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Cloud Computing Readiness of Some Selected Organizations in Ethiopia: Towards A Strategic Guideline

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By

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Name and signature of Members of the Examining Board

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_____	Examiner	_____	_____

Declaration

I declare that the thesis is my original work and has not been presented for a degree in any other university.

_____

Date

This thesis has been submitted for examination with my approval as university advisor.

_____

Advisor

Acknowledgment

First of all I would like to thank GOD for giving me the very best things in life & supporting me to accomplish my study .I wish to express my great appreciation and heartfelt gratitude to my wife, Hermela, for her encouragement and assistance throughout my study journey. With much gratitude, I thank Doctor Tibebe beshah, my advisor, for his insightful advice, guidance and dedicated encouragement.

List of Acronyms

AAU - Addis Ababa University

ADSL - Asymmetric digital subscriber line

APIs - Application Programming Interfaces

AWS - Amazon Web Services

CEO - Chief Executive Officer

CPU - Central Processing Unit

CRM - Customer Relationship Management

CSP - Cloud Service Provider

EC2 - Amazon Elastic Compute Cloud

EHEIs - Ethiopian Higher Education Institutions

EthERNet - Ethiopian Education and Research Network

HE - Higher Education

HEI - Higher Education Institution

HEIs - Higher Education Institutions

IaaS - Infrastructure as a Service

IBM - International Business Machines

ICT - Information Communication Technology

IS - Information Systems

IT - Information Technology

MOE - Ministry of Education

NIST - National Institute of Standards and Technology

PaaS - Platform as a Service

QoS - Quality of Service

ROI - Return on Investments

SaaS - Software as a Service

SchoolNet - School Network

SLA - Service Level Agreement

SLAs - Service Level Agreements

SOA - Service Oriented Architecture

TOE - Technology Organization Environment

VMs - Virtual Machines

WoredaNet - Woreda Network

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ABSTRACT

Cloud computing is a new way of delivering computing resources and services. It promises better delivery of IT services as well as availability whenever and wherever needed at reduced costs with users paying only as much as they consume through the services of cloud service providers. The cloud technology reduces complexity while increasing speed and quality of IT services provided. Nowadays, organizations understand that Cloud computing can present them significant benefits, but many are struggling with what the options are, the benefits and risks of those options and when and how they should initiate their journey to embrace cloud computing.

Organizations believe that cloud computing can improve their performance. However, as with any innovation & adoption, cloud computing should be strictly assessed before its widespread adoption. This paper discusses the factors and challenges of cloud computing adoption. Additionally, the paper discussed the various service and deployment models of cloud computing and present important factors necessary for successful cloud computing adoption.

This paper investigates the readiness of 7 selected Organizations from four different sectors located in Ethiopia. The study used the Technology Organization Environment (TOE) framework. This research collected data from interviews .The data was analyzed using qualitative data analysis methods. It produces a Strategic guideline that could be used by Ethiopian organizations for the successful adoption of cloud computing. The researcher also validated the Guideline by different Experts in the works at managerial and Technical level. Organizations can use the strategic guideline to determine the direction, strategy, and resource allocation when they decided to migrate from traditional to cloud-based environment. If they follow the guidelines proposed by the study, their cloud computing readiness level will be improved and they will benefit from a successful cloud computing implementation.

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Keywords: Cloud computing, cloud computing adoption, Organizational readiness, cloud computing strategic guideline

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CHAPTER ONE

1. INTRODUCTION

1.1. Background

Cloud computing covers a broad range of technologies and approaches to deliver Information Technology services and represents a major shift away from the traditional on premise model where organization own and operate all IT resources [6,8]. Cloud computing is emerging as a major disruptive force for both IT vendors and users. The popularity of cloud computing is increasing by the day, it is not just a promise or something only discussed at seminars and conferences anymore. It is the reality to fast, automated, and inexpensive management of IT resources that have combined to make information technology a compelling paradigm for greater efficiency and enhanced productivity [8, 38]. Cloud computing uses the Internet as its backbone to provide flexible, on-demand and dynamically scalable computing infrastructure for many applications using any of its four deployment models: private, public, community, or hybrid cloud and its three-service delivery models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS)[23].

Organizations require continuous and systematic innovation in order to remain cost effective, efficient, and timely, and to provide high-quality services [24, 32]. Many managers and IT experts predict that cloud computing can improve organizational performances & change the face of information technology (IT).Despite the many benefits associated with cloud computing applications for organizations, there are also several management, technology, security, and legal issues to be addressed [27,41,48].

Cloud computing readiness of an Organization can be defined as "the ability of the Organization to successfully adopt, use, and benefit from Cloud computing through efficient use of accessible resources" [48]. In order to ensure a successful achievement of Cloud computing and properly manage changes that occur as a result of Cloud computing, organizations need to prepare themselves and be ready before implementation. Once an organization decides to implement Cloud computing, the organization should determine their level of readiness for Cloud computing to determine their suitability for a successful adoption.

When the readiness level is known and the organization Cloud computing readiness is good enough, only then can the organization decide to adopt Cloud computing. The adoption requires

that organizations have readiness on multiple dimensions including Governance, Process Analysis and Improvement, Application Rationalization and Modernization, and Hardware and Software Standardization [17, 48] .

Most Organizations are in the process of trying to understand the opportunities and challenges that cloud computing represents, cloud computing is becoming a strategic priority for most executives[22] . According to the CIO Magazine 2011 Cloud Computing survey, 38% of business executives make cloud computing a high or critical priority and 18% have budget allocation for cloud computing services [22, 41] .

The economic argument between in-house IT and cloud computing has already been settled in favor of the cloud [14], which can provide more capabilities and access to greater IT expertise for organizations. Larger organizations should approach cloud computing in stages. If the company owns highly underutilized assets, there is less impulse to move to the cloud as long as those assets can be utilized over time without significant additions to IT staff. Even in this case, however, cloud computing principles used in-house to virtualize IT and deliver the technology as services, creating an internal cloud, will be more cost-effective than the traditional IT model of delivering services.

Cloud has produced a change in the value chain, which permits the organization to respond with more service effectiveness to the corporate clients [20]. It allows organizations to respond more effectively to customer demands for information availability. Likewise, cloud has potential to enhance collaboration, agility, scaling, and availability, and provides the opportunities for cost reduction through optimized and efficient computing .Cloud computing can help the organization to reduce operational cost.

A coordinated approach between business and IT managers is needed to identify opportunities to benefit from cloud-based services [3]. Timing such as planned system replacements or emerging business requirements, Impacts on capital and operational expenditure, The government's strategic direction on cloud computing, The complexity of integrating cloud-based services with existing processes and technology and The risks associated with storing and processing information in the cloud, e.g. Security and service provision lock-in.

Both the benefits and drawbacks of cloud computing need to be evaluated in the context of a particular organization taking into account specifics of the cloud computing model under consideration, current business requirements as well as long-term strategic business objectives should also be evaluated.

1.2. Statement of the Problem

In Ethiopia different national capacity building programs are initiated. The major ones are EthERNet, schoolNet and WoredaNet that aims to build and deliver highly interconnected and high performance networks for Universities, schools and local governments. The establishment of those initiatives has provided services like datacenter, video conference, e-library and technical support. The way for delivering services based on cloud computing for a better service delivery strategy and strategic utilization of resources has been recognized. And also, the importance of cloud computing towards bringing Flexibility, Scalability, Cost Effectiveness and Efficiencies in the private and public services have been well acknowledged by the country. However, like many other developing countries in the world, the potential of cloud computing is highly unexploited. Ethiopia ranks 130th in the Network Readiness index 2014 [4], Ethiopia has one of the lowest (worst) availability of Network. Ethiopia is still working in the preliminary stages of the expeditions of cloud computing. Therefore, there are many more factors that need to be addressed for the rapid and smooth implementation of cloud computing.

In recent years a few works have been done on the benefits and adoption strategies of collaborative cloud computing Architectural framework for higher education institutions by Selamawit & Sewale [35,36], for the banking industry Alemayehu [2], and for medical image archiving & sharing by Bizuayehu [5]. Despite these works, A Cloud Computing Readiness of Ethiopian organizations & Cloud Computing model Preference has not been investigated. Cloud Readiness Assessment Framework and Recommendation System was proposed by Fasil & Fekade in 2014, the frame work doesn't consider some basic factors which should be considered before the adoption of cloud computing like the selection of the cloud service provider, the SLA, Integration of the Existing system with the cloud. It is also a framework not a strategic guideline, it doesn't include management and planning issues.

To make sound decisions, organizations need to clearly understand the current situation at national level. Challenges and gaps need to be clearly identified and addressed. This would best be done by starting with a detailed assessment. Adoption of cloud computing depends on major factors like overall cost, quality of service and business agility, performance of cloud service provider, and economic considerations. The adoption of cloud computing is not uniform across organizations even within the same industry [14]. So, one solution might not fit for all: therefore additional study must be performed by forming a clear set of patterns of organizations or depending on the nature of the organizations.

The readiness of Ethiopian organizations for Cloud computing should be strictly evaluated before its widespread adoption. This paper investigates Strategic planning issues that could be used by organizations to determine the direction, strategy, and resource allocation when they decide to migrate from traditional to cloud-based services. In view of this, this paper attempts to answer the following research questions:

Research Question 1: Are the selected Ethiopian Organizations ready to adopt or deploy Cloud computing platform?

Research Question 2: what are the strategic issues Ethiopian Organizations should consider before adopting cloud computing?

1.3. Objective of the study

1.3.1. General Objective

The General objective of this research is to investigate the readiness of the selected Ethiopian organizations for the adoption of Cloud Computing and propose A Strategic Guideline for adopting cloud computing.

1.3.2 Specific Objectives

In order to achieve the general objective the following specific objectives are drawn:

- To conduct critical literature review on the concept of cloud computing and its benefits.
- To assess existing organizational readiness for adopting cloud computing.

- To identify strategic issues that affects the adoption of cloud computing in the organization.
- To investigate various cloud computing models in light of Ethiopian organizations.
- To propose and evaluate the strategic Guideline for the adoption of cloud computing.
- To report the result and make appropriate recommendations for future research.

1.4. Significance of the study

The benefits that will attain from this study are: organizations from both public & private sectors can have an insight view on this new emerging technology & select their services to move to the cloud. The strategic guideline will be available for the organization adoption so misuse of appropriate model will be eliminated and organizations will have a guideline which can help them to decide when & how to migrate from the traditional approach to the cloud based approach.

1.5. Scope and limitation of the study

As defining the scope of the study it focuses on only seven organizations from both private & public sectors. The manufacturing, Entertainment, broadcasting, & construction industries are not included in the study. Additionally, this study focuses on exploring the readiness of organizations & implements a strategic guideline to guide the adoption of cloud computing. It doesn't aim to produce a model.

1.6. Organization of the Thesis

The thesis is organized in five chapters; the first chapter, the introductory part gives highlight about the paper. The remaining chapters of this Thesis are organized as follows: Chapter 2 focuses on the literature review of the cloud computing. It discusses the application of cloud computing, Characteristics of cloud computing , Cloud Computing Deployment Models, Cloud computing service/delivery Models ,Factors Affecting the Adoption of Cloud Computing Technology Organization Environment Framework (TOE) ,Challenges of Cloud computing and finally Related works. Chapter 3 discusses the methodology that is used, it describes the data collection method, sampling size & the population size and also the data interpretation & validation. Chapter 4 discusses the survey results and provides the analysis of the results and its findings then it proposes a strategy for adopting cloud computing, Chapter 5 summaries the research, provides conclusions and discusses further areas of research and recommendations.

CHAPTER TWO
2. LITERATURE REVIEW

2.1 Cloud Computing

Cloud computing refers to an on-demand, self-service Internet infrastructure that enables the user to access computing resources anytime from anywhere [1, 8, 21]. It is a new model of delivering computing resources, not a new technology. It delivers computing resources over the Internet. Instead of keeping data on in house hard drive or updating applications, it is provided as a service over the Internet, at another location, to store the information or use its applications.

The following definition of cloud computing has been developed by the U.S. National Institute of Standards and Technology (NIST):

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models." [23]

The advent of cloud computing in recent years has sparked interest from different business organizations and institutions. Because of its benefits of its new economic model for the IT departments of business organization, cloud computing brings about a shift in the way organization invest in Information Technology [6, 20]. The new economic model removes the need for the organization to invest a large amount of money to procure limited IT resources that are internally managed, but rather the organization can outsource its IT resource requirements to a cloud computing service provider and pay per use.

Cloud computing is a developing paradigm, and its definition, attributes, and characteristics will evolve over time [47, 51]. Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically re-configured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized Service-Level Agreements [40].

2.2 Cloud Environment Roles

In cloud environments, individual roles can be well-known the same the roles in Service Oriented Architectures and in business oriented Organizations[40]. As the roles relate strongly to the individual business models it is very important to have a clear definition of the types of roles involved in order to ensure common understanding.

