary. Primary data is information gathered by the researcher from the ground up in order to answer his current research questions. Primary data is a data that directly emerge or emanate from an unobservable phenomenon.

Primary data can be collected in a variety of ways, including observation, direct communication with respondents in one form or another, for instance through personal interviews. Secondary data is information derived from one or more people's summaries or interpretations of primary data concerning to an unobservable.

Because this study collects primary data from employees both from the management and ICT staffs, the process necessitates the use of questionnaires as well as unstructured interviews with relevant stakeholders. Secondary data is use of information already collected by someone else. Secondary data may either be published data or unpublished data.

ICT managers and ICT staffs who have a direct involvement in cloud related tasks included from each organization as a preferred target population for this study, primary data is collected directly from this group via questionnaires and an interview. More strategic guided data that can show future plans for the organization's ICT development is expected to be obtained from IT Managers.

The rest of the ICT team will be evaluated in terms of their understanding of cloud computing services as well as their organization's current status in terms of cloud service adoption readiness.

Aside from gathering primary and secondary data from organizations, additional information will be obtained through a literature review. This procedure allowed for the collection of additional information and issues concerning the subject. The data obtained during the data collection process necessitated a logical arrangement for contextualizing the issues and to have a depth insight to the organizations readiness of cloud computing adoption.

Semi-structured interview and questioner will be used as a primary data, the questionnaire include close ended questions. Secondary data sources will be used including the organization documents, bid documents, and inception reports.

During data collection, 87 questionnaires were distributed to ICT staff at the selected organizations (AASTA, MoT, MoF, ERA, Planning and Development Commission, and Ethiopian Postal service Agency). The questionnaire's purpose and task requirements were explained both orally and in writing. Respondents were informed that the questionnaire would include questions about the organization's culture, beliefs, and experiences.

3.4.1 Questionnaire design

Most respondents will be concerned about assurances that their responses will not have an impact on their working environment after answering researchers' questions. The use of questionnaires, on the other hand, will help to relieve some of the tension related with this issue. Some respondents may be more truthful when filling out questionnaires than when conducting face-to-face interviews. More over a low return rate is a disadvantage of using questionnaires to collect data but in this study 90.5 percent of respondents returned the questionnaires.

People may agree to fill out the questionnaires, but their writing and reading skills may affect the outcome in case of misinterpretation.

(Leedy & Ormrod, 2015) propose a series of steps in questionnaire preparation to ensure that the results are both fruitful and efficient. This suggestion serves as a foundation in development of this questions. This study focuses primarily on four of those fundamental standards. The researcher tries to make the questions **short and concise** so that they are **simple and concrete** for the respondents to read when answering them.

Questionnaires should only inquire for the information needed for the research project and be as brief as possible. Before each closed-ended question and at the start of likert sections, **specific instructions** are provided in the questionnaire to direct respondents on how to respond to the questions.

As the questions have been adapted from previous related papers, they are not used exactly as they are. Rather, the majority of the questions have been refined with regard to target sector terms and using simple language standards or **avoiding ambiguous language**. In order to accomplish this, a pilot study is being conducted.

Bastos et al., (2014) recommends using existing instruments unless there are no other options for measuring the phenomenon or if the existing ones have a confirmed limitation. Creating a new instrument can be considered a separate research project. It requires its own time and effort to complete, and especially it requires a scientific foundation and tests to condemn the previous instruments.

The questionnaire designed for this survey is based on the questionnaire design approaches of Nasir(2017) and Leulseged(2017), but it has been updated and refined to meet the research objectives (see Annexure 1). This set of questions was carefully selected from both papers in order to elicit experts' perspectives on the critical issues impeding cloud computing readiness. The questions are organized and listed in the STOPE framework aspect. The factors of sub-sub domains would need to be refined into measurable entities based on (Al-Osaimi et al., 2006) recommendation with a reason that target assessments vary in different cases. That is why this study is attempting to refine some of the factors.

The questionnaires were prepared to address both the management and ICT staffs' separately, so two different types of questionnaires were prepared. Both questionnaires share a front page with demographic questions for respondents. The first questionnaire, which was designed for managers, has two additional sections. The first section contains closed-ended questions designed to elicit management staff perceptions of cloud computing from both a strategic and technological standpoint. Closed-ended questions were used to elicit additional information on the issues or factors related to a specific STOPE framework variable. Open-ended questions take time to complete and can be contextually challenging for both participants and researchers. Even more respondents may be unable to answer the questions in concrete or brief writing methods(Leedy &

Ormrod, 2015). The usefulness of responses to open-ended items is entirely dependent on participants' ability to express their thoughts in writing. As a result, close-ended questions were used in this study.

The second section is organized in the context of Strategy, Technology, Organization, People, and Environment, and it employs a likert scale response method to overcome their tendency of cloud services adoption. For each listed question respondents were asked to select a scale of agreement or disagreement on a Likert scale. The questionnaires distributed to the remaining ICT teams are slightly modified versions of section two of the management one. Because the first group respondents were chosen from high or middle level management positions, the some questions are different for both groups.

3.4.2 Interview question design

Questionnaires may not provide all of the information required to gain a fundamental understanding for all minor issues. Furthermore, if a large number of questions are included on a single questionnaire, the respondents may become bored. As a result, in order to obtain more detailed information, this study chose to conduct a few one-on-one interviews with some middle-level managers. Interviews are conducted as a secondary primary data collection method for this study.

Interviews are used by researchers to gather information from individuals about their own practices, beliefs, or opinions. Interviews are one-on-one conversations between an interviewer and a participant that are designed to gather information on a specific set of topics. Background information or an expert's tacit knowledge can be taped with interviews. The level of organization employed on the interaction with participant differentiates interviews from a surveys (Harrell & Bradley, 2009). Interviews can be conducted in a number of ways, including structured, semi-structured, and unstructured formats. During a structured interview, the researcher only asks specific questions. On the other hand, one or more questions may be individually added in the first standard questions to elicit clarification or probe a person's reasoning on in a semi-structured interview. Interviews can take place either in person or over the phone. The researchers have the opportunity to build a relationship with the participant during a face-to-face interview, allowing him to gain more cooperation from them. Telephone interviews also allow you to meet with any participant, no matter how far away they are(Leedy & Ormrod, 2015).

In this study, semi-structured interview method was used. The interview questions were organized in accordance with the research framework that was chosen. However, after the participant's responses to the previously selected standard questions, the researcher introduces additional related questions. The interviewer has some freedom in the order in which questions are asked in a semi-structured interview, but the questions are standardized. With this conversational style of interview detailed information gathered(Harrell & Bradley, 2009).

The interview questions were developed using existing literature on Cloud Computing and framed within the selected STPOE framework. The interview questions were adapted from previous related papers (Xi, 2014) and (Gebremariam, 2015), but they are updated and refined to meet the study's objectives (see Annexure A).

3.4.3 Limitation and scope of Interview

There were a number of limitations during the data gathering and analysis process. One of the limitations was that it was difficult to get hold of the participants. The time planned for data gathering was extended because of the difficulty in getting hold of some of the participants. The behavior of government organizations employees is differ from the other sectors. Even if the research plans to acquire primary data from disseminated questionnaires conducting some interviews from each selected organization also vital.

The other difficulty befall in the interviews sessions are recording problems. The majority of participants who are willing to participate in the interview refuse to have the session recorded. Even if they have been told that no major or critical issues will be discussed during the interview. As a result, the researcher transcribed the interviews from high-level key notes into text format. The data was then subjected to thematic analysis in order to identify, analyze, and report on themes in the data.

Another potential limitation of this study is that it is difficult to include all of the appropriate participants in this interview for a variety of reasons. A lack of willingness, carelessness, and the presence of a newly hired employee are some of the reasons.

3.4.4 Pilot study

An excellent pilot study can be used to determine the feasibility of a study. Pilot studies may take some time to complete, but the end result may save you a lot of time and stress in the future(Leulseged, 2017). Pilot study were conducted as preliminary investigations for this research, and the result of volunteer communication with pilot study respondents allows to spot some weak points and some words were refined.

Conduct one or more pilot tests to determine the validity of your questionnaire is very essential. Even experienced researchers conduct test runs of newly designed questionnaires to make sure that questions are clear and will effectively solicit the desired information. At a minimum, you should give your questionnaire to several friends or colleagues to see whether they have difficulty understanding any items.

A pilot study was conducted with a sample of 10 respondents in order to test the validity and reliability of the questionnaire. All of the participants filled the questionnaire send their comments, which indicated 100% response rate of the pilot study.

3.5 Target population and sample size

The term "target population" refers to a group or set of elements about which you want to learn more. It can also be defined as an explicit, conceptually bounded group of potential participants who can represent the entire population of interest in a particular topic. The primary task of researchers in target population identification is to determine the characteristics of the groups to be studied as well as to define the boundaries in a relevant context. An iterative examination and critical consideration of all boundaries within a population aids in the successful selection of a target population. As a result, we can say that the information gathered is comprehensive enough to represent the entire population. A list of selection criteria for the best possible representative of the population can provide a well-defined target population(Jabar, 2009).

This study excludes INSA (Information Network Security Agency) and MInT (Ministry of Innovation and Technology). The reason for this is that one of these organizations serves as a policy provider, while the other serves as a service provider. In this study, MInT is viewed as a service provider because the project they have is the motivation for this study.

The study's goal was to evaluate the other service organizations and their synergy with MInT and INSA on CC issues. This study seeks to examine those organization's alignment with government strategy as STOPE framework is chosen to illustrate this.