Cloud Providers: The provider supplies the cloud service and owns the assets required to produce and offer cloud services to the consumer. In the private cloud, internal providers deliver services to internal consumers [24]. In a public cloud, the provider is an external third party, and provides services to multiple consumers. Providers can also be part of a hybrid service delivery model, in which they supply both public and private cloud services, from different service types.

Cloud Aggregators: aggregate cloud platforms from cloud providers to either provide a larger resource infrastructure to their customers or to provide enhanced features [18, 39] This relates to community clouds in so far as the cloud aggregators may expose a single interface to a merged cloud infrastructure. They will match the economic benefits of global cloud infrastructures with the understanding of local customer needs by providing highly customized, enhanced offerings to local companies.

Cloud Adopters or Software Vendors: enhance their own services and capabilities by exploiting cloud platforms from cloud providers or cloud Aggregators [19, 39]. This enables them to provide services that scale to dynamic needs.

Cloud Consumers or Users: make direct use of the cloud facility. As opposed to cloud Aggregators and cloud adopters, however, not to improve the services and capabilities they offer, but to make use of the direct results. The future market developments will most likely enable the user to become provider and consumer at the same time, thus following the "Prosumer" concept, as already introduced by the Service Oriented Architecture concepts [40].

2.3 Characteristics of cloud computing

In this section the potential of cloud computing like non-functional, economic and technological capabilities in any cloud model will be discussed.

Non-functional features represent qualities or properties of a system, rather than specific technological requirements. Implicitly, they can be realized in multiple fashions and interpreted in different ways which typically leads to strong compatibility and interoperability issues between individual providers as they pursue their own approaches to realize their respective requirements, which strongly differ between providers [19 ,30]. Non-functional aspects are one of the key reasons why "clouds" differ so strongly in their nature.

Economic considerations are one of the key reasons to introduce cloud systems in a business environment. The particular interest typically lies in the reduction of cost and effort through outsourcing or automation of essential resource management [1, 19]. As has been noted in the first section, relevant aspects thereby to consider relate to the cut-off between loss of control and reduction of effort. With respect to hosting private clouds, the gain through cost reduction has to be carefully balanced with the increased effort to build and run such a system. Obviously, technological challenges implicitly arise from the non-functional and economical aspects, when trying to realize them. As opposed to these aspects, technological challenges typically imply a specific realization [13, 32]. Even though there may be no standard approach as yet and abnormalities may therefore arise.

In addition to these implicit challenges, one can identify additional technological aspects to be addressed by cloud system, partially as a pre-condition to realize some of the high level features, but partially as they directly relate to specific characteristics of cloud systems.

2.3.1 Non - Functional Features

2.3.1.1 Elasticity

Elasticity is an essential core feature of cloud systems and circumscribes the capability of the underlying infrastructure to adapt to changing [2,8,52].For example amount and size of data supported by an application, number of concurrent users etc. One can distinguish between horizontal and vertical scalability, whereby horizontal scalability refers to the amount of

instances to satisfy e.g. changing amount of requests, and vertical scalability refers to the size of the instances themselves and thus implicit to the amount of resources required to maintain the size. Cloud scalability involves both (rapid) up- and down-scaling [8]. Elasticity goes one step further, tough, and does also allow the dynamic integration and extraction of physical resources to the infrastructure. Whilst from the application perspective, this is identical to scaling, from the middleware management perspective this poses additional requirements, in particular regarding reliability. In general, it is assumed that changes in the resource infrastructure are announced first to the middleware manager, but with large scale systems it is vital that such changes can be maintained automatically [43].

2.3.1.2 Reliability

Reliability is essential for all cloud systems ,in order to support today's data center-type applications in a cloud, reliability is considered one of the main features to exploit cloud capabilities [43]. Reliability denotes the capability to ensure constant operation of the system without disruption [5, 6, 19], i.e. no loss of data, no code reset during execution etc. Reliability is typically achieved through redundant resource utilisation. Interestingly, many of the reliability aspects move from hardware to a software-based solution.

2.3.1.3 Quality of Service

Quality of Service support is a relevant capability that is essential in many use cases where specific requirements have to be met by the outsourced services and / or resources [40,51]. In business cases, basic QoS metrics like response time, throughput etc. must be guaranteed at least, so as to ensure that the quality guarantees of the cloud user are met. Reliability is a particular QoS aspect which forms a specific quality requirement.

2.3.1.4 Agility

Agility and adaptability are essential features of cloud systems that strongly relate to the elastic capabilities. It includes on-time reaction to changes in the amount of requests and size of resources, but also adaptation to changes in the environmental conditions [10, 21, 25, 26] that e.g. require different types of resources, different quality or different routes, etc. Implicitly, agility and adaptability require resources (or at least their management) to be autonomic and have to enable them to provide self-capabilities.

2.3.1.5 Accessibility & Scalability

The cloud promises universal access to high powered computing and storage resources for anyone with a network access device [41, 47, 51]. Organizations could have access anytime, anywhere.

The cloud is an always-on computing resource that enables users to tailor consumption to their specific needs. Infinitely scalable, cloud computing allows IT infrastructures to be expanded efficiently and expediently without the necessity of making major capital investments [40, 43]. Capacity can be added as resources are needed and completed in a very short period of time. Thus, organizations can avoid the latency, expense, and risk of purchasing hardware and software that takes up datacenter space and can reduce the traditional time required to scale up an application in support of the mission. Cloud computing allows organizations to easily move in the other direction as well, removing capacity, and thus expenses, as needed.

2.3.1.6 Resource Provisioning & Collaboration

One of the key benefits of the Cloud is the quick provisioning of resources [2, 23, 48]. Applications that need to be quickly available and scaled up rapidly based on demand are ideal candidates for the Cloud for instance an organization running on online marketing campaign may need the resource for a specific period of time. Several applications are seasonal in nature for example HR and Payroll applications, which need resources to be processed only during certain periods. These sorts of applications can make use of the ability of the Cloud to quickly provision resources.

The cloud presents an environment where users can develop software-based services that enhances collaboration and fosters greater information sharing [34, 35, 51], not only within the organization, but also among other public and private entities.

2.3.1.7 Customization

Cloud computing offers a platform of tremendous potential for creating and amending applications to address a diversity of tasks and challenges. Its inherent agility means that specific processes can be easily altered to meet shifting organization needs [21,25], since those

processes are typically changeable by making a configuration change, and not by driving redevelopment from the back-end systems.

2.3.1.8 Availability

Availability of services and data is an essential capability of cloud systems and was actually one of the core aspects to give rise to clouds in the first instance [8,9,43]. It lies in the ability to introduce redundancy for services and data so failures can be masked transparently. Fault tolerance also requires the ability to introduce new redundancy (e.g. previously failed or fresh nodes) in an online manner non-intrusively (without a significant performance penalty). With increasing concurrent access, availability is particularly achieved through replication of data / services and distributing them across different resources to achieve load-balancing [9]. This can be regarded as the original essence of scalability in cloud systems.

2.3.2 Economic Features

2.3.2.1 Cost effectiveness

Cost effectiveness is one of the first concerns to build up a cloud system that can adapt to changing consumer behaviour [9, 14, 38, 43] and reduce cost for infrastructure maintenance and acquisition. Scalability and Pay per Use are essential aspects of this issue.

The capability to build up cost according to the actual consumption of resources is a relevant feature of cloud systems. Pay per use strongly relates to quality of service support, where specific requirements to be met by the system and hence to be paid for can be specified [23, 43]. One of the key economic drivers for the current level of interest in cloud computing is the structural change in this domain. By moving from the usual capital upfront investment model to an operational expense, cloud computing promises to enable especially SME's and entrepreneurs to accelerate the development and adoption of innovative solutions.

Improved time to market is essential in particular for small to medium organizations [1,11]that want to sell their services quickly and easily with little delays caused by acquiring and setting up the infrastructure, in particular in a scope compatible and competitive with larger industries. Larger organizations need to be able to publish new capabilities with little overhead

to remain competitive. Clouds can support this by providing infrastructures, potentially dedicated to specific use cases that take over essential capabilities to support easy provisioning and thus reduce time to market.

2.3.2.2 Return of investment (ROI)

Return of investment (ROI) is essential for all investors and cannot always be guaranteed [43, 45, 48]. In fact some cloud systems currently fail this aspect. Employing a cloud system must ensure that the cost and effort vested into it is outweighed by its benefits to be commercially viable – this may entail more customers and benefits from advertisements. Outsourcing resources versus increasing the local infrastructure and employing (private) cloud technologies need therefore to be outweighed and critical cut-off points identified.

2.3.3 Technological Features

2.3.3.1 Virtualisation

Virtualisation is an essential technological characteristic of clouds which hides the technological complexity from the user and enables enhanced flexibility [8] (through aggregation, routing and translation) .

More concretely, virtualisation supports the following features: Ease of use: through hiding the complexity of the infrastructure (including management, configuration etc.) virtualisation can make it easier for the user to develop new applications [7,9,2], as well as reduces the overhead for controlling the system.

Virtualisation allows for higher interoperability by making the code platform independent. by exposing a virtual execution environment, the underlying infrastructure can change more flexible according to different conditions and requirements. The services can be accessed independent of the physical location of the user and the resource.

2.4 Cloud Computing Deployment Models

To deploy cloud computing, the US National Institute of Standards and Technology (NIST) listed 4 models.

2.4.1 Public cloud

A cloud service provider makes resources (applications and storage) available to the general public over the Internet on a pay-as-you-go basis. In a public cloud infrastructure, the servers and other resources are owned by a third party service provider who makes the resources available to the general public.[8,10,13,28] The cloud user has no control over where the infrastructure is located as the infrastructure is located on the service provider's premises. The server and all other resources are shared among the organizations and they are billed per usage. An example of public cloud is Amazon Elastic Compute Cloud (Amazon EC2).

2.4.2. Private cloud

A cloud infrastructure is operated solely for a single organization. In other words, the proprietary network or the data center supplies hosted services to a certain group of people [8,10,13,42] This type of Cloud Computing requires organizations to have their own servers which may be managed by the organization or an appointed third party. The servers may exist on the organizations premises or on the third parties premises but they are dedicated to a particular organization.

2.4.3 Community cloud

The cloud infrastructure is shared by several organizations with common concerns [5, 35] (e.g., mission, security requirements, policy, and compliance considerations). The cloud infrastructure is shared among several organizations within a community with certain communal goals. The infrastructures may be managed by the organizations or a third party.

24.4 Hybrid cloud

In hybrid cloud, the infrastructure is made up of a combination of 2 or more clouds (private, public, or community) [27, 36]. In this infrastructure, an organization provides and manages some resources within its own data center and has others provided externally. This type of cloud

infrastructure is very efficient in a situation where an organization has data which is separated into sensitive and non-sensitive data. The sensitive data could be stored on the private cloud for better control by the organization while the non-sensitive data could be stored on the public cloud [3].

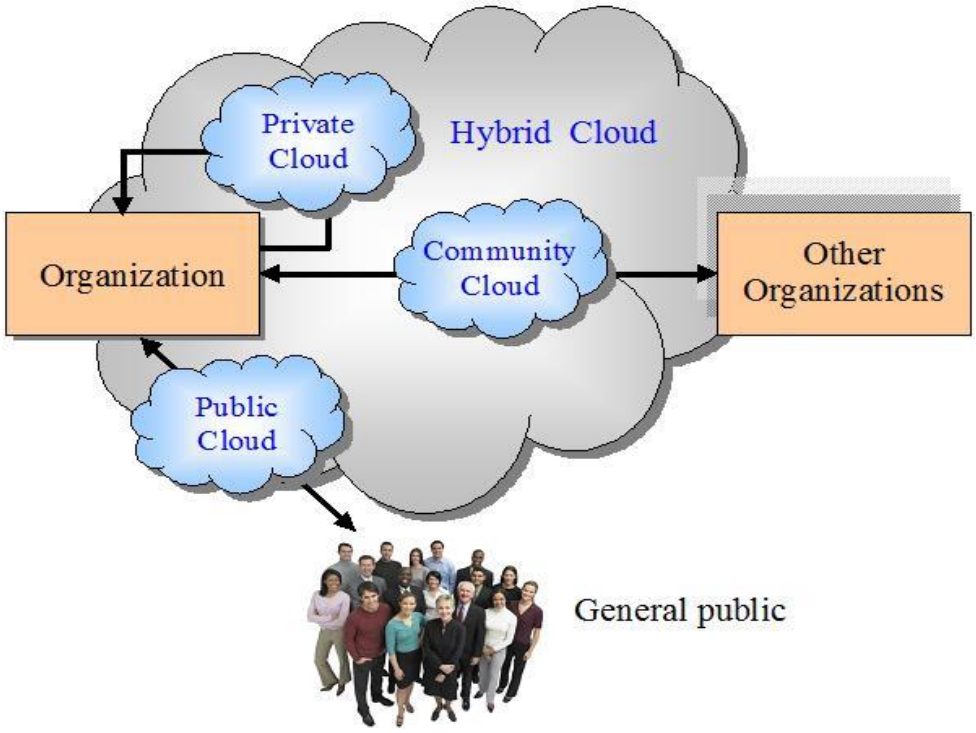

Figure 1 Cloud Computing Deployment Models [16].

2.5 Cloud computing service delivery Models

From a service point of view, cloud computing includes 3 standard models: software, platform, and infrastructure.

2.5.1 The SaaS

The applications are hosted by a cloud service provider and made available to customers over a network, typically the Internet [2, 8, 17, 27, 39]. It represents the top layer of the cloud. It offers its services in a software model of web-based applications and serves a large number of users. All that is required from the user of the application is a connection to the Internet. With SaaS, the user does not need to install or run any applications on their devices or worry about maintenance, upgrades, and support. Applications such as e-learning systems, admission process, research, digital library, email, financial processes, and other administrative processes can be hosted on the

SaaS layer for easy access [32, 35, 36, 37]. This can be on the public as well as a private cloud, the most sensitive applications such as the admission process, account and financial services, and any other services considered critical and requires very high confidentiality should be hosted on a private cloud [42, 49]. The SaaS services on the public cloud can be provided by cloud vendors such as Salesforce.com, Google, and SkyDrive.

2.5.2 The PaaS

The PaaS layer is the middle layer between the SaaS and IaaS [23, 48]. It is an environment for web developers to create, store, and host their applications over the Internet [51]. The development tools are hosted in the cloud and accessed through a browser. With PaaS, developers can build Web applications without installing any tools on their computer, and then deploy those applications without any specialized administrative skills. The services on this layer eliminate the need to create and manage instances of virtual machines. The PaaS layer facilitates the development and deployment of applications without the developers worrying about the cost and complexity of buying, managing, or configuring the underlying layers needed for developing applications because the development tools are already hosted in the cloud and provided by the cloud vendor [3, 23]. This layer provides access to different platforms and programming languages, thereby making it possible for developers and programmers to easily do their work by simply connecting to the cloud. This layer can be hosted on a public cloud using Force.com, Microsoft Azure, Google App Engine, and so on.

2.5.3 The IaaS

The IaaS also referred to everything as a service layer provides basic computing resources including servers, storage, hardware, and networking equipment [3, 23, 47, 48]. This layer delivers computing IaaS in a virtualized environment [13, 18]. The cloud user outsources the equipment used to support operations, including storage, hardware, servers, and networking components. The provider owns the equipment and is responsible for housing, running, and maintaining them. The user typically pays on a per-use basis. It could also include the operating system, bandwidth, and virtualization technology needed to manage the resources. It all depends on need and negotiation with the cloud service provider. IaaS offers everything as a service; it helps to address the problem of limited learning resources and the e-learning scalability. One of the key players in the IaaS layer is Amazon E2C (Amazon Elastic Compute Cloud), it reduces the time needed to get and boot up new servers to minutes, it allows quick scaling capacity back

and forth as demands change and provides a computing environment and resources that quickly and cost-effectively process large amounts of research data.

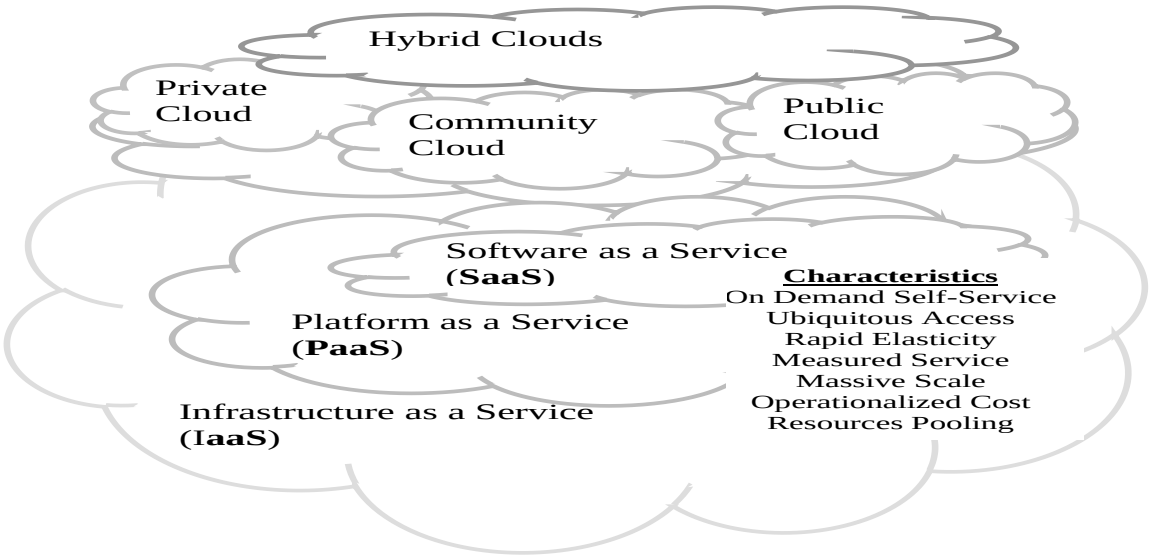

Figure 2: Cloud computing service & deployment models [23]

2.6 Cloud Readiness of Organizations

In an internal cloud, where resources are virtualized, each organization purchases the capacity it needs, when it needs it. An entire organization can be served with fewer resources at lower cost because of the cloud's ability to scale. There is little need for excess capacity, because the organizations rarely need ultimate capacity at the same time, and usually can be planned for and provided on an as-needed basis.

Private clouds will represent an interim phase in enterprise IT migration to hybrid and public cloud services [13, 23, 24]. Traditional IT vendors will struggle to compete with cloud-computing providers in the areas of cost, flexibility, and scalability unless they virtualize their own operations [12]. In addition to the near-term financial benefits realized by deploying a Private cloud, the process also assures cloud readiness. Issues with data privacy and security remain as short-term challenges, but in reality it is no more likely that a hacker will invade a cloud than the in-house data center. However, these concerns will continue for a while, and they are probably the reason some organizations will go for Private clouds first.

All organizations should stay informed about the evolution of cloud computing, and reevaluate the potential benefits of cloud against their current IT services delivery and consumption model.

2.7 Factors Affecting the Adoption of Cloud Computing

There are various factors need to think about and analyze before migrating an IT system to cloud. The main factors related to business, technology and implementation which should be consider while evaluating the suitability of an application and infrastructure for Cloud migration [9,19,24]. Migration of the systems and the applications to the cloud has its own difficulties for organizations. The challenges include IT policy formulation, organizational politics and culture [19, 32].

It also includes identifying the system dependencies and how the migration to cloud will affect these dependencies and the work processes in place. The other problems involved with migrating systems and applications to the cloud are security, compliance, and SLAs management [19,28, 32] .The other major concern behind adoption of cloud computing services was found to be related to maintaining confidentiality of corporate data. Cloud computing involves the storage and sharing of information of different organization entities at remote servers owned or operated by others and accessed through internet . A properly planned user access control is needed for securing the data and information stored on the cloud [21, 30]. Providing training to organizational employees on security best practices is also desirable. The second major concern behind adoption of cloud computing services is related to data security and privacy [27].

2.7.1 Security

Security is obviously essential in all systems dealing with potentially sensitive data [13, 52]. Security involves confidentiality, privacy, integrity and availability which aid the development of secure systems [52]. There is so much concern about security within Cloud computing environment . Literature has revealed that security is the biggest management issue with Cloud computing for the reason that applications and data being hosted by service providers are disposed to vulnerabilities from unauthorised parties [7, 30, 52].

Security measures should be taken to prevent unauthorised access to data, applications, software, and hardware. In Cloud computing , security is not guaranteed because business information and critical IT resources are outside the company firewall on the service provider’s

premises . This is a major concern for organizations before adopting Cloud computing .The application will need to provide security at the data storage, processing and transmission stages [7, 30, 52]. Three critical components namely a) Data in transit needs to be protected either at the application or the transmission level. b) Data at rest must be protected by the application. The application must provide a mechanism to protect the data stored in the cloud. Encrypting data at rest is the best option at this time. c) Servers to server communications are typically forgotten because they currently exist within the data Center.

Multi-tenancy is a highly essential issue in cloud systems, where the location of code and / or data is principally unknown and the same resource may be assigned to multiple users (potentially at the same time) [7]. This affects infrastructure resources as well as data / applications / services that are hosted on shared resources but need to be made available in multiple isolated instances. Classically, all information is maintained in separate databases or tables, yet in more complicated cases information may be concurrently altered, even though maintained for isolated tenants. Multi tenancy implies a lot of potential issues, ranging from data protection to legislator issues

2.7.2 Confidentiality and privacy

Confidentiality means that only an authorised person will have access to data. In Cloud computing , the chances that data will be accessed by an unauthorised person are increased as a result of many users using the same resources such as memory, networks, data, and programs . The fear that confidential and sensitive organizational data might be lost or exposed to third party as a result of the increased number of parties, devices and applications on the cloud is another reason why organizations are reluctant to adopt Cloud computing. Cloud computing uses a business model that shares resources such as memory, networks, data, and programs among different users. These could lead to breach of data confidentiality as current data retention strategies over the internet platform have been found to be inefficient.

Privacy means that control of disclosure of personal information lies with the information owner [52]. Privacy is a serious management issue with Cloud computing because data might be saved in numerous locations within a country or even in different countries which poses a bigger risk of confidentiality and privacy breach [7,10,13,52]. Another problem with this issue is that there are legal challenges towards privacy issues involved in data stored in the

cloud across different countries because each country have their own laws and jurisdiction regarding confidentiality and privacy.

There have been issues of unauthorized access to user accounts as a result of weak access control and application programming interface (API) infrastructures The issue of data loss and leakage is of major concern to organizations in implementing Cloud computing .

2.7.3 Integrity

Integrity means only an authorised person can make changes to data, software, and/or hardware[10,13] . The uncertainty about integrity is another problem that prevents organizations from adopting Cloud computing. Because of the increased number of users sharing the same resources on the cloud, it is important for service providers to maintain data integrity and accuracy to increase organizational confidence in Cloud computing . In a situation where an employee who is unhappy decides to delete or make unnecessary changes to data, it may be difficult to identify the perpetrator as fingers might be pointed to the service provider . Authentication can help resolve this issue as the user with such permissions can easily be identified [10, 38]. It is also very difficult for an organization to check the data handling practices of the cloud service provider and confirm that their data is being handled in a lawful way. Service providers need to make their data handling process transparent to the customer organizations to gain their trust.

2.7.4 Availability

Availability refers to the service, data, and infrastructure being accessible to authorised users immediately upon request [10,38,42]. Organizations need to be assured that there will be an uninterrupted access to service, data, and infrastructure without interruption even in the event of a security breach. Since there is no guarantee for continuous availability, many organizations are reluctant in moving their data into the cloud and do not make further effort to get themselves ready for Cloud computing adoption.

2.7.5 Data lock in

Organizations are unwilling to adopt Cloud computing because of concerns over data lock in due to lack of standards [41,45] . The fear of uncertainty such as the provider going out of

business, price increases, and reliability issues as a result of data lock in also prevent organizations from adopting Cloud computing.

2.7.6 Jurisdictional issues

It is often difficult to fix resources such as data Centers to a specific geographic location. Load balancing by the cloud provider, network availability, and data Center performance are some of the factors that determines where a data is stored. As a result, an organizational data may be stored in different locations with different legal jurisdictions and different laws about security issues such as data protection and intrusions [8,9]. This is an important issue for organizations to consider before adopting Cloud computing as the safety of their data is eminent for the continued success of the organization.

Geopolitical issues especially for Governments and financial institutions should be carefully evaluated before making the transition to the Cloud [6, 42, 49]. In the context of our country this is especially relevant as most Cloud data Centers are not located within the country .It is also important to ensure that local regulations relevant to each organization should be observed before deciding to move to the Cloud.

2.7.7 Lack of standardised service level agreement

Although SLAs exists, there are different SLAs in Cloud computing market because of the different definitions of Cloud computing resources which are often described through different non standardised resources such as execution time, inbound bandwidth, outbound bandwidth, CPU cores, and processor type [23]. The lack of standardised SLAs is an issue that hinders wide adoption of Cloud computing. There is a need for service providers and users to standardise SLAs that will guide their business relationship and help to ensure delivery of agreed resources. Organizations need to ensure that there is standardised SLA between the service provider and the organization to ensure delivery of agreed service.

The need for specific SLAs is another challenge. This is a challenge due to the fact that vendors may not always meet the requirements for SLA of an organization [14, 38, 40]. The potential for down-time and lack or inadequate SLA agreement from some cloud vendors might cause a great problem.

2.7.8 Customization

The sharing of resources by differing users prevents service provider from being able to customize their services to suit the different customer needs. Customisation affects Cloud computing readiness of organizations because most organizations are uncertain about Cloud computing customisability to meet their specific business needs [3,43], however share a different view as they believe that users can customise and personalize their computing environments like software installation, and network configuration[47]. Organizations will therefore need to find out more about the resources and services that can be customised to their business needs to ensure that Cloud computing will offer such customisation before implementing Cloud computing .