Based on the findings of the observations and consultations with private companies, the following criteria were chosen to select organizations from the Ethiopian government structure.

- An organization with an ICT development strategy for the coming years.
- An organization that has made significant investments in information technology in recent years.
- An organization that provides a wide range of services throughout the country.

As a result, six government organizations were chosen for this study. The Addis Ababa City Government Science and Technology Agency was chosen as one of the target populations because they have various organizational systems that cover a wide range of services and users. In previous years, they spent a significant amount of money on ICT development. In addition, they intend to construct their own government cloud datacenter.

The Ministry of Finance (MoF) is the second organization selected for this study. This organization has a system purchased from Oracle mainly targeted to tress financial transactions. The system is intended to be implemented in all government organizations across the country, but it is still in its early stages. As a result, a large computational infrastructure will be required in the future. In addition, they construct of a large data center in the main office in previous years.

The other two selected organizations are Ministry of Transport (MoT) and Ethiopian road Authority (ERA). This organization spent a significant amount of money upgrading their datacenter as well as building a new one.

The final two organizations are chosen based on their plans for ICT development in the coming years. Based on a survey of presales consultants, these two organizations have developed a datacenter construction and infrastructure upgrade plan.

The other organizations were chosen based on the above criteria in order to conduct an extensive research that will cover a significant portion of the Ethiopian government organizations. The decision was based on a review of secondary data and a discussion with some private cloud

company's. with this criteria Planning and Development Commission (PDC) and Ethiopian Postal Service Enterprise (EPSE) were chosen.

The selected organizations for this study are listed below.

No.	Selected Organization
1	Addis Ababa City Government
2	Ethiopian Road Authority
3	Ministry of Transport
4	Planning and Development Commission
5	Ethiopian Postal Service Enterprise
6	Ministry of Finance

Table 1: List of selected organizations

3.6 Data analysis

Data analysis is a crucial process of combining facts and figures to answer a research problem. The interpretation of the data resulting from the data analysis and draws suggestions and conclusions, which make it the important aspect of a research. The examination of numerical data or a data that can be "converted" into numbers that can show a meaning is called Quantitative data analysis(Leedy & Ormrod, 2015). A specific characteristic of the entire population from which that we appeal a conclusion is called parameter in quantitative data analysis.

Non-numerical information such as interview transcripts, notes, video and audio recordings, images, and text documents are examples of qualitative data. The central distinction behind these methodologies is that quantitative data is concerned with numbers, whereas qualitative data is concerned with meanings. In comparison to numbers, meanings may appear shaky and untrustworthy. However, they are more significant and revealing(Dey, 2005) . The most important decisions in quantitative data analysis are made before the data is collected. But significant decisions and judgments will expected from the researcher during the course of the data analysis process in qualitative research.

In this research data were coded and analyzed in conjunction with the qualitative and quantitative data collection process (using questionnaire and interviews). In the Coding Cycle, the collected data is thoroughly examined using the factors assigned to each domain. The process managed based on the selected variable under Bakery STOPE model domains. As mixed method approach

is used quantitative and qualitative data's are combined in getting research questions answered. Data is analyzed in light of the research questions. To answer the research questions, both qualitative and quantitative analysis are carried out while keeping the conceptual framework in mind. The themes discovered in the data are revealed through analysis and interpretation in the case of a qualitative study, and also Statistical analyses are carried out for a quantitative study. The theme use in this study is based on the selected model. STOPE model is used as a theme to reveal what the work is really about and to form insights and analysis.

The qualitative data collected in this research is analyzed using Kalpokaite & Radivojevic (2019) new qualitative data analysis model. The model was designed to analyze qualitative data through a series of iterative cycles that synthesize the main tactics found in qualitative approaches. In preparation for reporting and presentations all collected data from each participant was analyzed and summarized. Tables and descriptive analysis were used with frequency, percentage, and mean to present the analysis of the data. After organizing the data, the descriptive analysis technique was used to manipulate it.

3.7 Ethical consideration

Scientific ethical values can be conveyed with the application of ethics in a research. The Principles of Research Ethics define the ultimate values and beliefs of the research community(Nazmul et al., 2021).

Most ethical issues in research fall into one of four categories: protection from harm, voluntary and informed participation, right to privacy, and honesty with professional colleagues. This four basic research ethical consideration were applied during data collection period.

The participants involved in this study are not exposed for readers to avoid the risks of day-to-day working environment. The participants were informed that their personal information would be kept confidential. People who are specifically recruited for participation in this research study first informed the nature of the study to be conducted and given the choice of either participating or not participating. Furthermore, they are told even if they agree to participate, they still have the right to withdraw from the study at any time. They are also told that they can have the results of the paper at the end of the study via E-mail.

The Research report the findings in a complete and honest fashion. Findings are stated based on the analysis results there is no misrepresentation to mislead the findings. All the data is collected using standard data collection methods and guidelines for both primary and secondary data.

3.8 Validity and reliability the research

The collected data's validity clarifies how well it covers the actual area under examination. We can say that validity is the ability to measure what is intended to be measured (Taherdoost, 2017). The degree to which a measurement of a phenomenon yields a stable and consistent result is known as its reliability. If repeated measurements under constant conditions return the same result, the test is said to be reliable. As a result, we can say that repeatability is an important aspect of reliability. The consistency of a measuring instrument's parts can be measured by testing Reliability(Taherdoost, 2017).

We must make measuring reliability and validity a primary rule in all measures we implement. If we are concerned about the overall validity of our approach, we are close to obtaining an accurate, meaningful, and trustworthy result.

For the detected results additional possible explanations must be ruled out by the researchers to ensure a research study's internal validity. Triangulation is one of several strategies used by researchers to demonstrate the likelihood that their result is most likely close to their observation. In this study, triangulation was used to support the specific findings of this study. This method is most commonly used in qualitative research, but it is also used in mixed-methods designs because it is more suitable as both quantitative and qualitative data is collected in this research design(Leedy & Ormrod, 2015). Collecting both quantitative and qualitative data allows us to conduct triangulation and to explain the procedure in detail.

The degree to which a research study's findings apply to circumstances outside the scope of the study is referred to as its external validity(Leedy & Ormrod, 2015).

Samples are drawn from a category by researchers to learn more about a specific entity which can represent the category as whole(Taherdoost, 2017a). This study's sample represents a wide range of government organizations to which the respondent belongs.

The validity and reliability of instrument measurement were used in this study to ensure how reasonably the instruments can address the issue under investigation. Based on the findings of

previous studies, we employ valid strategies and techniques that are appropriate to this research objectives.

A pilot study was conducted with a sample of 10 respondents to test the questionnaire's validity and reliability. The significance value of all validity test results is greater than 0.05. Cronbach's Alpha reliability test result is 0.893, which is greater than 0.6. So we can say that the internal consistency of the prepared questionnaire is reliable.

4 Chapter Four: FINDINGS AND DISCUSSION

4.1 Introduction

This section of the research paper presents the study's main findings based on the data collection and analysis methods used. Findings are presented in qualitative manner, free of bias or interpretation based on personal beliefs. This section's main goal is to organize the data into meaningful presentations that demonstrate its relevance to answer the research questions.

Questionnaires are distributed to employees at six selected government organizations to assess their current readiness for cloud computing adoption. Interviews, physical observations, and document surveys are used to supplement questionnaire responses. In order to answer the research questions stated in Chapter One, data gathered through interviews, observations, and document surveys was organized into categories and themes. The analysis is carried out using SPSS version 25. Frequency, percentage, and means are used in the discussion of the questionnaire collected from the selected organizations.

A total of 88 questionnaires were distributed, and 78 were returned, yielding ran 88.6 percent response rate. These questionnaires were distributed to the staff members who were chosen as the most relevant for this study. During the data cleaning phase, four papers were dropped. 1 survey response indicates that the questionnaire was filled with people who did not meet the target sampling criteria. The other three papers were filled with rash attempts and left many questions unanswered. As a result, this research analysis relies on a total of 74 responses.

4.2 Demographic Analysis

This section of the study focuses on the respondents' backgrounds in order to better understand those who complete the questionnaire for this study. Respondents are asked to provide information such as their years of experience and current position in the organization. The table below shows the demographics of the respondents. The most important demographic and background variables that can influence their knowledge of cloud computing were chosen.

9.5% of respondents are directors, 23.0% are team leaders and 14.9% of them are system administrators, 23.0% of them are software engineers, 17.6% of them are network administrators, 5.4% of them are information security officer and the rest 6.8% of them are database administrators.

The questionnaire includes the respondent's job experience because it can show how familiar the respondents are with their work operations and how experienced they are with various systems. When it comes to work experience in the organizations, 39.2% have more than 5 years of experience, 28.4% have 3 up to 5 years of experience, 25.7 percent have 1up to 3 years of experience, and 6.8 percent have less than a year of experience. This means that roughly 67.6% of the respondents in this survey have more than three years of experience, indicating that the participants in this study are experienced employees.

The ICT department was represented by all of the participants from the selected organizations. The participants' roles and years of experience are shown in the table below.

Respondents Profile	Classification	Frequency	Percentage
Work Experience	Over 5 years	29	39.2%
	3 to 5 years	21	28.4%
	1 to 3 years	19	25.7%
	Less than a year	5	6.8%
Job Position	Director	7	9.5%
	Team Leader	17	23.0%
	System Administrator	11	14.9%
	Software Engineer	17	23.0%
	Network admin.	13	17.6%
	Information Security	4	5.4%
	Database Admin.	5	6.8%

Table 2: Demographic Analysis table

The participants are more qualified and experienced to answer the distributed questionnaire form, as shown in the table above. All of the selected participants hold significant departmental positions and they more appropriate to contribute to the data collection process. The participants all have varying levels of experience in their current roles. This is an important consideration in determining the organization's cloud knowledge sharing status. ICT development plan will not be successful solely because the managers better understanding, rather all staffs' collaborative effort

will have more value. As (Curzi et al., 2019) stated the ability of organizations to innovate is more important than ever in digital competitive environments. One strategy to build a strong organization is to exploit employees' ability to generate new ideas and use them as building blocks for new and better product, service, and work processes.

4.3 Questionnaire Response Analyses

A separate readiness assessment instrument was prepared and distributed for top managers and the rest of their team for this study. This section's goal is to examine the responses provided by the participants. Respondents are asked to rate their level of agreement on the provided questions on a scale of 1 to 5. On a scale of 1 to 5, 1 represents strongly disagree and 5 represents strongly agree. The questions are structured in accordance with the chosen framework, with five constructs identified as critical to the adoption's success.

The following scale is used to interpret the results: 4.51-5.00 excellent or very good, 3.51-4.50 good, 2.51-3.50 average or moderate, 1.51-2.50 fair, and 1.00-1.50 poor(A. Bekele et al., 2019). This is scale used by (A. Bekele et al., 2019) based on the work by Zaidatol, A. L., &Bagheri, A. (2009), and both papers are a printed journal articles. Closed-ended question responses are also incorporated into this section using a narrative approach, providing a comprehensive view of respondents.

In this section, data analysis is presented based on the STOPE model domain. After presenting quantitative data for both the manager and the ICT staff remarks and in-depth perspectives are discussed in the qualitative response section including quantitative perspectives.

4.3.1 Top Management Responses

The response obtained from top management listed in the table below.

Top Management Response	Strongly Agree		Agree		Uncertain		Disagree		Strongly Disagree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
SQ1	6	25.0	13	54.2	4	16.7	-	-	1	4.2	3.96
SQ2	7	29.2	13	54.2	2	8.3	1	4.2	1	4.2	4.00
SQ3	4	16.7	6	25.0	9	37.5	4	16.7	1	4.2	3.33
SQ4	8	33.3	12	50.0	4	16.7	-	-	-	-	4.17
SQ5	-	-	5	20.8	13	54.2	4	16.7	2	8.3	2.88

SQ6	9	37.5	11	45.8	4	16.7	-	-	-	-	4.21
SQ7	5	20.8	13	54.2	5	20.8	-	-	1	4.2	3.88
SQ8	3	12.5	3	12.5	10	41.7	6	25.0	2	8.3	2.96
TQ1	2	8.3	10	41.7	6	25.0	5	20.8	1	4.2	3.29
TQ2	2	8.3	9	37.5	12	50.0	1	4.2	-	-	3.50
TQ3	15	62.5	5	20.8	1	4.2	1	4.2	2	8.3	4.25
TQ4	2	8.3	11	45.8	4	16.7	7	29.2	-	-	3.33
TQ5	-	-	8	33.3	6	25.0	6	25.0	4	16.7	2.75
TQ6	9	37.5	7	29.2	7	29.2	1	4.2	-	-	4.00
TQ7	5	20.8	12	50.0	6	25.0	1	4.2	-	-	3.88
TQ8	4	16.7	8	33.3	4	16.7	6	25.0	2	8.3	3.25
OQ1	7	29.2	5	20.8	7	29.2	5	20.8	-	-	3.58
OQ2	5	20.8	3	12.5	6	25.0	9	37.5	1	4.2	3.08
OQ3	4	16.7	7	29.2	9	37.5	4	16.7	-	-	3.46
OQ4	8	33.3	8	33.3	4	16.7	4	16.7	-	-	3.83
OQ5	4	16.7	15	62.5	1	4.2	2	8.3	2	8.3	3.71
OQ6	9	37.5	7	29.2	6	25.0	2	8.3	-	-	3.96
OQ7	6	25.0	10	41.7	5	20.8	1	4.2	2	8.3	3.71
OQ8	1	4.2	13	54.2	8	33.3	2	8.3	-	-	3.54
PQ1	5	20.8	6	25.0	8	33.3	3	12.5	2	8.3	3.38
PQ2	5	20.8	12	50.0	-	-	4	16.7	3	12.5	3.50
PQ3	13	54.2	4	16.7	4	16.7	1	4.2	2	8.3	4.04
PQ4	8	33.3	10	41.7	3	12.5	3	12.5	-	-	3.96
PQ5	8	33.3	6	25.0	7	29.2	1	4.2	2	8.3	3.71
PQ6	12	50.0	9	37.5	2	8.3	1	4.2	-	-	4.33
PQ7	3	12.5	14	58.3	5	20.8	1	4.2	1	4.2	3.71
PQ8	1	4.2	13	54.2	9	37.5	1	4.2	-	-	3.58
EQ1	3	12.5	7	29.2	10	41.7	2	8.3	2	8.3	3.29
EQ2	-	-	-	-	11	45.8	10	41.7	3	12.5	2.33
EQ3	7	29.2	7	29.2	6	25.0	2	8.3	2	8.3	3.63
EQ4	10	41.7	9	37.5	-	-	3	12.5	2	8.3	3.92
EQ5	3	12.5	2	8.3	12	50.0	5	20.8	2	8.3	2.96
EQ6	-	-	12	50.0	11	45.8	1	4.2	-	-	3.46
EQ7	13	54.2	8	33.3	3	12.5	-	-	-	-	4.42
EQ8	6	25.0	15	62.5	1	4.2	2	8.3	-	-	4.04
Mean											

Table 3: Top management Quantitative Response

4.3.1.1 Top management response on strategy construct

The top management questionnaire's first set of questions focuses on strategic commitment and readiness to adopt cloud computing services. According to the table above, 79.2% of respondents believe their organization has a well-articulated mission, vision, and direction for cloud computing

development. 83.4% of them believe that the organization has a proper plan for cloud computing adoption, while 16.6% are unsure and disagree. Moreover, to the question how the vision of cloud computing adoption plan is communicated all around the organization, the majority of them (41.7%) agreed that it is arguably communicated but 37.5% of them are uncertain about it. This three basic strategic question about cloud computing mission and vision has mean scores of 3.96, 4.0, and 3.33 respectively, indicating a favorable rate.

The majority of respondents agree that their organization has spent a significant amount of money to develop their ICT environment. In the second budget-related questions, 78.6% of respondents agreed that their organization spent a significant amount of money on ICT development, and similarly 75% agreed that their organization still can spend money for cloud computing.

Respondents were also asked whether any internal or external policy or legal issues would be a barrier to cloud computing adoption. According to 54.2 percent of respondents, they are not sure whether there are some policy and legal issues that might be a barrier to cloud adoption or not. Furthermore, 75 percent of respondents agreed that their organization is ready for cloud adoption in this construct. 35.7 percent unsure responses are acquired when asking the current service delivery is insufficient or not

4.3.1.2 Top management response on Technology construct

Eight questions were provided to the participants in order to assess organizational readiness from a technological point of view. These executives believe cloud computing will play a significant role in the organization's ICT development. The majority of respondents have a fair opinion on the compatibility of the existing infrastructure, with 28.6 percent agreed response and 2.43 mean rate. A moderate result is obtained with 42.8 percent agreed response on internet quality.

The majority of respondents have a fair opinion on the compatibility of the existing infrastructure for cloud adoption, with 28.6 percent agreed response and 2.43 mean rate. A moderate result is obtained with 42.8 percent agreed response on the quality of internet. 57.2 percent of managers believe that the existing security methods are adequate. In terms of issues that arise during and after the implementation of cloud computing Third-party dependency, loss of control over ICT equipment, and excessive effort during implementation and to reengineer legacy applications are identified as bottlenecks with 4.07, 4.07, and 3.21 mean rates.

4.3.1.3 Top management response on Organization construct

The responses to all of the organization construct questions shows positive results. For the four human resource questions, majority of managers believe that their organizations have sufficient operational/maintenance personnel with 3.5 mean rate. In addition, the rest of the staff is adaptable and eager to use technology in their daily tasks. The outcomes also demonstrates that their human resource department is well-organized, with experienced personnel capable of organizing and evaluating trainings. For all of these questions, the average result shows a good to very good rate. 50% of participants believe their current organizational structure is suitable for cloud adoption and that they are prepared for it, but the other 35.7% are not sure about it. 35.7% agreed response also obtained in the question of whether current policies encourage the use of cloud services, where 42.9% of respondents had uncertain thought about it. The participants believe they organization have a clear SLA with vendors, 42.8 agreed response acquired.

4.3.1.4 Top management response on People construct

The fourth construct from the chosen framework is the people construct, for which 8 questions were provided. This construct assesses the manager's perception of their employees. These managers believe there is an average level of awareness among senior level managers (3.0 mean rate), and they consider building an internal datacenter is an expensive plan than using cloud services with 50% agreed response the rest of them have 28.6 uncertain thought.

The issues related to employees' perception in training also yielded the best results on this construct. With a response mean rate of 3.93, 71.4% of respondents agreed that their HR believes trainings will strengthen the organization structure, and there is an acceptable level of ICT training provided to employees. According to the 78.6% response result employees are willing to participate in training programs, and as well they believe there is an average dedication by employees to improve themselves in daily bases.

4.3.1.5 Top management response on Environment construct

The final construct, represented by eight questions is the environment construct. On the subject of moving government services to the cloud, a 35.7 percent agreed and 35.7 uncertain result was obtained. Similarly, a 50 percent agreed and 50 percent uncertain response is obtained regarding the availability of sufficient external vendors or agents to support them in their cloud migration.