2.7.9 Lack of supporting resources

Migration to the clouds requires knowledge and experience from the organizations support [47,48]. The implementation of a new technology requires knowledge about its existence and its applicability [3]. Lack of prior knowledge and experience of Cloud computing by the IT staff can be very risky for the organization .Organizations need to ensure that they have the right skills and expertise require for Cloud computing because Cloud computing is a technical area that requires skilled resources for implementation[20, 24].

2.7.10 Service provider selection

Because of the different Cloud computing service providers, organizations find it difficult in choosing a service provider[3,47,48]. While choosing a service provider, organizations should consider factors such as the reputation and size of the service provider's organization in terms of staffs, market share, as well as their resources. The process of choosing a service provider is very important because if the organization chooses a wrong service provider, the cost of moving from one provider to another can be high due to incompatible programs[41] .

Organizations need to be aware of the different service providers and how their offerings fits with their requirements as this influences organizations decision on Cloud computing , which will in turn affect their level of readiness and ultimately the success of their Cloud computing adoption.

2.7.11 Internet Connection

The dependence of Cloud Computing on the internet is a serious management issue because if there is any problem with the internet, Cloud Computing will be affected. Cloud Computing depends on internet to function properly [11]. If there is no internet connection, it automatically means, Cloud Computing cannot function. Organizations need a broadband network to deliver next-generation cloud services [4, 11]. The enhancements and reliability of these requirements will support the increased adoption of business-grade and consumer-grade cloud computing.

Slow internet connections will also affect service delivery of Cloud Computing. In order to resolve this issue, organizations should endure they subscribe to a reliable internet service provider who will guarantee consistent, fast and reliable internet connection. Organizations can also have back up internet connections like wireless connections which they can automatically switch to when their main internet connection is down.

For instance, it is important for consumers to be able to download music and videos on the road as well as for business users to have continuous access to videoconferencing and mission-critical customer relationship management (CRM) and enterprise resource planning (ERP) systems [9, 32]. Download and upload speeds as well as latencies are vital measures to assess network capabilities of cloud readiness.

2.7.12 Change management

The implementation of Cloud Computing brings about a change in the way organizations carry out their daily activities. The process of change management is therefore a serious management issue because it will determine the success of the organizations Cloud Computing implementation [39, 50]. Proper change management practices should be put in place in order to overcome issues as a result of change. implementation issues are also important as the success of implementation will bring about the desired change through Cloud Computing .

2.7.13 Implementation issues

Organizations find it difficult to determine which of their data should be moved into the cloud and which should remain on the organizations traditional system [41, 43]. Organizations are also concerned about how to migrate their data into the cloud without any interference in their

businesses during migration [3, 48]. Organizations prefer to implement the hybrid model in order to have control over their important and sensitive data and infrastructure. The less sensitive data is then migrated to a public cloud. Management find it difficult to integrate their in-house infrastructure and service provider's infrastructure because of the different API's which makes the infrastructure incompatible [40]. Standardisation of API's will also help resolve these issues.

2.7.14 Malicious insiders

An employee of the service provider may also cause a security breach because the employee may have access to confidential data and services which may then be exposed to unauthorised third parties. This is a serious issue for service providers because they have an ethical duty to protect customer data.

2.7.15 Risk management

Cloud computing exposes organizations to a wide range of risks [13]. The management of these risks is a serious issue because the success of Cloud computing implementation depends on proper management, reduction, and mitigation of risks associated with Cloud computing[3,48]. One of the risks of Cloud computing that organizations need to consider is constant dependence on internet. Any problem with the internet would lead to interruption of Cloud computing services and this could be costly for organizations especially in financial institutions departments such as exchange rate departments where real time information is needed [2].

2.7.16 Strategy issues

The introduction of Cloud computing will bring about a change in the organizations information technology (IT) structure [8]. Some of the questions that need to be answered to resolve the strategy issues are: what type of cultural change does the organization need, how will the change be addressed, and how will the organization prevent employee resistance of Cloud Computing. One of the possible changes in the IT structure due to the introduction of Cloud Computing could be the downsizing of IT department as most of the work done by the IT department will now be done by the service providers[6,24] . This can also lead to a decrease in job satisfaction of technical staffs, support care staff, and sales and marketing staff as most of the technical roles will be taken up by third party service provider and technical staffs will only be left to do some reporting work and resolving issues with third party service providers

[6, 19, 24]. This is a sensitive issue because employees may not accept Cloud Computing because of the fear of losing their job or being reduced to support personnel whose job will be to log complaints to the service. The question of whether the organization has skilled IT professionals with experience to manage Cloud Computing is also an important strategic issue. The effect of Cloud Computing on organization culture and how well the management is able to address this issues and convince the employees to accept Cloud Computing will be influential in determining the success or failure of their Cloud Computing implementation.

Organizations should identify the information types, services and associated business processes which placed to gain the most from cloud-based services and assess the impact of moving them to the cloud [32, 40]. The organizations architecture will provide a useful place to start this analysis.

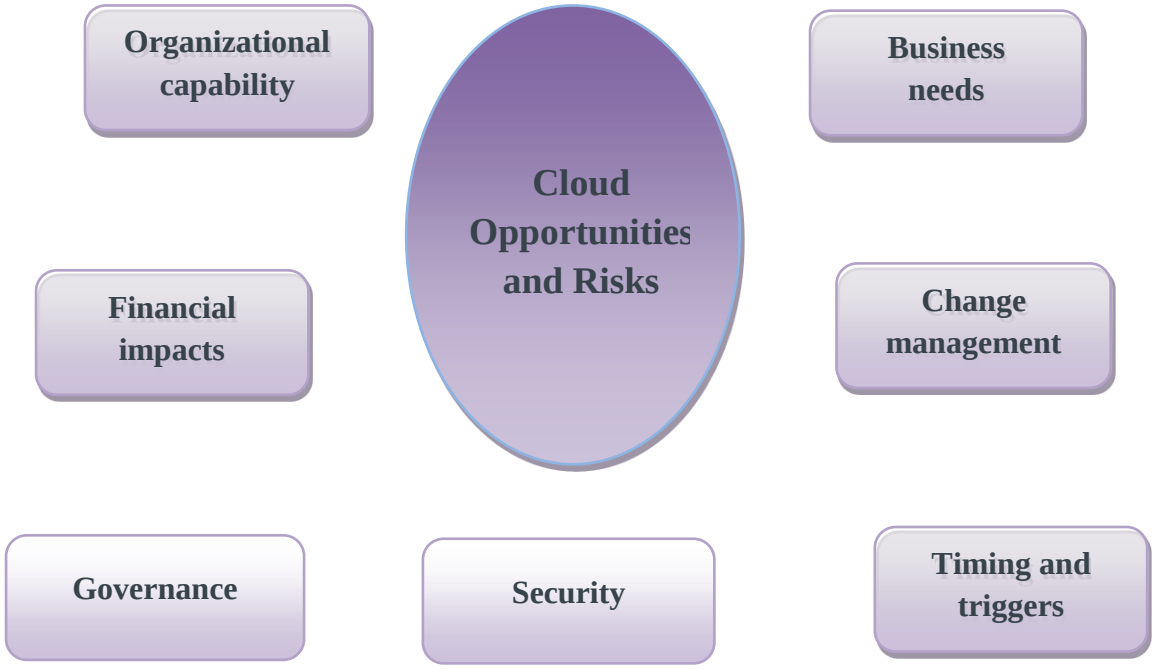

Figure 3: Inputs to a cloud computing approach [3]

As part of determining which services are appropriate for the cloud, Organizations should consider the business problem or opportunity [3]. When evaluating which end-to-end business services are suitable for the cloud, Organizations should consider the services that:

- have stable and consistent functional requirements;

- could be readily shared with other Organizations with similar needs;
- have cyclical, seasonal or uncertain demand, and could benefit from added flexibility from the cloud;
- aren't highly integrated with in-house applications or other processes;
- have data formats or portability requirements that are not critical;
- have manageable business continuity requirements;
- have discrete components of the end-to-end business process that can be transitioned to the cloud, e.g. public-facing workflows; and
- Have functional requirements that could be met by cloud-based services.

With an understanding of which information, services and business processes that would benefit most from cloud-based services, Organizations should assess the technical barriers they will have to address[3,48]. Factors such as impacts to existing infrastructure, e.g. bandwidth, and enterprise applications apply to even the simplest cloud-based services. Hybrid cloud-based services that integrate with in-house software services will require an in-depth investigation into technical issues such as service orchestration, programming interfaces, data format standards and latency.

Consider timing and triggers: An organization's architectural roadmap and project portfolio will provide useful tools to identify the timing and trigger points that present opportunities for the use of cloud-based services [3]. Organizations should consider: business and IT systems scheduled for replacement; planned system implementations/upgrades; requirements for system development/testing where cloud infrastructure could be used; pilots, time-bound or short lifespan projects; and capabilities used only periodically[3,10]. Organization should also seek opportunities to develop/adopt cross-organization or portfolio cloud-based services and/or build on initiatives established by other organizations.

Consider financial impacts: The transition to cloud-based services will have financial and budgetary impacts that Organizations must consider at strategic and operational levels [32, 42]. While cloud-based services have the potential to reduce capital expenditure, Organizations will have to consider the impacts on their budgets and financial statements [3, 50]. Any impacts will need to be reflected in the organization's financial statements. Any reduction in capital spending will need to be reflected in the organization's capital management plan.

Consider organizational capability: The management of cloud-based services requires capabilities similar to that used in typical outsourcing arrangements. Organizations will require

well-developed skills in project and program management, relationship management, procurement and contract management, and services provisioning and management [47, 50]. Organizations will also need to understand workflow design, cloud architecture and capacity management. Organizations that do not have mature capability in these areas should take a gradual approach to moving to cloud-based services while they develop that maturity. Cloud-based services may require new skills. There may be a decreased need for specialist operation and support skills depending on the nature of the cloud solution, but there will also be a need for additional contract management capabilities. The organization should also have mature capabilities in the areas of enterprise architecture and business analysis to assess and manage changes to its architecture and business processes. A cloud solution will not fix immature business processes or cultural issues. Organizations should consider the strategic impact that their approach to cloud-based services will have on their organization structure and skills sets, and implement a plan to mature capabilities in targeted areas.

Manage change: Organizations can improve the likelihood of successful adoption and user take-up of cloud-based services by actively keeping stakeholders informed and addressing their concerns. Stakeholder concerns may include: storing information in the cloud; uncertainty with new technology; shifting staff roles; increased dependence on a third party; the possibility of deterioration of customer care or service quality; and loss of control [3, 16, 48]. Organizations should establish a stakeholder engagement plan, obtain senior executive sponsorship and work closely with key stakeholders to ensure they are kept informed throughout.

Review governance: Well-defined, effective governance is essential for cloud computing. Organizations should review their governance model to ensure the structure, guidance and controls are adequate [3, 40]. Organizations should consider new or changed roles and responsibilities, such as the addition of CSPs and partner Organizations for community clouds [3]. In the case of community clouds, the lead organization may need to review existing memorandums of understanding and establish a cloud computing agreement.

Application Complexity: Simple applications can be easily migrated to the Cloud and the amount of effort required to move such applications may not be not too significant [7,12,16]. These applications can be directly migrated to Software as a Service (SaaS) applications already available from various vendors. E.g. e- Mail applications can be directly ported onto Cloud offerings like Office365, Google Apps or Lotus Live. Similarly, moving a

simple web server to an Infrastructure as Service (IaaS) platform may not require as much effort. Migration of complex applications however, needs elaborate planning and testing prior to implementation .Processing requirements and memory locks: Application should be designed to work on the parallel architectures.

2.8 Theoretical foundation

The choice of whether to adopt cloud-based services in an organization is similar to an IT outsourcing decision, with some differences related to additional concerns and benefits which makes the adoption decision a bit more complex [24]. This study is considering the adoption decision from two perspectives, namely , adopting new technology and cloud computing as a service. Specifically , The study reviews some literatures according Technology Acceptance Model (TAM), Diffusion of Innovation (DOI) , Technology-Task Fit theory, Technology Organization and Environment (TOE) framework, to investigate the drivers of adoption of cloud-based services.

2.8.1 Technology Acceptance Model (TAM)

The original version of Technology Acceptance Model (TAM) was proposed by [9]. TAM theorizes that an individual's behavioural intension to use a system is determined by two factors: perceived usefulness , defined as the extent to which a person believes that using the system will enhance his or her performance, and perceived ease of use , defined as the extent to which a person believes that using a system will be free from effort [46]. The decision to adopt cloud computing, which is basically a web-based service, depends a lot on technology acceptance by the user .

The user in this case is the IT manager and not the end user who has to analyse the cloud based services in terms of their usefulness. Further , as these services have reliability and graphical user interface characteristics similar to IT products, IT managers also have to evaluate it from the point of view of perceived ease of use by the employees who would be using the same. Two constructs perceived usefulness and perceived ease of use play a very important role in shaping the user's attitude and intention to adopt new technology [9, 20] .

2.8.2 Diffusion of Innovation (DOI)

Diffusion of Innovation theory (DOI) introduced by [33] talks about five attributes which facilitate adoption of any innovative technological solution. They are relative advantage, compatibility, trial-ability, observe-ability, and complexity. For our study, we investigated the relative advantage of cloud-based services vis-à-vis traditional IT services.