With a 35.7 percent majority response, participants thought a lack of sufficient support would not be an issue, but they strongly believe a lack of QoS and SLA monitoring solutions will be a serious issue after cloud migration. Furthermore, 71.5 percent of these management participants believe that inconsistency in electric power supply will cause significant disruption after cloud adoption.

4.3.2 ICT staffs Responses

The responses obtained from the rest of the ICT team is shown in the table below.

Top Management Response	Strongly Agree		Agree		Uncertain		Disagree		Strongly Disagree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
SQ1	10	20.0	18	36.0	12	24.0	8	16.0	2	4.0	3.52
SQ2	10	20.0	13	26.0	17	34.0	9	18.0	1	2.0	3.44
SQ3	11	22.0	16	32.0	14	28.0	6	12.0	3	6.0	3.52
SQ4	20	40.0	24	48.0	3	6.0	3	6.0	-	-	4.22
SQ5	3	6.0	22	44.0	16	32.0	8	16.0	1	2.0	3.36
SQ6	7	14.0	20	40.0	13	26.0	7	14.0	3	6.0	3.42
SQ7	7	14.0	21	42.0	15	30.0	7	14.0	-	-	3.56
SQ8	12	24.0	17	34.0	11	22.0	8	16.0	2	4.0	3.58
TQ1	6	12.0	21	42.0	9	18.0	9	18.0	5	10.0	3.28
TQ2	10	20.0	16	32.0	16	32.0	8	16.0	-	-	3.56
TQ3	18	36.0	23	46.0	8	16.0	1	2.0	-	-	4.16
TQ4	4	8.0	11	22.0	22	44.0	12	24.0	1	2.0	3.10
TQ5	6	12.0	10	20.0	11	22.0	21	42.0	2	4.0	2.94
TQ6	6	12.0	25	50.0	17	34.0	2	4.0	-	-	3.70
TQ7	5	10.0	24	48.0	18	36.0	2	4.0	1	2.0	3.60
TQ8	4	8.0	26	52.0	15	30.0	5	10.0	-	-	3.58
OQ1	3	6.0	28	56.0	17	34.0	2	4.0	-	-	3.64
OQ2	7	14.0	22	44.0	16	32.0	5	10.0	-	-	3.62
OQ3	6	12.0	14	28.0	18	36.0	12	24.0	-	-	3.28
OQ4	9	18.0	19	38.0	19	38.0	2	4.0	1	2.0	3.66
OQ5	7	14.0	22	44.0	17	34.0	4	8.0	-	-	3.64
OQ6	14	28.0	20	40.0	12	24.0	2	4.0	2	4.0	3.84
OQ7	9	18.0	21	42.0	16	32.0	4	8.0	-	-	3.70
OQ8	3	6.0	20	40.0	17	34.0	6	12.0	4	8.0	3.24
PQ1	10	20.0	21	42.0	13	26.0	5	10.0	1	2.0	3.68
PQ2	10	20.0	22	44.0	5	10.0	10	20.0	3	6.0	3.52
PQ3	12	24.0	22	44.0	11	22.0	5	10.0	-	-	3.82
PQ4	2	4.0	33	66.0	13	26.0	2	4.0	-	-	3.70
PQ5	11	22.0	14	28.0	13	26.0	11	22.0	1	2.0	3.46
PQ6	13	26.0	21	42.0	13	26.0	3	6.0	-	-	3.88
PQ7	7	14.0	15	30.0	16	32.0	10	20.0	2	4.0	3.30
PQ8	3	6.0	25	50.0	16	32.0	6	12.0	-	-	3.50

EQ1	4	8.0	22	44.0	11	22.0	11	22.0	2	4.0	3.30
EQ2	3	6.0	22	44.0	8	16.0	12	24.0	5	10.0	3.12
EQ3	12	24.0	20	40.0	10	20.0	5	10.0	3	6.0	3.66
EQ4	16	32.0	22	44.0	1	2.0	8	16.0	3	6.0	3.80
EQ5	10	20.0	23	46.0	16	32.0	1	2.0	-	-	3.84
EQ6	5	10.0	24	48.0	14	28.0	7	14.0	-	-	3.54
EQ7	4	8.0	19	38.0	20	40.0	7	14.0	-	-	3.40
EQ8	3	6.0	19	38.0	21	42.0	6	12.0	1	2.0	3.34
Mean											

Table 4: ICT Staffs Quantitative Response

4.3.2.1 ICT staffs response on strategy construct

The above table shows 56% of ICT staffs consider their organization has a well-articulated mission, vision, and strategy for cloud computing. 46 percent believe the organization has a proper plan in place for cloud computing adoption, while 34 percent are unsure and 21.44 percent disagree. Similarly, the majority of them (54 percent) agreed that the cloud computing adoption strategy is clearly communicated. The mean scores for these three fundamental strategic questions are 3.5, 3.44, and 3.52 which indicates an average rate. Even if the majority of the staff agreed on the above three strategic direction and planning questions, the remaining number cannot be ignored. Executives should improve their promotion of development strategies and plans to employees.

In response to a management-related question, 54 percent of respondents believe that cloud management related challenges will arise in the future as a result of current management techniques. In the other strategy construct question, 58% of respondents believe cloud computing is extra expense and that the current state of service delivery is adequate.

4.3.2.2 ICT staffs response on Technology construct

According to 42 percent of ICT staff, there will be a compatibility issue in cloud technology adoption due to existing infrastructure, and on the negative side, 54 percent of respondents agreed there is a suitable internet for cloud adoption, while 18.0 percent are skeptical.

52 percent agreed response with 3.18 moderate mean rate indicates that staffs believes the organizations' security options is good. The highest result in this construct is obtained with 82 percent agreed response on the importance of cloud computing for the transformation of the current ICT environment.

Third-party dependency, loss of control over ICT equipment, and excessive effort in reengineering legacy applications are rated as disadvantage cloud technology with 62%, 58% and 60% agreed response, and 3.54, respectively.

4.3.2.3 ICT staffs response on Organization construct

In the question of whether high and mid-level employees think positively about technological intervention 62 percent agree response is obtained from ICT staffs.

Current policies believed to encourage the use of cloud services with 40% agreeing response, while 24 disagreeing and 36.0 percent unsure results are obtained.

Human resource is rated as moderately organized department, with experienced personnel capable of organizing and evaluating trainings (68 percent). More than 60% of participants believe their current organizational structure is suitable for cloud adoption and that they are ready for it.

61 percent of employees agreed that the organizations mid and high-level mangers believe the improvement of employees will also have an influence in the organizations standards. Furthermore, the rest of the staff is adaptable and willing to incorporate technology into their daily tasks, 56 percent of those polled agreed.

4.3.2.4 ICT staffs response on People construct

These ICT department participants believe there is a high level of awareness among senior level managers (62 percent). The participants believe that their manager has superior technical and managerial skills, and this belief also yielded the highest percentage of agreed responses (56.4%) beside 38% percent of the unsure responses.

With a mean response rate of 3.62, 58 percent of respondents agreed that there is an acceptable level of ICT training provided, and the response shows previous ICT trainings were reasonable with 40 percent agree response in this construct. According to the 68 percent agreed result, high and mid-level managers encourage their employees to pursue self-development. Most of the respondents are agreed that all the staff accepts cloud computing as a key organizational service advancement technology.

4.3.2.5 ICT staffs response on Environment construct

In this construct for the question about the trustworthiness of cloud vendors, the respondents agreeing with 52% response and the rest with 22% unsure and 26% disagreeing responses.

Inadequate support from cloud vendors remains a problem after cloud migration according to 66 percent of participants. After migrating to the cloud, 46 percent of respondent agreed that a lack of QoS and SLA monitoring solutions would be a problem, while 40 percent were unsure. Furthermore, inconsistency in electric power supply will cause significant disruption after cloud adoption, according to 76 percent of these participants.

4.4 Qualitative data analysis

Following the identification of organizations that meet the criteria. High-level executives were chosen and asked to participate in the interview. The interview session includes 7 executives. As mentioned Earlier, the qualitative data collected in this research is analyzed using (Kalpokaite & Radivojevic, 2019) new qualitative data analysis model. The Inspection Cycle, Coding Cycle, Categorization Cycle, and Modelling Cycle are the four iterative cycles that make up this core model, and memo-writing is an integral part of the overall analysis process. The analysis begins with a basic quantitative examination of the data, followed by multiple coding cycles that begin with inductive approaches and progress to deductive strategies, after which the codes are grouped and categories drawn out, leading to the development of the final conceptual framework that synthesizes and corroborates previous knowledge with the findings of the data analysis. Qualitative research findings and results presentation is the focus of this section. The study used descriptive analysis. The research objectives are followed in the presentation of the findings and results.

In this study, qualitative data analysis was used for triangulation and to provide better explanations, understanding, and interpretation of the phenomena. In addition to observation and document references, 7 management members were interviewed. Documents in this category include previous project papers, assessment questionnaires, and inception reports. The semi-structured interview with managers enables us to discuss the overall previous experiences with cloud adoption and their trend as an organization. The qualitative data gathered for this study is presented below.

4.4.1 Qualitative Analysis for strategic construct

When comparing interview responses to quantitative responses, the attempt to investigate the status of the government's direction toward cloud computing revealed that there is no clear direction on it. The responses to this question demonstrated that they do not share a common understanding or a common direction. To elaborate, some of the selected organizations spent a significant amount of money upgrading their internal datacenter a few years ago, while others have already set a strategic plan to build an internal datacenter in the next one or two years. For example, AASTA is currently running a project to build government cloud datacenter for the city of Addis Ababa.

According to the quantitative data, the majority of respondents believe their organization has a well-articulated mission, vision, and strategy for cloud computing development. However, the results of the observations and interviews show the organizations vision generally uses the term ICT development, so cloud computing is not stated separately. This means they did not clearly set cloud computing as an ICT development goal.

As a result, most organizations have made little progress toward cloud computing. Only AASTA set a clear direction to cloud computing and began some work on cloud computing. . AASTA planned a project to build a government cloud datacenter which intend to give and effective and efficient service for CGAA. The project is currently in an assessment phase. In opposition to this, the rest of the organization's ICT development plans took a different path. This implies a major strategic failure if we see it from cloud computing technology perspective. Because, according to (Kauffman et al., 2018), strategy-driven organizations have the best chance of easily identifying and benefiting from the potential business value of cloud computing.

The quantitative results also show that these organizations have spent a significant amount of money on ICT development in previous years and continue to do so. Qualitative data similarly also shows that the majority of them still have development plans with some sort of budgets. However, if their intention remains in cloud computing as a goal, these budgets should be strategically framed.

This managers who participate in the study have a favorable perception of cloud computing. Based on the qualitative data, participants picked increasing computing capacity, service performance,

flexibility of IT resources, and improved disaster recovery as a strategic reasons for adopting cloud computing.

Related to the motivation of the study participants we asked whether or not they are aware of the MInT Government Datacenter and whether or not. The majority of the participants were unaware of the project and had no involvement in it. The results of some qualitative data show that there are rules and regulations for cloud computing in Ethiopia, which are near to be stated as policy. However, the majority of participants were unaware of any legislation or laws governing cloud computing adoption.

In general, these findings in strategy domain indicate that there is a problem with enterprise architecture management. According to(Jafari et al., 2020), enterprise architecture management is at its best when the principles, policies, and standards of information systems and IT infrastructure are in sync with the organization's current or future business goals.

4.4.2 Qualitative Analysis for Technology construct

Currently, all of the selected government organizations didn't use cloud computing service. AASTA and EPSE have a strategic plan in place to migrate some of their services to the cloud. Most of the participants chose to adopt IaaS deployment model if they adopt a cloud services. CDS from the Ethiopian Postal Service Enterprise; HealthNet, WoredaNet, SchoolNet, Ethiopian Vital Event, land and housing from the Addis Ababa Science and Technology Agency; IFMIS from the Ministry of Finance, ERAMS & ACCPAC from the Ethiopian Road Authority are among the services that will most likely be migrated to the cloud.

According to the participants, the features that most organizations are concerned about when deciding whether or not to use cloud computing are privacy, continuous higher costs, and a lack of skilled expertise in cloud services tasks. In addition to the disadvantages, executives are concerned that end-users may be concerned about data privacy, and cloud vendors also may be vulnerable to cyber-attacks.

In both data collection methods the participants have a doubt on their quality of internet and resource compatibility with the cloud. As a result, their network should be examined in terms of band width and sensitivity. Furthermore, organizations should assess whether the existing

infrastructure's resources are shareable and reusable. A flexible ICT infrastructure which is based on a service-oriented architecture and reusable components provides a solid foundation for the use and integration or cloud resources(Jafari et al., 2020). Concerns about reliability also pointed out in the close ended questions. Issues related to internet connections also affect the reliable delivery of organizational services(Al-Hujran et al., 2018).

In this manager's opinion, security concerns are also a point of uncertainty in cloud adoption decisions. (Jafari et al., 2020) states the most common barrier preventing organizations from migrating to the cloud is a lack of information security readiness for cloud computing. The implementation of CC drives organizations to use public internet, which raises security concerns. As a result, organizations prefer to keep their data on a private corporate network that they have a full control. Privacy also must be taken into consideration(Al-Hujran et al., 2018). So, when organizations plan to adopt the cloud assessment tests should be performed first.

In addition, Disaster recovery plans are important decisions in ICT development because they reduce a company's loss of valuable resources. Disaster, in its broadest sense, refers to any calamity that could have a negative impact on a business(Anitha, 2020). In terms of disaster recovery plans, the majority of them lacked a standard mitigation method. AASTA is the only organization that has a separate datacenter for business continuity and disaster recovery.

4.4.3 Qualitative Analysis for Organization construct

Based on the opinions of all participants, cloud computing migration will not disrupt the interoperation of existing Organization Architecture. Cloud computing is also important in transforming the current ICT environment and services to a more acceptable level.

As a disadvantage of this construct, in most the selected organizations staffs lacked an experienced in cloud tasks. Likewise ICT staff turnover and high investment on trainings for ICT staffs will be another issues after cloud adoption. The use of skilled IT personnel is required for the preparation and transformation of a cloud computing-compatible IT infrastructure. Developing consistent and worthwhile systems for the organization services can be done with Skilled IT personnel’s(Jafari et al., 2020). The adaptability that managers observed on their staff's to organizational changes and daily task solution delivery accomplishments can be viewed as a positive advantage for the issue.

The ability to properly manage a cloud vendor refers to cloud management, which includes developing SLAs for all outsourcing decisions(Jafari et al., 2020). In relation to this issue, management acknowledges that they do not have proper SLAs with vendors. Typically, the SLAs they have agreed upon with vendors are implemented after their projects have been completed. Exceptionally, AASTA has made a SLA agreement with Ethio Telecom in the last year.

Similarly to the quantitative data, the interview results show that managers have serious doubts about their organization's readiness for cloud adoption. As a semi-structured interview was conducted, questions related to the STOPE domain were asked from the researcher. Following that, the managers provide hesitant responses to the questions posed.

4.4.4 Qualitative Analysis for People construct

Similar with the quantitative data, qualitative results reveal that there is certain level of awareness on cloud computing technologies among senior level managers. The benefits of cloud computing can be obtained by repositioning all stakeholders to a potential awareness and knowledge status of cloud technology(Njoku & Ken-agbiriogu, 2021).

Participants believe that there is average rate of trainings provided for the team but cloud related trainings are not provided in previous years. And they propose that all organizations should work hard to improve their employees through these types of trainings. Previously, according to the majority of participant's staff trainings were provided without proper investigation. As a result, there are no experienced staff in cloud computing in the organizations, so they should learn from this and provide appropriate training.

According to (Jafari et al., 2020) learning habits through trainings allows ICT staff to improve their knowledge and skills. Continuous investigation with new Cloud Computing resources could help the staffs to advance and improve their capability.

4.4.5 Qualitative Analysis for Environment construct

One of the most important environmental measurements related to cloud adoption is environment uncertainty(Narkhede et al., 2018). Participants also mentioned the concern that they have about

the sustainability of vendors services and the issues that will arise when attempt to change cloud vendors.

The scope of implementation determines the organizational dimension, which also frequently overlaps with the people domain(Jafari et al., 2020). Because of there is a strong relationship between the domains, some issues discussed in this section also overlap question in the other domains. Beside the assessment in the quality of internet provided by Ethio Telecom in technology domain, Infrastructure and SLA based questions are also provided for participants to respond their thoughts in Environment domain. There is an uncertain thought perceived from the quantitative data, and also in the qualitative results participants acknowledge the improvement of Ethio Telecom infrastructure while recognizing its service limitations.

Most participants mentioned security and reliability as factors to consider when selecting cloud service providers. In terms of SLAs, the majority of them lacked clearly articulated agreements. Their majority of service agreements are signed during project implementations and which is valid only for a few years. There is only one standard agreement between AASTA and Ethio Telecom. AASTA previously met with two cloud vendors to discuss about their services, but there is still work to be done for security reasons. We can see this from cloud management perspectives. Organizations should develop vendor selection and monitoring mechanisms based on previous capabilities and practices identified in the in literatures or practices(Jafari et al., 2020).

5 Discussion and conclusion

5.1 Discussion

These section also organized according to STOPE model domains based on the findings presented in chapter four in a manner that answers the research questions and secondly associates these findings with the previous studies that are presented in chapter two of this study.

Strategy

The findings, which are based on a survey questionnaire, interviews, and secondary data revealed that these government organizations have a strategically weak perception of cloud adoption.

Vision (*Lack or clear direction toward cloud computing***)**: This federal organization has an issue with cloud computing directions. The respondents believe that their organizations have a clear path toward cloud computing, yet their recent infrastructure development decisions have shown that they are off track.

Organization (ICT) plan (*Lack of proper ICT development plan toward Cloud technology***)**: Even if they are aware of cloud technology and believe they have a clear direction toward cloud computing, the majority of organizations lack a solid plan and action that will enable them to reap the benefits of cloud technology.

Commitment (Lack of proper participation in MInT projects**)**: there is a strategic misunderstanding between MInT, INSA, and the other government organizations. They didn't have a shared understanding or direction when it came to the idea of a single government-wide cloud infrastructure platform. MInT is launching a project to build a government cloud datacenter that will benefit all government organizations by offering cloud services based on the IaaS service model. The majority of firms, on the other hand, were unaware of the project and were instead focused on the construction of internal datacenters. MInT did not host any meetings or seminars with these stakeholders in order to adequately educate them and inform them of their plan.