2.8.3 Technology–Task Fit Theory (TTF)

Technology–Task Fit (TTF) is the degree to which a technology assists an individual in performing his or her range of tasks. More specifically, TTF is the correspondence between task requirements, individual abilities, and the functionality of the technology [15]. More specifically ,the TTF model suggests that technology adoption depends in part on how well the new technology fits with the requirement of a particular task [20]. According to [15]quality, authorization, compatibility, ease of use, training, production timeliness, systems reliability, and relationship with users are important characteristics of the TTF theory .

2.8.4 Technology Organization Environment Framework (TOE)

The TOE framework has been a helpful tool in understanding how organizations adopt technological innovations. According to the TOE framework [44] three aspects of an organization that influence the decision to adopt new technological innovation are Technological context, Organizational context and Environmental context.

Technological context describes both the internal and external technologies relevant to the firm. Organizational context refers to descriptive measures about the organization such as scope, size and managerial structure while Environmental context is the arena in which a firm conducts its business-its industry, competitors, and dealings with the government [26,44].

2.8.4.1 Environmental Context

The environmental context is the arena surrounding a firm, consisting of multiple stakeholders such as industry members, competitors, suppliers, customers, the government, the community, etc. [44]. They can influence how a firm interprets the need for innovation, its ability to acquire the resources for pursuing innovation, and its capability for actually deploying it. These stakeholders could either support or block technological innovation. Changing market and

competitive conditions prod firms to use various forms of innovation. Government regulation is also another powerful tool for constraining a firm's operational activities, increasing costs of production, and instigating an investigation of technologies that must meet specified mandatory criteria. Finally, dominant customer firms could exert their power to shift their suppliers' production activities and/or business processes to comply with its requirements.

2.8.4.2 Organizational Context

A range of descriptive measures characterize the "organizational context": firm size; the centralization, formalization, and complexity of its managerial structure; the quality of its human resources; and the amount of slack resources available internally; formal and informal linkages within and outside the firm; decision making and internal communication methods; and boundary spanning mechanisms to communicate with the external environment. The concept of the "organic" versus the "mechanistic" organizational system is also relevant here [44]. Frequent lateral communication, decentralization of leadership and control, and active networking both within and outside the firm are hallmarks of the "organic" system. Building inter organizational collaboration mechanisms is fundamental in meeting the needs of electronic coordination linkages enabling supply chain partnerships.

Top executives can energize major organizational changes [22] by: (1) developing and communicating a clear image of the organization's strategy, core values, and role of technology in meeting this strategy; (2) sending consistent signals both within and outside the firm about the value of the innovation; and (3) creating a team responsible for crafting a vision relevant to the innovation.

2.8.4.3 Technological Context

The technological context is related to both internal/external and to existing/new technologies which are relevant to the organization.

Organisations should ensure that the entire necessary infrastructure to support Cloud Computing is available to them before deciding to implement Cloud Computing [26,44]. This includes the availability of necessary technologies and expertise to operate those technologies.

The knowledge and awareness of an organisation about a technology is important for the success of implementation. If an organisation is aware of a technology, they will be able to make necessary preparations before adoption and this will increase the success of their implementation.

2.9 Applications of Cloud computing

The United Kingdom government is establishing an onshore, private government cloud, called G-Cloud, providing IaaS, PaaS, and SaaS [1]. The customers of the Government will sign up for SaaS through an online applications store modelled after Apple's App Store. G-Cloud is helping the government achieve 10 strategic goals: Standardize and simplify the desktop, Standardize networks. Rationalize data centers. Commit to open source, open standards, and reusability, Make IT greener, Strengthen information security and assurance Offer shared services, such as payroll, human resources management and ERP, Provide reliable project delivery, Manage suppliers, Transform IT-enabled business processes [1,4] .Sources of expected cost savings include reduction of the more than 10,000 software applications used in government, consolidation from 130 data Centers to approximately 12, and increased server utilization.

Japan's government is building a massive cloud computing infrastructure to consolidate all government IT systems [50]. Tentatively called the Kasumigaseki Cloud, the cloud will be built-in stages, completing in 2015, with the goals of improving operational efficiency, reducing costs, and more rapidly introducing advanced government services. Instead of maintaining their own data centers, ministries will use shared resources, scaling up or down as needed.

South Africa, Rwanda, Kenya and Nigeria are leading countries in use of cloud computing in Africa as of the year 2014 [1, 4,43]. According to a survey carried out by Cisco and World Wide Worx. [50] The study found that 50% of South Africa's medium and large organizations were using cloud services, compared to 48% in Kenya and 36% in Nigeria.

South Africa currently leads the continent in Cloud computing uptake. Kenya, in addition to the 48%, another 24% of organizations in Kenya were considering adopting within a short while. Some of the key highlights of the study include [43]:

- Rapid adoption of cloud computing in Nigeria and Kenya was mainly due to the growing confidence of the IT decision makers in the technology and environment.

- 57% of decision-makers across the three countries had high confidence in the security of the cloud, while a further 34% were neutral. The rest respondents did not have trust the security in the cloud.

- 73% of respondents across the three countries expressed high confidence, while the rest - 25% - were mainly neutral on reliability.

- Private cloud was the most popular in 2013 with 25% or organizations surveyed currently deploying this compared to 13% opting for Hybrid cloud and only 7% of companies opting for the Public cloud [43,50]. The most popular category for cloud use was storage (28% of companies) followed by SaaS (10% of companies surveyed).

A number of governments had engaged in specific initiatives to stimulate cloud computing in their countries. These countries were Benin, Burkina Faso, Burundi, Cape Verde, Gabon, Mali, Rwanda, Tanzania and Togo. About half of the countries had no legislation on data protection [43].

2.10 Challenges of Cloud computing

The key challenges for the vendors will be to make their cloud computing service more interoperable with their respective partner cloud computing products and services so that a user can be selective with his choice of the services across multiple service providers. Also the service level agreements between a vendor and a user will be a challenge as much as the challenge of deploying a sound service level agreement among the vendors. For the organizations the challenges will be vast and varied. Firstly organizations will require a mindset change from computing being a product to a cloud computing as a service [27, 41]. Other challenges that will

need to be addressed are: billing, security, compliance, significant change to the role of the IT project managers, IT support and downtime, aligning business to cloud computing, deployment of the kind of enterprise cloud – private or public, service level agreements, data security and storage, migration of the legacy systems to a cloud computing environment, assessment of ROI (return on investment) of cloud computing, setting up of a government cloud coordinator organization, and Interoperability between Enterprise Architecture, Cloud computing enabling technologies such as Service Oriented Architecture.

2.11 Related works

Handling of large data sets in the cloud using High Performance Computing (HPC) applications was researched by Samuel & Sreenivas [34], private cloud infrastructure implementation for each university using Open Stack by considering HPC was discussed. Then, creating a collaboration mechanism for each University Private clouds throughout the country using federated cloud architecture was proposed as a solution.

Shaik [37] discusses the advantages of cloud computing for educational institutions, the limitations of Current IT utilization in Ethiopian Higher Education institutions. It also discusses alternative solutions to solve the current IT utilizations limitations in Ethiopian Higher Education Institutions. The research finding shows that Cloud Computing is a better ICT utilization mechanism for Education institutions service delivery requirements, it enables wise and strategic use of technology which significantly reduces cost. As a result, a Hybrid Cloud Computing model was proposed.

In 2012 Sewale [36] examines the existing ICT utilization strategy in EHEIs and analyze cloud computing concepts for adopting cloud computing technology in Ethiopian Higher Education Institutions and design a cloud computing framework that can be used in all Higher Education Institutions located in Ethiopia. The research methodology took into account the best practices for Cloud Computing usage within universities, interviewing selected ICT directors, plus the authors' experience in IT and higher education.

The research paper [36] briefly states the advantages of cloud computing for educational institutions, shows the limitations of current IT utilization in Ethiopian Higher Education institutions. It also proposes alternative solutions Hybrid Cloud Computing model to solve the current IT utilizations limitations in Ethiopian Higher Education Institutions. The research

finding shows that Cloud Computing is the better ICT utilization mechanism for Education institutions teaching-learning and service delivery requirements, and also it enables wise and strategic use of technology which significantly reduces cost.

Bizuayehu [5] developed a cloud based framework which is used for efficient utilization of cloud computing in order to facilitate medical image archiving & sharing. The paper uses the Design science Methodology & conduct an online survey to evaluate the design framework of medical image archiving & sharing.

The advantages of cloud computing for banking sectors & their limitation of ICT usage was studied by Alemayehu [2] in 2014.The objective of the study was to find an alternative solution for the usage of IT to deliver a scalable, efficient & flexible IT services for Ethiopian Banking Industries. The author used Design Science Methodology for the research& proposed hybrid Cloud Computing model which can reduce IT investment cost & management complexity.

Selamawit [35] used an exploratory research method to study the existing E-learning system problems. Purposive sampling was selected& questionnaires were designed to collect relevant data from Instructors & students of Addis Ababa Institute of Technology & Adama Science & Technology University. Results showed that a commonly shared E-learning platform based on community cloud computing for technology Institutes in Ethiopian HEI's can be deployed to maximize their capacity.

A cloud computing security framework was developed by Yonas [52] in 2014. The study aims at assessing cloud computing adoption in Ethiopia, identifying security challenges, and facilitating factors in securing cloud computing with the view to develop cloud computing security framework. In this work data were collected via interviews, document analysis and observation from organizations: Ethio-Telecom, INSA, and ILISO.

Cloud Readiness Assessment Framework and Recommendation System was proposed by Fasil & Fekade in 2014 [11], they use TAM, DOI & TOE as a conceptual framework to build the model. The research used 12 readiness factors in order to determine organizational cloud readiness, The attributes are from TAM, DOI & TOE the expert system considered those factors and it uses them to recommend the appropriate deployment & service model to adopt .The paper focuses only on the factors that affect cloud computing without the management & planning issues. It doesn't tell whether the organization is ready or not.

Author [year]	Objective	Method	Key Finding
Alemayehu [2014]	Finding an alternative solution for the usage of IT to deliver a scalable, efficient & flexible IT services for Ethiopian Banking Industries.	Design Science Methodology	Hybrid Cloud Computing model which can reduce IT investment cost & management complexity
Bizuayehu [2012]	Designing a cloud computing framework in order to facilitate medical image archiving & sharing	Design science Methodology	A cloud computing framework in order to facilitate medical image archiving & sharing
Fasil & Fekade [2014]	Developing a cloud readiness assessment framework and an expert system that assesses cloud readiness and recommend which cloud deployment and service model to adopt.	TOE, DOI and TAM	A cloud readiness assessment framework and an expert system
Selamawit [2014]	Developing a shared E-learning platform based on community cloud computing for technology Institutes in Ethiopian HEI's	exploratory research method	a shared E-learning platform based on community cloud computing for technology Institutes in Ethiopian
Sewale [2012]	Designing a cloud computing framework that can be used in all Higher Education Institutions of Ethiopia.	Design science Methodology	A Hybrid Cloud Implementation Architecture for Higher Education Institutions
Yonas [2014]	developing security framework for cloud computing	Design science Methodology	A security framework for cloud computing

Table 1: Summary of Related Works

CHAPTER THREE
3. METHODOLOGY

Methodology is defined as the steps and procedures that one follows to achieve the objectives and research questions of a certain study [29]. It is something that shows the direction in which a research follows to attain the end. Research methodology provides a way to systematically solve the research problem [29, 31]. The research is a qualitative research. It also used the Design Science Research Methodology to construct the Strategic Guideline. In order to achieve the above objectives, this study has employed the following methods: shaping the framework for the study, defining the deliverables, specifying the methodology, and defining stakeholder contacts. Various steps are generally adopted by studying the research problems along with the logic behind them.

3.1. General Approach

3.2. Research Participant and Sampling

The sampling techniques in previous related works on the area of cloud computing was reviewed. For example Selamawit [35] used a purposive sampling method to conduct the online survey. In other related paper Alemayehu [2] took 5 banks for sampling & his respondents were 10.When we come to this paper 7 organizations were identified to participate in the study. The sampling technique used is purposive sampling. Purposive sampling refers to conditions where participants are selected based on their special perspective, insight, experience, characteristic, or condition that we wish to understand.

The organizations were classified into 4 categories Health Institutions, Higher Education Institutions, Financial Institutions and Government Administrations. In each of the 4 categories identified, 7 organizations were selected. The organizations were identified using a purposive sampling. The respondents were therefore considered for qualitative interview.

category	population		Sample selected organizations	No of respondents selected interview
	private	public		
Health Institutions		✓	Black Lion Referral Hospital	2
	✓		Kadisco General Hospital	2
Higher Education Institutions		✓	Addis Ababa University	2
	✓		HOPE University	2
Financial Institutions		✓	Commercial Bank of Ethiopia	2
	✓		Wegagen Bank	2
Government Administrations		✓	Addis Ababa Information communication Technology Development Agency	2
total	3	4		14

Table 2: Sampling Technique used for the study

3.3. Data Collection Instruments

This study used the technology-organization environment (TOE) framework. The capabilities of the organization from the three context will be the basis of the decision of whether to adopt cloud-based services or not. The data collection tool /Interview question/ was implemented Based on the Technology, organization, environment (TOE) framework. To achieve this primary data was collected from the selected sample size. This requires interviewing the stakeholders. For the research the researcher prefers collecting those data by means of interviewing private and public sectors IT Managers. In order to design the interview questions, a literature review on cloud computing was undertaken. Some of the Interview questions were also adopted from related research works [40].