If these government organizations are aware of the project, they can evaluate and update their plans in order to accomplish the intended objectives within the time range and budget set in their strategic plan. On the other side, the Addis Ababa Science and Technology Agency (AASTA) is assessing the status of the existing infrastructure under the City Government of Addis Ababa (CGAA) with the goal of constructing a government cloud data center for Addis Ababa. Building a separate data center for Addis Ababa is a good idea, but for the time being, it's like bringing one problem to the table before addressing the first one. This indicates that there are some misaligned goals between the organizations.

Another issue identified as a strategy concern in this study is that many government initiatives including cloud-related projects, have ownership that is bouncing from one owner to the next.

ICT HR Plan (Dependent on ICT team request): all the organizations do not give training for their employees as a basic strategic solution to improve their abilities and help them to cope with the rapid pace of technological advancements. They didn't examine their employees' training needs, instead relying on someone's own preferences.

In general, the findings in the strategy domain revealed that all of the organizations had problems managing their enterprise architecture. Jafari et al. (2020) states that we can claim to have the best enterprise architecture management if we align our principles, policies, directions, and ICT infrastructure with the organization's goals.

Technology

These government organizations have a moderate level of cloud computing awareness and acceptance.

Availability (*Moderate availability of internet*): An internet connection is a necessary infrastructure for cloud computing technology, as it allows users to access programs and data as a service from any location on any device. The findings of this study demonstrate that these organizations have an internet connection, despite the fact that there are stability and quality issues, which is a major issue if they decide to use cloud technology.

Performance (*Unmeasured infrastructure performance*): When it comes to cloud computing, the technology requires a certain level of infrastructure to acquire services from providers, which includes computing devices, storage devices, and network resources. Users must first prepare their internal infrastructure in order to receive services and applications from cloud service providers. As a result, before making a cloud adoption decisions, users should analyze their infrastructure readiness. A service-oriented architecture and reusable components-based ICT infrastructure provides a solid platform for the utilization and integration of cloud services(Jafari et al., 2020).

Product (*Different security products and no Impact analysis*): Security is the most important factor in this construct, and it is still an issue for them in some ways. For organization of any size, network security is critical. Cybercriminals are always looking for new ways to access networks, and cyber risks are always growing. The selected government entities on this study employ a variety of security approaches and tools to protect their internal infrastructure, however the majority of them do so without conducting an in-depth analysis and assessment.

Moreover, government security policies will continue to be an issue in cloud adoption. Backup and recovery concerns are also important at this point. Based on the findings, the majority of these organizations did not have a proper backup and disaster recovery plan, which would be a problem during the cloud adoption process.

ICT Support (3rd party dependency and medium level of operation and maintenance support): According to the data, one of the key reasons cited by respondents as a risk in cloud adoption is third-party dependency. Beyond the concerns of cloud technology's reliability and service quality, third-party dependency has been identified as a major drawback in the use of cloud services. If organizations do not invest in improving their workers' knowledge development, they will become more reliant on service providers, even for minor and simple activities.

Availability: (*Moderate availability of internet*): In the utilization of cloud services, the internet serves as a backbone. The internet is moderately available in these government entities, however the quality and speed of the internet are still in question.

Organization

Basic ICT regulations (*lack of ICT regulations and standards*): organizations almost on the path to entirely rely on the use of ICT technologies on a daily basis. It is excellent to use ICT technology

to get some work done, but the use of these tools should be governed by some regulations and policies. The ICT regulations provide rules that must be followed when employees use ICT systems, as well as the security requirements that users must comply to, which aid in data management and security, among other things. These Ethiopian government organizations lack a well stated and practical ICT rules and regulations, therefore they are vulnerable to a variety of security threats beside the other management and readiness issues.

Internet service regulations (lack of SLAs): Ethio telecom is the only Internet service provider (ISP) offering an internet service to Ethiopian subscribers. As a result, the reliability of future cloud service adoptions and the performance of existing systems are both dependent on the service quality of this profit-making government company. For these government organizations, the current internet service quality and reliability is not good enough to perform their services properly and quickly. As these government organizations are required to pay Ethio telecom a service fee, Ethio telecom must also ensure the service by enforcing certain regulations and obligations. In this case, explicit SLAs should be developed, and both parties should follow the principles outlined in this document. Only AASTA and Ethio Telecom had signed SLA at the time. Based on the findings, the organizations made service level agreements only based on their previous project SLAs. SLAs, on the other hand, should not be considered only for a few years after project implementation.

The respondents also cite the high cost of the budget required for the extensions of redundant internet lines as a disadvantage. It would be preferable if the country had two different service providers and two different internet services, but even in the current circumstances, pulling two fiber connections from two different Ethiopian telecom stations is an expensive proposition for these organizations. Moreover, even though the redundant line is in the passive mode, the high cost expected to be paid for it raises the internet budget.

Knowledge sharing for Innovation (*medium knowledge sharing trend*): Employees with expertise knowledge pass on everything they know to others, which is one of the advantages of knowledge sharing in the workplace. Organizations will be able to keep critical knowledge in this manner, and new employees will be able to improve their expertise and cope with the environment more readily. These organizations have a medium level information sharing trend, but it would be better if they established a more standard trend and used tools in knowledge sharing. Furthermore,

it would be preferable if they could organize new hire trainings whenever they add new members to their organization.

Quality (*no service quality assessments*): Quality of service in an organization's is a capacity to provide service in accordance with internal quality criteria. Organizations should evaluate their service delivery on a regular basis and address any weaknesses in order to improve service quality.

The majority of these government agencies did not undertake this type of evaluation to improve their service quality. Even though some of them have attempted this, they didn't do it in a professional manner. This type of evaluation should be carried out not only in accordance with management's perceptions of consumer demands and expectations.

People

ICT Literacy (*good level of Cloud computing technology advantage awareness and use of technology*): The proper understanding of how to use and how it is important of any technological advancements should be distributed and get matured among the expected consumers first. The respondents at the chosen government organizations have a good level awareness of cloud computing's benefits and how to apply it.

Education system support– (good level of education and training): These firms give ICT education and training to their entire workforce, as well as some specific trainings are also provided for ICT personnel's. Training is critical for standardization, increasing productivity, and ensuring organizational sustainability. Most organizations provide some form of training for their ICT department, but there is still a gap in cloud-related training. Most employees are willing to participate in trainings for a variety of reasons, but selecting the appropriate training is the responsibility of higher-level executives and the human resources department.

ICT qualification (*good educational qualifications and good training*): Skilled IT workers can develop consistent and worthwhile systems for the organization's services(Jafari et al., 2020). So, for any organization in order to have a more valuable system, they should work to improve the abilities of their ICT personnel. In previous years, good ICT-related trainings were provided for ICT workers, but cloud-related trainings were not included.

According to the findings, the majority of organizations have an adequate number of operation and maintenance employees who are moderately motivated to improve themselves in their jobs.

Government regulation (*CC regulation are not communicated*): Cloud computing is not governed by a specific cloud regulations and its services are not subject to government regulation. In our country, a cloud policy is being developed and it is in approval process, however for the time being, some cloud-related issues are being addressed through direct papers from INSA and MInT. Furthermore, it is preferable to incorporate all appropriate stakeholders in the development of such a regulations.

Infrastructure (unstable electricity): Electricity fluctuation is a crucial issue in the longevity of ICT infrastructure and services. Consistent electricity supply is now strongly tied to the organization's reliability and service. According to the responders, the electrical supply in these organizations is unreliable, and as a result, several electric gadgets perish before their expected service time.

Furthermore, the electrical staff's poor knowledge on the use of the new electric devices such as UPS and generators is an additional problem in the ICT infrastructure's health. These kinds of electrical gadgets are becoming smarter all the time, and the electrical staff teams at these organizations are struggling to keep up.

Management (Lack of SLA monitoring solutions and poor vendor management): When it comes to choosing the correct vendor for a certain business need, vendor management is crucial. Additionally, firms can employ vendor management to achieve business objectives. Vendors must also be adequately managed in order to ensure that requested services are delivered on time with the desired standard.

Organizations should build vendor selection and monitoring methods based on past capabilities and practices identified in literatures or practices to attain their goal in working with some suppliers(Jafari et al., 2020). Unfortunately, until the time of this study, these firms lacked a vendor management mechanism.

Findings shows that there is unclear thought whether the cloud vendors are trustworthy or not. The reason to this issue is that most of the cloud service providers are found outside the country.

Government's policy to finance related systems and their backup and recovery weakness makes this decisions unclear.

Service-Level Agreements (SLAs) are an important part of cloud service delivery. In the absence of SLA, the organization will be in an unconvincing position. Previous experience with this organization indicates that there was a disagreement with their vendors/agents. As a result, it can be used as a good example to learn from when making cloud adoption decisions.

As a remark, there are a number of issues that organizations must consider before moving to the cloud. Some of the steps that should be considered before cloud adoptions are IT resources and utilization patterns, determining sensitive data, improving staff capability, vendor selection, and SLA preparation(A. Akande, 2014). Generally, there is some sort of critical evaluation before any adoption attempts.

5.2 Conclusion

The following specific conclusions are drawn from the data presented and analyzed in the study.

In strategy construct, ICT leadership and future development plans issues were assessed using (vision, government support, commitment, ICT plans, and HR plan) factors, and the results show that these government organizations are not strategically ready in all the selected factor except government support.

In technology construct, ICT basic communication & Information structure and ICT provisioning issues were assessed using (availability, performance, product and ICT support) factors, and the results show that this government organization are not technologically ready.

In organization construct, ICT government regulations, ICT corporation and ICT management issues were assessed using (basic ICT regulation, internet service regulation, knowledge sharing for innovation, change and quality) factors, and the results reveals that this government organizations lacks organizational readiness in key domain areas.