The general opinions on cloud computing adoption were obtained from the IT Managers. Concern about the understanding of cloud computing concept was explored. This measure facilitates the development of theoretical framework and question formulation. More information will then obtain via literature review. This process enabled collection of more information and issues related to the topic. This measure generates insight to the real problem that was faced by organization. All the information was integrated in to a logical manner. This helps to conceptualize the problems and formulate possible solution for the problem of organizational readiness for cloud computing adoption.

3.4. Data analysis and interpretation

The aim of qualitative analysis is a complete, detailed description. All collected data was analyzed and outlined for reporting and presentations. Descriptive statistics was used in order to present the qualitative data collected from the survey.

The data collected was analyzed using qualitative data analysis (QDA) modes commonly used to analyze textual data. The data that a researcher always ends up with in an interview makes it necessary to analyze and interpret the data to edit and make the data meaningful to explain the solution to the research question

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The modes of analysis available for analyzing qualitative data are semiotics, narrative analysis, and hermeneutics and thematic analysis. This research adopted narrative analysis, because it has been found to be efficient in analyzing textual and qualitative data [29].

3.5. Validity and Reliability of the Research

The sample represents a broad inclusion of public & private organizations to which the respondent belongs to. This extensive representation is likely to reduce concerns of bias in the sample.

The results/findings of the research should be interpreted with some concern & was measured. Bias due to misinterpretation of questions is possible. The end result (strategic guide line) which is produced was evaluated by experts in the domain.

CHAPTER FOUR
4. FINDINGS & DISCUSSION

4.1. Findings

In order to come up with the appropriate and convenient cloud computing adoption strategy, it is a must to consider the current context and background of the organizations. Interviews were performed in this study with different level IT professionals from the selected seven organizations.

The data collection was started through the semi structure interviews involving ICT Managers and professionals who have a better understanding on cloud computing issues. Open ended questions was asked in order to collect preliminary data. The data collection was important to understand and asses the current working ICT environment, Cloud computing and its related issues and also understanding the real issue faced by organizations for adopting cloud computing. This process allows the exploration of additional insight of possible determinant that seem to be important in determining the strategic guide line. The average time for each interview was around two hour. The interviews were conducted face-to-face, in person, at the interviewees' organization.

This interview questions aims to assess the cloud computing readiness of organizations from three perspectives which are technology, organization, and environment.

After gathering the information; editing, classification and narration is done for further analysis. All gathered data was structured and processed separately for each item in a way appropriate to answer the questions in the problem statement.

4.1.1 Data findings based on General Question

All the participants from the organizations were asked about their role in their organization's IT decision, from the responses, most of them are involved in taking IT decisions for their organizations. In terms of their understanding of cloud computing all the participants have good knowledge of cloud computing and were able to describe cloud computing from different views.

Additionally they were able to give their own definitions of cloud computing based on their experience. Some of the definitions of cloud computing by the participants are:

"Cloud computing generally refers to providing resources such as software and infrastructure to users over the internet and allowing them to pay per usage"

"Using computing services on demand at a specific cost either based on utilization or allocation of resources. Cloud can be private or public"

"Cloud computing provides organization with cheaper cost over the internet. It is based on a pay as you go model where users only pay for the services they use"

"I know that cloud computing refers to the provisioning of computing resources over the internet to people in different locations. Its aim is to save cost and it achieves that through its payment model where people can pay for only what they use"

"Cloud refers to the consumption of networked computing resources"

"Cloud computing allows organizations to have access to infrastructures, software and platforms on a pay per use basis without having to purchase and own them"

Most participants also noted that the ability of cloud computing to allow users to pay per use, this is an important factor for organizations since they consider it will help them to reduce cost. The understanding and definitions of the participants about cloud computing are quite good.

4.1.2 Data findings based on TOE framework

4.1.2.1 Technology

The respondents were asked if their organization start using cloud computing (if yes what cloud computing services do they use).Most of the selected organizations don't start using cloud computing, only one of the selected organizations is starting to use cloud computing (SaaS).

The participants mentioned that the features that would influence most organizations to use cloud computing are cost & flexibility. Some features of cloud computing mentioned by the participants are:

"Lower capital outlay, easy to update technology"

"Ability to work from anywhere"

"It allows quick deployment, Cost reduction and flexibility"

"Ability to provide flexibility"

"It provides easy access to resources. The service availability is also very good. For example if we have 100 gigabytes of server storage capacity and we want to upgrade it to 500 gigabytes which is five times to our initial requirement, the service provider will make it available to us immediately"

Additionally, the participants mention the ability of cloud computing to bring growth and expand their customer base. This is possible because Cloud computing has the ability to connect all the branches of the organizations (such as banks and hospitals) including the ones in rural areas and provide them with facilities such as storage and computing power which would normally not be available in such areas.

All the participants mentioned security as a very important factor to consider. Another problem is the possibility of not being able to move from one service provider to another (Vendor lock-in) when you are no longer happy with the service provided was also found to be of serious concern. It is surprising that all the participants did not mention legislation and jurisdictional issues among the factors that would affect their organization. A couple of respondents say:

"Security and the lack of full control of the environments are main factors that would affect our organization"

"Security issue is a serious problem with cloud computing"

In relation with deployment models Most of the participants prefer private cloud instead of public, community & hybrid cloud. One suggested that:

"Private clouds are more secure than the others"

In general, cost and security came up several times for different questions. This shows that cost and security are the two most important factors for organizations. This correlates with literature as several literature also mentioned cost and security among the top issues with Cloud Computing.

All the participants believe that interoperability of convergence of Cloud Computing with Organization Architecture and enabling technologies such as Service Oriented Approach as a challenge. The integrations of Cloud Computing into the existing Organization architecture was also found as an important issue which need to be addressed. All the participants indicated that it is very important to re-architecting the existing Organization Architecture to integrate it with Cloud Computing. One suggested that:

"Integration with cloud is very important and also complicated, it can be a terrifying task to integrate the existing infrastructure with cloud computing."

In relation to migration to cloud computing a service by service basis was indicated by the respondents. Most of the participants mentioned that "Mission critical applications should migrate before other Systems"

4.1.2.2 Organisation

Organizations need to understand the change that Cloud Computing will have on their organization. From a business driver or strategy perspective, they need to understand the driver and they need to understand the implication on the organization. Say for instance they use public cloud it will lead to a change in their business processes. It will affect the structure of the IT department and the nature of the operations would change so they need to understand the change it will bring to their business. According to this some questions was forwarded.

In relation to the ICT strategic plan whether it includes a migration to Cloud Computing or not, two of the participating organizations responded that they include migration to Cloud Computing in their ICT strategic plan whereas five of the participating organizations don't include Cloud Computing strategies in their ICT strategic plan. Some of the responses are:

"Migration to cloud computing is not part of our strategic plan; we might think to include it in the future"

"We included migration to cloud in our ICT strategic plan, so in the near future we are going to implement it"

According to management and planning issues if they are migrating to Cloud Computing. All the respondents have defined and measured the business value of Cloud Computing as management

and planning issue if they are migrating to Cloud Computing. So, they can be able to determine the impact of Cloud Computing on their business.

In terms of skills, all the participants mentioned that proper understanding of Cloud Computing is important as the organizations need to know how Cloud Computing will fit into their business and what impact it will have on their business. Some of the responses are:

"Determining the impact of cloud computing in the business is a serious issue"

"In order get the maximum benefit from the cloud the employees should have a good knowledge about the cloud"

Another respondent argue that skill shouldn't be an issue since the cloud service provider handles the technical complexity whereas, organizations focus on the service provided.

"We do not need expertise on the building of the components for a service you need. You just pay for it whilst expertise is held with the service provider"

4.1.2.3 Environment

4.1.2.3.1 Cost

In accordance with the cost of cloud computing services most of the participants mentioned that in determining cost, several factors need to be considered i.e. whether you are using a public cloud or private cloud, whether you are considering infrastructure cost or the application cost. And also they mentioned that depends on availability of infrastructure i.e. Whether or not you have an adequate bandwidth. The type of application, the type of service, the type of network, availability and deployment model etc. are factor that determine the cost of Cloud computing. Some of the participant's responses are:

"The cost of Cloud Computing is driven by environmental factors such as availability of bandwidth, competition among cloud service providers"

"You have to look at the entire business case to see what makes sense. Cloud is about additional value, that value is definitely more than just lowering cost"

"The costs of public cloud services are reasonable"

"Cost is very important since the goal is to spend less where possible and still deliver the same or better quality of work" "Cost reduction is also an ultimate goal"

In relation to Service Level Agreement, Most of the participating organizations don't have an existing SLA with their infrastructure and networks vendor so they mention that it would be better to set up new SLA based on the specific service provided by a Cloud Computing vendor. Lack of detailed understanding of SLAs i.e. downtime and commitment mean time to recovery Business continuity. One respondent suggested that:

"When there is an outage, it will seriously affect our business as we need to be online every moment without any interruptions"

Cloud providers play an important role in the success of Cloud Computing implementation. Choosing the right cloud provider is an important step for organizations in order to ensure successful adoption of Cloud Computing. Some of the respondents

"*To select the right cloud provider the first thing is to understand the current maturity, the current state of the IT landscape, the infrastructure, the architecture and how they interact with each other. Once the requirements are available, you can then come up with a list of cloud providers that offer those requirements which you have identified in order to choose from them"*

" functionality, ease of deployment, ease of upgrade, SLA and costs should be considered when choosing a cloud provider."

"Costs, reliability, security and ease of growth and changes should be considered when choosing a cloud provider and this is in agreement"

It is also important to verify the trustworthiness of a cloud provider before trusting them with your data. Some of the indicators that a cloud provider is trustworthy are track record in the market, number of clients in our industry or vertical, recommendations by research organizations, transparency shown during the due diligence, access to audit reports conducted by a third party and ability to provide evidence of controls and procedures .

"The reputation of the cloud provider is important to determine their trustworthiness"

Another factor to consider is the responsiveness and pro-active thinking of the cloud provider. The level of innovation and ability to provide solutions even when these might not seem to suit them from a business point of view is another important factor to consider.

The findings from this study confirmed that Cloud Computing readiness level of the selected organizations is low. This research also found that adoption of Cloud Computing in the selected organizations is also very low.

It was also confirmed that cost and security are among the biggest concerns about Cloud Computing among Ethiopian organizations. This was evident as the Ethiopian organizations that are already using some Cloud Computing offerings are only using it for their non-core and less sensitive business activities such as virtual desktop cloud. The more sensitive and core data are still kept in the traditional systems in-house.

Although Cloud Computing adoption is low, most of the selected organizations are in the process of considering its use for their core business activities. This is because they believe that Cloud Computing has the capabilities to turn their businesses around and improve their quality of service.

The quality of internet service in Ethiopia is not so good because of the poor bandwidth availability [4]. Fast reliable data such as fiber is expensive while Asymmetric digital subscriber line (ADSL) can be slow and unreliable. Successful implementation of Cloud Computing is dependent on fast, reliable bandwidth.

The data analysis shows that cost and security are the most important factors to organizations when considering Cloud Computing adoption. There is no specific legislation or law in Ethiopia to regulate Cloud Computing.

One of the surprising findings of this research is that most of the selected organizations do not include migration to the cloud in their ICT strategic plan while they understand the benefits of cloud computing.

Since the organizations are still in their early stages of cloud computing adoption, most of them are currently assuming to integrate their existing architecture with cloud computing. they prefer private clouds because it offers more security and control than public clouds. The ability of users to have more control of their data and information in private clouds makes it a preferred choice for the organizations.

Another finding of the research is that the service provider management is important because of the huge responsibility placed on service provider by Ethiopian organizations in managing important aspects of cloud computing such as privacy, data loss and disaster recovery.

This therefore makes it important for the organizations to develop appropriate strategies for managing service providers so as to ensure that they deliver agreed level of service.

This research also found that many organizations still have datacenters dedicated to specific units. As each unit must be provisioned for peak usage, about 75 percent of that capability is unused much of the time. Each organization has its own datacenter and software budgets. Each of them makes independent decisions about which hardware and software to purchase, how many licenses it needs, and so forth. Clearly, these resources are not optimized across the organization, and a great deal of computing capacity is tied up in dedicated equipment.

To answer the research questions, the Cloud Computing readiness of Ethiopian organizations is still in its early stages as most of the organizations are not yet ready for Cloud Computing adoption. Some of the barriers of Cloud Computing adoption include security and privacy, regulatory compliance concerns, reliability of the service provider, governance issues, inadequate cloud SLAs, vendor lock in, poor Internet service, confidentiality, integrity and availability issues. The enablers of Cloud Computing adoption include scalability and flexibility, broad network access, pay per use, cost effectiveness, reliability, increases speed of time to market, improved communication, improved focus on core business, scalability, and cost reduction.