In people construct, ICT awareness, ICT education & training and ICT qualification and job issues were assessed using (ICT literacy, education system support, and ICT qualification) factors, and

the results show that this government organization have a people readiness in all key factors of this domain.

In Environment construct, organization and infrastructure issues were assessed using (government regulation, management and basic service) factors, and the results show that this government organization are not ready in all key factors of this domain.

In the strategy domain, vision, commitment, and organization (ICT) plan; in the technology domain, performance, product, and ICT support; in the organization domain, basic ICT regulation, internet service regulations, and quality; and in the environment domain, management and infrastructure are identified as key factors influencing cloud adoption in Ethiopian government organizations.

Based on this, to fill the gaps in strategy domain identified by the research Government officials should clearly discuss their cloud computing strategy with the appropriate entities. They can all work together toward a common goal when they have a common understanding in the issue. This kind of projects are not supposed to be planned by solely by government officials, rather all stakeholders should be included and participate. Similarly, cloud computing policies and legal issues MInT and INSA should be communicated to all organizations so that they can frame their internal policies accordingly.

Employees in the Ethiopian government organizations have a good awareness about the advantages of cloud computing. In addition, respondents are pleased with the organization's commitment to providing training to help them do their jobs effectively. However, the majority of them lacked cloud computing experience and knowledge, so cloud computing competency trainings should be prepared for them for the preparation of cloud-related tasks.

As we can see from the results all managers accept cloud computing as a solution for their current computational problems. According to the managers, an in-depth assessment of sensitive data, the kind of training which should be provided for staffs, the existing quality of internet, ICT team change impact, legacy systems compatibility and cost effectiveness of CC assessments should be conducted before cloud technology adoption decisions. This can be considered a good indicator of matured awareness of the managers about cloud technology and it is helpful knowledge if it is

managed with a proper plan. The results also shows all Managers accept cloud computing as a solution to their current computational problems.

Organizations will benefit from SLAs if they prepare a well-articulated one, as it ensures the stability of the standard service provided by cloud vendors. A service level agreement provides a well-documented method for a vendor and client to work through their mutual expectations. The selected organizations should accept this as organizational culture by developing a standard service level agreement (SLA) for their computing infrastructure support needs and acquired services.

Finally, despite the positive results in cloud adoption awareness, the results show that government organizations are not ready based on STOPE model assessment at the time this paper was submitted. The implication of the results in this study indicates that this organization is less likely to adopt cloud services from vendors located outside of the country. So, in order for the MInT government cloud datacenter project to be successful, the ministry should inform his target customers about his goals and encourage them to update their strategic plans, and make them being ready in strategy, technology, organization, and environment domains.

5.3 Recommendation

Even though the awareness of the top management staff is found to be "good" in cloud computing, there is still an area of improvement to increase the overall rating and to make their organization fully ready for cloud adoption. Based on the findings above, the researcher recommends that government organizations should consider the following issues.

- Updating strategic plans to change the direction of their current ICT development towards cloud computing is critical.
- Cloud computing trainings for ICT staffs should be planned in order to improve the overall staff synergy toward a common goal.
- SLA related organizational culture should be improved as well, in a way which includes a specifically listed rights and obligations with vendors.
- Communication between government organizations is critical to understanding what they have in common during project executions. If all government organizations have a common

goal in MInT government cloud center project, the unnecessary expenses that government organizations spend on ICT development will be reduced.

Finally For future works:

- Researchers can validate the key factors mentioned in this study.
- Assuming that the MInT government cloud center project is successful, researchers can design service delivery guidelines based on the organizations' claims and the cloud datacenter's capabilities.

6 Reference

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7 APPENDIX

7.1 APPENDIX 1 (Questionnaire 1)

This questionnaire is prepared to assess the executives perception on cloud computing.

Responder Personal details

Note: All information gathered by this survey is for research purposes only.

- Your name and contact details.

Please write your answer(s) here:

Full Name (Optional)	
Organization Name	
Email	

- What is your current job title (or role)?

Please choose only one of the following:

☐ ICT Director
☐ ICT Team leader
☐ ICT Manager
☐ Systems Administrator
☐ Database Administrator
☐ Network Administrator
☐ IT Support
☐ IT Consultant
☐ Implementation Manager
☐ Other title: _____

- How long have you been working in your present job (or role)?

Please choose only one of the following:

☐ less than a year
☐ 1 to 3 years
☐ 3 to 5 years
☐ over 5 years

- Would you like to further participate in this research study by joining discussions or collaboration in case studies and would like to be contacted in the future for this purpose?

Please choose only one of the following:

☐ Yes
☐ No

Section: One

1. Does your organizations ICT strategic plan include a migration to Cloud Computing?

☐ Yes ☐ No

2. What were the organizational goals /drivers / reasons for migrating IT services on Cloud Computing?

Please choose all that apply:

☐ Increase computing capacity and service performance.

☐ Gain flexible and scalable IT resources.

☐ Add redundancy to increase service availability

☐ Avoid capital expenditure (CAPEX)

☐ Bring diversification in IT systems

☐ Enhance disaster recovery capabilities

☐ Reduce ICT's operational cost

☐ To overcome lack of staff capabilities

☐ There is no plan to migrate ICT services to the cloud

Other:_____

_____

3. Do you have any concern in the implementation of cloud computing services?

☐ Privacy Compliance

☐ Security ☐ Sustainability

☐ Abuse ☐ Higher Cost

☐ Recovery of lost data in contingency ☐ Up keeping (management) of Cloud

☐ Lack of resources/skilled expertise

If any Other: _____

_____

4. The major concerns of the end-users at my organization regarding data and services hosted on Cloud Computing were/ will be?

Please choose all that apply:

☐ Availability of service/Cloud vendor

☐ Privacy of data stored on Cloud

☐ Reliability of services offered by Cloud Vendor

☐ Integrity of data hosted on Cloud

☐ Cloud vendor's vulnerability to cyber attacks

☐ Security concerns/apprehension about Cloud Computing

Other:

_____

_____

5. Migrating IT service on Cloud Computing at my organization has/will _____

Please choose all that apply:

☐ Caused IT staff turnover

☐ Changed IT organizational work patterns

☐ Burdened IT staff with more work

☐ Forced IT department to invest into IT staff trainings

☐ Strengthened IT department's authority

☐ Undermined IT department influence

☐ build a sense of ineffectualness in IT staff

6. Which of the following actions (or similar in nature) were carried out (or do you believe to be carried out) before migrating/deploying or launching the IT services hosted on Clouds?

Please choose all that apply:

☐ Profiled service users, their service needs and utilization patterns

☐ Developed plan for IT Organization realignment with Clouds

☐ Assessed data sensitivity and criticality of work

☐ Assessed organizational wide change impact

☐ Developed a systems migration/transition plan

☐ Assessed IT staffing and training needs

☐ Planned and executed Pilot Testing Project

☐ Developed an internal marketing plan for launching the Cloud based services

☐ Sought senior executive's support as sponsor or change champion

☐ Assessed end-user change impact

☐ Measured organizational climate for change readiness

☐ Assessed new IT resource needs (bandwidth etc.)

☐ Developed an integration plan for existing software/hardware

☐ Assessed IT Team change impact

☐ Developed end-user training plans

☐ Other action(s)

***Please briefly describe the action(s) that you have applied or plan to apply before migration or launching the Cloud Computing services?**

Please write your answer here:

7. After rollout of the migrated/deployed Cloud hosted services, which of the following actions (or similar in nature) were (do you think should be) carried out.

Please choose all that apply:

☐ Developed Cloud services quality feedback mechanism

☐ Updated IT Services Catalogue

☐ Removed old office software suites for all the end-user's

☐ Measured the usage/uptake of Cloud hosted services

☐ Removed old office software suites for specific groups within end users

☐ Launched trainings to increase IT staff's capabilities

☐ Other action(s)

***Kindly briefly describe the action(s) applied (or should be applied) after rollout of Cloud hosted services?**

Please write your answer here:

8. Do you have business continuity and disaster recovery (BCDR) plans in place for cloud environment?

☐ Yes ☐ No

9. Have your organization measured the business value of cloud computing? And, evaluated the costs and benefits of it?

☐ Yes ☐ No

***If your answer is "yes" Kindly describe the action(s) applied to evaluate the values of cloud computing?**

Please write your answer here:

10. Is there any legislations and laws specifically in the governance of government cloud services or adoption?

☐ Yes ☐ No

***If your answer is "yes" please kindly mention those legislations and laws?**

Please write your answer here:

11. Did you know that the Ministry of innovation and technology is planning to build a government cloud datacenter?

☐ Yes ☐ No

12. Is there any meetings or any discussions that MInT(Ministry of Innovation and technology) have made with your organization about the government cloud datacenter?

☐ Yes ☐ No

***Kindly describe the action(s) applied (or should be applied) related with the Government cloud datacenter?**

Please write your answer here:

Section: Two

Please mark the proper response on the scale ranging from strongly agree to strongly disagree by placing a tick (√) in the appropriate space.

Hint: Likert scale numbers range from 1-5 denote as follow:

1= strongly agree 2= agree 3=uncertain 4= disagree 5= strongly disagree

No.		Strongly Agree	Agree	Uncertai	Disagree	Strongly Disagree
	Strategy Construct Measures					
1	Your organization has a clear articulated mission, vision, direction, commitment and plan towards Cloud Computing development and utilization					
2	Your organization have a proper plan for the implementation of cloud computing					
3	Your organization cloud adoption plan has been widely communicated throughout the facility/employees					
4	Your organization can be categorized as one of the highest investors to support ICT projects					
5	Internal or external policy or legal issues might be barrier to the adoption of cloud services					
6	Your organization can set aside funds and implement cloud computing technology					
7	Your organization is ready to adopt cloud services					
8	Your organization's current service delivery is adequate, and moving to the cloud is an unnecessary cost					
	Technology Construct measures					

No.		Strongly Agree	Agree	Uncertai	Disagree	Strongly Disagree
1	Your organization quality of internet connection is suitable for Cloud computing					
2	Your organization has security measures in place that are robust enough to resist current security threats.					
3	Cloud computing had an important role in the transformation of the current ICT Environment					
4	Migration of applications and services will be difficult if ICT services are deployed in the cloud					
5	Existing IT Infrastructure/Resources is incompatible for Cloud Computing					
6	Using cloud services will increase dependence on a third party provider					
7	Loss of control over IT resources will be a risk after migration to the Cloud					
8	Reengineering legacy apps for cloud migration takes a lot of time and effort					
	Organization Construct measures					
1	Your organization have enough operation and maintenance persons with cloud computing experience					
2	Your organization have a clear standard service level agreement with the legal vendors					
3	Your organization policies are in place to encourage and manage cloud computing use					
4	Employees in your organization willingly use technology in routine/daily task					
5	Employees easily accept any organizational change or any change in a daily task occurred in your organization					
6	Your organization has an experienced human resources, personal, or training department that organizes and evaluates trainings and provides career development assistance to staffs					
7	Your organization's structure is ideal for cloud computing adoption.					
8	In your organization, there is a lack of organizational readiness for cloud service adoption					
	People Construct measures					
1	Advantages of cloud computing awareness exists among senior level managers in your organizations					
2	Your organization has an acceptable level of ICT training and education support and there are some programs in place to train the users/employees for cloud computing					

No.		Strongly Agree	Agree	Uncertai	Disagree	Strongly Disagree
3	Human resources (or personnel or training) department believe that training may strengthen the position of the organization in the society					
4	Your organizations' employees has technical and managerial skills on the use of technological innovation					
5	The cost using cloud service is more adequate than building home infrastructure					
6	Your employees willingly join trainings					
7	Employees can devote a few minutes (15, 30 or 60 minutes) to self-improvement during any part of the day (morning, afternoon, evening, or night)					
8	Cloud computing is accepted as a significant organizational service advancement technology by your entire staff					
	Environment Construct measures					
1	Moving government services onto the cloud is the right decision and cloud service providers are trust worthy					
2	The existing Telecommunication infrastructure is reliable and efficient					
3	Government organizations can provide quality of service using cloud technology to the society					
4	Inconsistency of electric power supply has a substantial disturbance on the use and adoption of Cloud Computing in your organization					
5	Lack of sufficient migration support from Cloud Vendor will be an issues after cloud migration					
6	There are plenty external vendors or specialists available to assist you with cloud computing migration, such as content experts, project managers, cloud service consultants, datacenter designers, and computer programmers					
7	Lack of QoS or SLA monitoring solutions in your organization will be an issue after migration to cloud					
8	Difficulty in determining Cloud Vendor's long-term viability or sustainability is/will be the main issue on cloud migration processes					

7.2 APPENDIX 2 (Questionnaire 2)

Note: This questionnaire is designed to assess the perceptions of ICT staff on cloud computing, and it has the same front paper as like the one designed for executives.

Section: One

Please mark the proper response on the scale ranging from strongly agree to strongly disagree by placing a tick (√) in the appropriate space.

Hint: Likert scale numbers range from 1-5 denote as follow:

1= strongly agree 2= agree 3=uncertain 4= disagree 5= strongly disagree

No.		Strongly	Agree	Uncertai	Disagree	Strongly
	Strategy Construct Measures					
1	Your organization has a clear articulated mission, vision, direction, commitment and plan towards Cloud Computing development and utilization					
2	Your organization have a proper plan for implementation of cloud computing					
3	Your organization's cloud computing adoption strategy communicated to the whole ICT team					
4	The organization's ICT staff and other stakeholders involved in the planning of new ICT projects					
5	Your organization measured the business value of cloud computing and evaluate the cost and benefit of it					
6	Because of the management strategies in place, your company will face cloud management issues in the future					
7	Your organization is ready for cloud computing adoption					
8	Your organization's current service delivery is adequate, and moving to the cloud is an unnecessary cost					
	Technology Construct measures					
1	Your organization quality of internet connection is suitable for Cloud computing					
2	Your organization has security measures in place that are robust enough to resist current security threats					

No.		Strongly	Agree	Uncertai	Disagree	Strongly
3	Cloud computing had an important role in the transformation of the current ICT Environment					
4	Migration of applications and services will be difficult if ICT services are deployed in the cloud					
5	Existing IT Infrastructure/Resources is incompatible for Cloud Computing					
6	Using cloud services will increase dependence on a third party provider					
7	Loss of control over IT resources will be a risk after migration to the Cloud					
8	Reengineering legacy apps for cloud migration takes a lot of time and effort					
	Organization Construct measures					
1	High and mid-level managers think positively accept the technological intervention in daily/routine tasks					
2	Your organization have a clear standard service level agreement with the legal vendors					
3	Your organization policies are in place to encourage and manage cloud computing use					
4	Employees in your organization willingly use technology in routine/daily task					
5	High and mid-level managers believe that self-development of employees may strengthen the position of the organization to a better level					
6	Your organization has an experienced human resources, personal, or training department that organizes and evaluates trainings and provides career development assistance to staffs					
7	Your organization's structure is ideal for cloud computing adoption					

No.		Strongly	Agree	Uncertai	Disagree	Strongly
8	There is a lack of organizational readiness for cloud service adoption in your organization					
	People Construct measures					
1	Advantages of cloud computing awareness exists among senior level managers in your organizations					
2	Your organization has an acceptable level of ICT training and education support and there are some programs in place to train the users/employees for cloud computing					
3	Previous trainings in your organization were reasonable and beneficial to your self-development					
4	Your organization's executives have technical and managerial expertise in the use of technology innovation					
5	The cost of using a cloud service is less than the cost of developing your own infrastructure					
6	High and mid-level manager motivate their employees to work on their personal development					
7	Cloud computing is accepted as a significant organizational service advancement technology by your entire staff					
8	ICT staff's skill and synergy is sufficient for cloud computing adoption to succeed					
	Environment Construct measures					
1	Moving government services onto the cloud is the right decision and cloud service providers are trust worthy					
2	The existing Telecommunication infrastructure is reliable and efficient					
3	Government organizations can provide quality of service using cloud technology to the society					

No.		Strongly	Agree	Uncertai	Disagree	Strongly
4	Inconsistency of electric power supply has a substantial disturbance on the use and adoption of Cloud Computing in your organization					
5	Lack of sufficient migration support from Cloud Vendor will be an issues after cloud migration					
6	There are plenty external vendors or specialists available to assist you with cloud computing migration, such as content experts, project managers, cloud service consultants, datacenter designers, and computer programmers					
7	Lack of QoS or SLA monitoring solutions in your organization will be an issue after migration to cloud					
8	Difficulty in determining Cloud Vendor's long-term viability or sustainability is/will be the main issue on cloud migration processes					

7.3 APPENDIX 3 (Interview Questions)

Section 1: General question

- What is the Position/title in your organization?
- How many employees does your organization have?
- What is your role in your organization's ICT decision?
- How long have you been working for your organization?

Section 2: Questions from the context of Technology

1. Is your organization already using cloud computing? IF yes, what cloud computing services do you use right now? IF no, what type of cloud service does your organization planning to use?
2. If your Organization is planning to migrate to Cloud Computing, which of the service model will it give push to in the first instance?

3. If your Organization has plans to migrate to Cloud Computing, what would be the main concern into the existing Organization Architecture?
4. In your organization, which of the services is most likely to get migrated to cloud computing?
5. What would be your concerns, with regard to security issues when migrating to the cloud?

Section 3: Questions from the context of Strategy

6. What is government's direction towards cloud-computing adoption in government services?
7. Does your organizations ICT strategic plan include a migration to Cloud Computing?
8. Did you know that the governments' plan to build a cloud datacenter at ICT park?
9. What steps have been taking around to communicate the strategies or the plans of MInT government cloud datacenter initiative with your organization?

Section 4: Questions from the context of organization

10. What kind of skills or competencies are you expecting from your employees in the cloud-computing environment?
11. Does your organization have employees with cloud computing experience?
12. Do you think necessary training is required for the current employees when cloud computing is being introduced? If yes, did you have a plan to prepare cloud related training programs for employees?
13. How would you describe management motivation, preparation and administration of your cloud environment?
14. Do you have business continuity and disaster recovery (BCDR) plans in place for cloud environment?
15. Have your organization measured the business value of cloud computing? And, evaluated the costs and benefits of it?
16. Is there any legislations and laws relating to cloud computing?

Section 5: Questions from the context of People

17. Do you believe that within the coming few year your organization adopt cloud computing?

18. Do you trust cloud services, or are you confident in moving government services onto the cloud?
19. Do you believe that Cloud computing had an important role in the transformation of the current ICT Environment?

Section 6: Questions from the context of environment

20. How will you identify the right cloud computing service provider for your organization?
21. What would be your areas of concern when choosing a cloud-service provider?
22. What are the indicators that make a cloud service provider reliable and trustworthy?
23. Do you have any standard SLA with any service provider right know?
24. What would be your main concerns when signing a Service-Level Agreement?

Section 7: End of the Interview

- Do you have anything else you would like to say?