Category	**Question**	**Knowledge / concepts**	**Supporting text**
Technology	What features influence you to use cloud computing?	Features of cloud computing	"Lower capital outlay, easy to update technology"
	What factors do you consider to be the most important when using cloud computing?	Factors that affect cloud computing adoption	"Security and the lack of full control of the environments are main factors that would affect our organization"
	If your Organization is planning to	Deployment	"Private clouds are more

	migrate to Cloud Computing, which of the deployment model will it give impetus to in the first instance?	models	secure than the others"
	If your Organization has plans to migrate to Cloud Computing, how important is the integration of Cloud Computing into the existing Organization Architecture?	Integration between Cloud Computing into the existing Organization Architecture	"Integration is also complicated with cloud and it can be a terrifying task to integrate the existing infrastructure with cloud computing."
Organization	Does your ICT strategic plan include a migration to Cloud Computing?	ICT strategic plan	"Migration to cloud computing is not part of our strategic plan, we might think to include it in the future
	Which kind of management and planning issues is your concern if you are migrating to Cloud Computing?	management and planning issues	"Determining the impact of cloud computing in the business is a serious issue"
Environment	How do you feel about the cost of cloud computing services?	cost of cloud computing	"Cost is very important since the goal is to spend less where possible and still deliver the same or better quality of work"
	Would your Organization Extend the existing SLA with your infrastructure and networks vendor or Set up new SLA based on the specific service provided by a Cloud Computing vendor?	SLA	"When there is an outage, it will seriously affect our business as we need to be online every moment without any interruptions"

Table 3: Summery of findings

4.2 The Proposed Strategic Guideline

When organizations considers moving their services into the cloud, it needs strategic planning to examine the new model's benefits and risks, assess its capabilities to achieve the goal, and identify strategies designed for its implementation. Some of the related approaches are discussed as follows.

Marks and Lozano [22] describe the cloud computing adoption life cycle method that contains 9 stages to begin a cloud project. These are: Concept/Pilot Project, Strategy and Roadmap, Modeling and Architecture, Implementation Planning, Implementation, Expansion, Integration, Collaboration, And Maturity.

Stanoevska [39] also provides practical guidelines for moving traditional IT infrastructure toward clouds. The guidelines are Initial Analysis of Demand and Readiness for Cloud Computing, Strategic Decision to Introduce Cloud Computing, Pilot Implementation, Internal Interconnection, Inclusion of External Resources, And Continuous Monitoring and Evaluation.

The Project Management Institute [51], a not-for-profit membership association for the project management profession, published a white paper on cloud computing that can be used as a reference for any cloud project manager. The paper provides 8 key steps for implementing cloud computing, as well as 2 case studies that support the method.

The strategic Guideline was developed using the Design Science Methodology in IS research. The design science research is a prescription-driven and problem-solving paradigm that seeks to create viable artifacts in the form of a construct, a model, a method, or an instantiation (design artifacts) which provide solutions for management problems [2]. Based on the three-cycle (rigor , design , evaluation) view of design science the researcher structured the research approach and began by conducting a rigor cycle and defining the knowledge base of scientific foundations. Following a rigor cycle the researcher started to build the strategic guideline and conducted a systematic literature review on Cloud Computing adoption requirements . The results of the rigor cycle (Outcomes of the literature review and interview using the TOE framework) were used for the initial design cycle. In this step, the researcher designed a first draft of requirements relevant for the adoption and selection of Cloud services based on existing knowledge. The researcher also constructed a first version of the Cloud computing adoption strategic guideline and assured that during this phase the results were revised against the requirements until a satisfactory design was achieved.

Finally the researcher conducted a relevance cycle to evaluate the Guideline and gather information about it.

The proposed Strategic Guideline has seven phases: planning, choosing the right deployment model, choosing the most suitable service model, choosing the right vendor, negotiating the SLA, migration, and integration.

This strategic guideline should be followed when organizations decide to adopt cloud computing so as to reduce to the plainest minimum undesirable impact that comes with the adoption of the cloud technology.

Phase 1: Planning

The first step is organizations should understand why they want to adopt Cloud Computing. Organizations need to know what values they want to derive from Cloud Computing. They also need to understand the risks and the challenges involved with Cloud Computing. Furthermore, they need to understand the impact of Cloud Computing on the organization versus the suitability. For example, if the impact is low and it's highly suitable for the organization then the organization is more ready than if the impact is high and suitability is low. After the decision to adopt the cloud computing has been taken, the first step is to have a planning team in place to plan and oversee the cloud project. The team should have staff of the organization's IT department who will offer advise based on what is currently in place in the organization and at least one external cloud expert who will give professional, and practical advice as that is their area of expertise. Having the right people in place from the very beginning is necessary, because it will save a lot of costly mistakes from happening as the journey to the cloud continues. At the planning stage, the team should do a background study, identify the advantages and possible disadvantages of adopting cloud computing to the organization, the maturity level of the organization, the organization's readiness to move to the cloud, and any other factors that may be considered important. Finally, the team should identify a system with best practices to benchmark against; this is because for any project or change to succeed, it has to be benchmarked against similar processes that have succeed; doing this will give a better reflection of the current processes, policies, and standards and how the best practices that have been identified can be achieved.

Phase 2: Choosing the right deployment model

Choosing the right deployment model is key to having a successful cloud platform, each of the four models of cloud computing have their strengths and weaknesses. For instance, the public cloud model offers full utilization of computing resources; it is more cost efficient and scalable than the other models but has greater security concerns whereas the private cloud though not as cost efficient as the public cloud but it offers a better security. Therefore, to enjoy the full benefits and promises of adopting cloud computing, the hybrid model is recommended as the best deployment model because it combines the strengths of the public and private clouds and handles their weaknesses more efficiently. The hybrid cloud provides scalability without boundaries; it is more cost-effective, gives the needed security, and offers great flexibility.

Phase 3: Choosing the most suitable service models

Just like the deployment model, it is important to know which of the service models is most suitable to meet the needs and achieve the objectives of migrating to the cloud. For instance, using IaaS delivers everything: servers, storage, space, and networking tools as a service. PaaS provides the platform for application developers to build and host their applications whereas SaaS provides complete applications to the end user of the cloud service; it only requires that the user has a web browser and is connected to the Internet. The choice of the delivery model is dependent on need. For a typical organization setting, each of these three models will be useful as they all have their unique features relevant to the needs of the organization.

Phase 4: choosing the right cloud service provider

The importance of choosing the right cloud service provider cannot be overstated. This is because the success or failure of the cloud project lies strongly with the cloud service provider delivering the service; hence, it is extremely important to investigate into the selected vendor before outsourcing.

The reliability of the service provider is a major barrier to the adoption of cloud computing. Cloud service providers needed to be reliable and trusted so that adopters of the cloud computing can be confident to entrust their vital information to them for safekeeping. The need to look up, properly research, and make a comparison between different cloud vendors to ensure reliability of the chosen vendor cannot be overstated. This is because information is the live wire of the

organizations, and all efforts should be put in place to ensure that moving to the cloud brings actual relief, solutions, and improved services. These can only be achieved, and the promises of the cloud enjoyed if the cloud vendor used is reliable and trustworthy. To achieve this and overcome the barrier posed by lack of trust and reliability of cloud service providers, the following guidelines should be followed:

To ensure that the services in the cloud are reliable and up and running well at all times, reliable cloud vendor is required. The chosen cloud service provider should be one that guarantees service level, uptime and availability of 99.9% of the time. The chosen vendor should have redundancy of power, cooling systems, security system, servers, storage, excellent Internet connection, and fire suppression systems among other things to ensure that the required services are consistently and constantly available.

The chosen cloud provider should be one with good track record; this can be ascertained by how well their services function properly without frequent downtimes and when they occur, how long they last before service is fully restored. The reasons behind downtimes and frequency of occurrence should be considered, this information can be gotten by finding out who their customers are and how well they have enjoyed or not enjoyed the services of the vendor. This should be carefully considered before data are moved to any vendors' data center.

After investigating the reliability of the service provider, the next line of consideration is the location where the data will be stored; this is important because of legal compliance that comes with different locations. Different countries have different laws on the right to information in the land, information security, privacy, data protection, and different levels of restrictions; therefore, it is important to understand the local data protection requirement of the country or location where the data will be housed before commitments are made.

Regulations, legislations and jurisdictional issues should be considered at this stage because they will have an impact on the success of Cloud Computing adoption. If there are regulations, legislations or jurisdictional issues that can help regulate Cloud Computing , organizations should be aware of them and develop strategies in order to make sure that they meet the requirements of those legislations and regulations.

Jurisdictional issues should also be thoroughly investigated as it will affect the success of their Cloud Computing adoption. For example, the cloud provider may have their data

center in another location with different laws, regulations and legislations. The organizations need to know which law will be applied in this case and how that laws will affect them in terms of who owns the data, which laws, regulations and legislations are applicable etc.

Phase 5: Negotiating the SLA

The SLA is a very important document; it is a binding contract between the organization and the cloud service provider. The terms of the SLA should be negotiated and agreed upon by the organization and chosen vendors before the deal is signed.

In the case of service transfer to another vendor, a seamless transfer without delay, downtime, and data loss should be assured.

Besides the service costs, all hidden costs within the documents for extra charges of any kind and terms and conditions written in tiny fonts should be made clear and properly understood by the organization before the SLA is signed to avoid any misunderstandings in the future.

Planned downtimes by the vendor to check bugs, do maintenance, and updates should be scheduled at times when the impact will be least felt. For example, at midnight of the organization's location and preferably over the weekends; such times should be communicated to the organization beforehand. The chosen vendor should assure 99.9% availability and have an immediate data recovery plan in case of any disaster.

The cloud provider should give guarantee by providing service levels for all services they are offering and ensure to meet the requirements of the SLA. The SLA should be negotiated to meet the expected level of service quality and should include refund guarantees or some kind of penalties if the promised service level is not delivered. This will keep the service providers on their toes to meet up with the terms and requirements of the SLA and the clients assured of quality service delivery. Also, the copyright laws as contained in the vendors' SLA and that of the location where the vendors' infrastructures are located should be carefully considered before commitments are made.

Phase 6: Migration

At this phase, the chosen deployment model and processes to be hosted on the service delivery models are mapped out.

This paper proposes the hybrid cloud as the most suitable deployment model for organizations. Deploying the hybrid cloud will offer cost benefits to the management of the organization; it will also make it easier for staff to share resources. With the hybrid model, the fear of privacy and other security-related issues are avoided, as very critical and sensitive data whose confidentiality cannot be compromised will be hosted on premise in the organization's data center, which serves as a private cloud. Additionally this paper proposes that the public cloud should combine the services of different cloud service providers to serve the organization more efficiently as well as avoid the problem of vendor lock-in.

The migration toward cloud should not be done all at once, as much as the cloud offers cost savings, increased agility and efficiency caution should be taken and the movement gradual with low risks applications going first. This will give the organization time to see whether the cloud project or the chosen vendor is worthy—if so, then the other applications can be moved step by step. In overcoming the barriers of security and privacy concerns, it is important to ensure compatibility between the organization and cloud service providers' systems; by moving gradually, the compatibility of both parties would have been determined before more sensitive data are moved to the cloud.

Phase 7: Integration

A successful integration is the key to realizing the full potential of the entire cloud investment. Lack of proper integration of the cloud with existing on premise applications has been identified as one of the key reasons why cloud projects fail in the survey conducted; therefore, to avoid this from happening, a proper integration is needed to harmonize processes across the hybrid model. Integration can be done using any of the three common traditional approaches like on-demand integration tools that connect multiple clouds together mainly adopted by small companies that have low-cost integration options or by implementing complex on premise software platforms also called the traditional middleware solutions, which provide sophisticated functionalities and are mainly used to meet the integration needs of large enterprises; the third type of the traditional approach is by writing custom codes. Besides these traditional approaches, other approaches to integrating the cloud with on premise applications is by using applications like WebSpace cast iron by IBM, Oracle cloud integration by Oracle, Boomi Atmosphere by Dell, or any of the other integration platforms available.

4.3 Validation of the proposed strategy

This Strategic Guideline was evaluated by expertise working in both management & Technical level. The Guideline was given to Two IT managers & two Experts for critics. The evaluation parameters were adopted from Yonas [52].The parameters used for the evaluation are:-

- Is the literature review wide-ranging and up-to-date?

The literature review has shown the recent state of cloud computing with relevant related previous studies and the gap is well recognized.

- Is the sample effectively described and reflective of population?

The method of sampling and the size of the sample has stated purely. The researcher strongly believes that the method of sampling and the size is very enough to cover this study.

- Is the selection of participants described and the sampling method identified?

The Sampled organizations are selected using purposive sampling where respondents are selected for their relevant knowledge or experience.

- How is the applicability of the proposed Guideline to Ethiopian organizations?

The proposed Guideline can be applied and it could be implemented & used to support organizations for a successful cloud adoption process.

- Did the researcher achieve the initial objective?

Yes, both the general and the specific objectives of the research are achieved.

- Is the conclusion comprehensive?

Yes, The Conclusion has supported by the findings. The researcher has identified limitations to the study. And also the researcher has incorporated recommendations for future research area.

Finally, they suggested that the strategic Guideline will assist organizations to determine whether or not they are ready for cloud computing adoption. It will also assist organizations to improve their readiness level. Generally, the strategic Guideline will increase the chances of success of cloud computing adoption and help organizations to acquire the benefits of cloud computing.

4.4 Discussion

From the above findings, the main barriers to cloud computing adoption are security and confidentiality of data concerns, privacy and regulatory compliance concerns, and reliability of the service provider. Resolving these concerns requires not just preventive and immediate solutions but also proactive and forward thinking approaches.

The technological factors include cost, ICT infrastructure, cloud computing architecture, security, SLA, customization, Internet service, data lock-in, integration issues, implementation issues, risk assessment and governance. They should first be considered in order to check the organization's capabilities in terms of the technological requirements of cloud computing .

The cost of cloud computing is the first factor that needs to be considered as it will be a waste of time to continue analysis if the organization cannot afford it. The organization needs to make provisions for all the necessary infrastructure and architecture that will ensure there is continuous service availability in the cloud and the service, data, and infrastructure are available to authorized users immediately upon request. The organization also needs to make plans to configure strong access control and API infrastructures that will improve security, integrity and data confidentiality. This will ensure that confidential and sensitive organizational data are not lost or exposed to unauthorized third parties once in the cloud.

The organization should also determine if there would be any need for customization of any of their applications of software in the cloud to meet their specific business requirements. This will help them in choosing a service provider that offers such level of customization. Since Cloud Computing relies on the internet for its services, the quality of internet service in a vital requirement for Cloud Computing as poor quality of internet service will result in poor quality of Cloud Computing services. The organization needs to investigate the kind of internet services available to them and determine whether the quality of the available internet service meets the requirements of their Cloud Computing service. All other known issues related to technology should be considered at this stage and proper plans should be put in place to provide solutions to them.

The issue of data lock-in should be considered as it will give the organization the chance to negotiate with service provider from an early stage. This will also help resolve integration

issues. Another important factor is lack of flexibility of user interface. The organization should include this in the criteria to select service provider. Implementation issues should also be dealt with so as to find ways to resolve them if and when they arise. Risk assessment and governance are also important because organization's need to understand the perceived risks involved with Cloud Computing and how to mitigate them.

Organizational factors such as technology awareness, satisfaction with existing system, top management support, size of the IT resources, the utilization pattern of the resources, sensitivity of the data they are handling, criticality of work done by the organization, skills, training, diminution in job satisfaction, lack of supporting resources, strategy issues, change management, reputation fate sharing, malicious insider and risk management should be considered at this stage.

The organization needs to know about Cloud Computing and related technologies so as to determine how it will fit into their business processes. The organization also needs to look at the existing system in terms of cost, ease of use, efficiency and effectiveness and compare this with Cloud Computing to determine if Cloud Computing offers more benefit than the existing system. The support of the top management is another important organizational factor as most organizations fail in their technology adoptions because there is no support from the top management. The size of the IT resources is also important at this stage because it will assist in selecting the right type of cloud. If the organization is a small organization, it may be cost effective to go for a public cloud as the data center and all other infrastructure will be provided by the service provider. If the organization is a large organization with large data center, choosing a private cloud may be the best option for them because they already have their data center and this will also give them control over their cloud infrastructure and ensure that security and privacy is improved. The utilization pattern of resources is also important because organizations that utilize a large amount of resources should be able to use that to negotiate for lower price with the service provider. This will assist them in cutting cost in the long run.

The sensitivity of data is also an important consideration. This will assist the organization to identify the more sensitive data and separate them from the less sensitive data. They will then be able to determine which ones to move into the cloud and which ones should remain in-house. The less sensitive data can be moved first into the cloud in order to test the cloud to see if it

meets the organizational requirements. This will reduce the risks of data loss and other risks associated with moving into the cloud. The criticality of work done by the company should be considered at this stage because stringent SLAs, resources, platforms, applications and security are needed for highly critical works while requirements of less critical works may be flexible.

There are some skills important for successful adoption of Cloud Computing. The organizations should arrange training for their IT staffs in order to equip them with the necessary skills. This will ensure that the staffs are able to tackle any issues that arise in a professional manner and avoid any problems that could have occurred as a result of lack of necessary skills. The possible impact of Cloud Computing adoption on employees' job satisfaction should also be considered. It should be identified and necessary plans should be put in place to reduce such impact and improve employees job satisfaction as the success of adoption will be affected if employees' are not satisfied with their jobs as a result of changes from Cloud Computing adoption.

Resources needed to support Cloud Computing should be made available as this will ensure that Cloud Computing runs smoothly. The organization also needs to develop Cloud Computing strategies that will guide them during and after implementation. Another important factor the organization needs to consider is change management as Cloud Computing will bring about change in their business. Risk management strategy should also be developed in order to reduce the risks identified. The possibility of having a malicious insider should also be considered and appropriate plans should be made to reduce possible risks as a result of malicious insider.

The environmental issues include cost, service provider, government support in terms of national infrastructure, regulations, legislation and jurisdictional issues, lack of standardized SLA's, competition from rivals and reputation fate sharing should be considered at this stage. The cost of Cloud Computing depends on environmental factors such as availability of service providers and availability of national infrastructure. The organization needs to investigate these factors to determine their impact on cost as they may drive cost high if their availability is low in the environment in which the organization is located. For example, if the availability of bandwidth is low, it will lead to an increase in the cost of Cloud Computing . If service providers are also few in the environment, competition will be reduced and cost of Cloud Computing will also be high. The organization needs to find out about

the available government support such as the available national infrastructure, available bandwidth and strategies that could influence Cloud Computing. The organization also need to carefully select a service provider by looking at the reputation of the service provider, the types of cloud services offered, functionality, ease of deployment, ease of upgrade and changes, SLA, costs, reliability and security. It is also necessary to verify the trustworthiness of a cloud provider by looking at the track record of the cloud provider in the market, number of clients in the financial industry or vertical, recommendations by research organizations, transparency shown during the due diligence, access to audit reports conducted by a third party and ability to provide evidence of controls and procedures. The ease of moving to another cloud provider and the ease of integration with in-house application and infrastructures should also be considered.

They also need to know what level of data confidentiality; security and privacy are available in that jurisdiction as this will all affect their Cloud Computing adoption success. SLAs should be standardized and it should clearly define what remedies or solution will be provided in case of a breach from the service provider. This will ensure that the service provider delivers agreed level of service at all times. It is also important to investigate whether competitors are already using Cloud Computing and whether it is giving them some form of competitive advantage over the organization. This will give the organization a clear picture of where their Cloud Computing implementation will place the in relation to competitors.

Finally, if the organization decided to implement public cloud, they should ensure that their data will be properly backed up and their access will be guaranteed by the service provider in case there is a problem of reputation fate sharing.

Security and privacy concerns are two major issues that come with the adoption of cloud computing. Due to the importance and confidentiality of the organizational data, the following techniques and should be implemented to help in overcoming these concerns.

Organizations must be assured of tight, well-defined security services in the cloud before they employ the services of any vendor. These security services include identity management, access control as well as authorization and authentication mechanisms to ensure the right level of control within the cloud environment and that only authorized personnel can make any changes or additions to the data and applications in the cloud as a way of ensuring the security, privacy, and confidentiality of data. The service provider should have a comprehensive security infrastructure in place at all levels of the services they provide.

Security and privacy concerns can also be overcome by using digital signatures, an electronic signature used to authenticate the identity of the user of the services provided over the cloud, by using this technique, the user must provide the appropriate login or access credentials before they can have access to the information or application they want to use. This will help to ensure the authenticity, accountability, and integrity of data in the cloud.

Encryption is the process of changing or transforming information into a form that cannot be understood by any unauthorized person. By using this technique, the data are translated into a secret code that cannot be understood by anyone else except those who have the code or password to decrypt the encrypted information. This will protect the data and ensure its authenticity and integrity, and further prevent the improper disclosure of confidential educational data stored in the cloud. Encryption is the main method used to ensure the security of data stored in the cloud.

Another factor to investigate is the responsiveness and pro-active thinking of the cloud provider. Once all of these factors are considered, this will guide the organization and assist them in choosing the right service provider and increase their chances of successfully adopting Cloud Computing.

A direct contact should be created between the organization and cloud service provider without the services of an intermediary, because the more the levels or stages that the data have to pass from the vendor to the user, the more the chances of the data being compromised. Direct contact will ensure that data are moved in one way direction, from the cloud vendor to the user.

The chosen cloud provider security measures and the kind of security mechanisms, infrastructure and configuration in place to ensure the safety of data stored on their cloud, should be thoroughly investigated. Also, the plan for security events by the service provider detailing the responsibilities and actions to be taken in the event of a security breach should be understood, analyzed, and ensured to be in line with the required standards set by cloud computing bodies like the NIST (National Institute of Standards and Technology) and the CSA (Cloud Security Alliance) to ensure that the right level of security is provided by the cloud vendors to their clients and there are appropriate backups in place in case of any problems or the occurrences of disasters like fire, flood, or earthquake. This investigation is necessary by adopters of the cloud technology to ensure constant availability and confidentiality because of the level of privacy that is required to preserve research results and other confidential information.

Data splitting technique requires the use of more than one service provider; the data to be stored in the cloud should be split across different clouds, in a way, that preserves the confidentiality, availability, as well as integrity of the data. The use of two or more cloud services improves performance, avoids vendor lock-in, and reduces the risks of data loss and downtimes as security concerns such as data integrity, intrusion, and service availability can be controlled using fault-tolerant protocols across the multiple clouds. The data splitting technique avails the universities the opportunity to use different clouds for different purposes because some clouds are better than others for some applications; for example, the public cloud from Google might be best for email services whereas Microsoft Azure can be used to provide both PaaS and IaaS services. As the cloud technology advances, synchronizing data across multiple clouds is easier with the availability of migration solutions and the services of cloud-based service providers such as accountability that make it easier to manage multiple cloud providers at the same time . Similarly, the cost of splitting data on multiple clouds should be carefully considered, the cost implications differ depending on the particular pricing scheme; applications frequently used and kept running for extended periods may have lower costs than those run for short periods.

It is important to note that Cloud Computing is still evolving and more issues may arise with time. Once those issues arise and they are identified, they should be included and proper solutions should also be put in place for them to ensure that the organization is ready for Cloud Computing adoption.

CHAPTER FIVE

5. CONCLUSION & RECOMMENDATION

5.1. Conclusion

Cloud computing is a catalyst for innovation and transformation. It boasts attractive properties such as agility, scalability, pay-per-use, and cost efficiency. The cloud approach is an important component in many e-governance, education, and healthcare strategies worldwide. The advent of cloud computing sparked the interest of many organizations around the world to choose the cloud as an alternative means of delivering quality IT services to their clients and staff at reduced cost. However, the failures experienced by early adopters of the cloud technology and challenges that come with its adoption have left many unconvinced in committing to it.

Cloud computing can greatly benefit organizations of all types and sizes by Reducing costs and controlling costs, Consolidate facilities, optimize human capital, utilize assets efficiently, reduce charge for services, Improving agility and adaptability, Virtualize resources, increase capacity with simple scalability, expand or contract services to meet demand, deploy software quickly, expand flexibly to meet needs, Enhancing services and collaboration: Take advantage of leading-edge applications, provide broad access for stakeholders, improve collaboration, Addressing risk issues: Maintain critical service levels, help ensure elasticity,

Organizations should choose cloud computing deployment and service models that meet security and privacy requirements. By selecting their cloud models wisely and aligning them closely with their organization's business model, decision makers can deploy an effective, economical solution, while also successfully addressing reliability, data +management, and security issues.

This paper discussed the both the benefits and challenges of cloud computing, the factors that affect cloud computing adoption. It used the TOE frame work to assess the cloud computing readiness of the selected organizations.

Finally the study brought a strategic guideline that can be followed to reduce to the plainest minimum negative impact of cloud computing adoption so as to ensure a safer and more reliable transition to the cloud for organizations. The strategic guidelines was evaluated by experts in the domain.

5.2. Recommendation

The results of this research has shown that adoption of Cloud Computing of the selected organizations is slow because of issues such as security, reliance on internet, lack of standard SLA's, lack of laws and regulations specific to Cloud Computing. This research has contributed to knowledge by developing a strategic guideline which will assist organizations to improve their Cloud Computing readiness level and increase the chances of adopting Cloud Computing successfully.

There is a wide range of research area on Cloud Computing because it is still in its early stages. In future, researchers could apply the strategic guideline on organizations that are planning to adopt Cloud Computing and observe and document any improvements in their Cloud Computing readiness level. Since this research focused specifically of Health Institutions, Higher Education Institutions, Financial Institutions and Government Administrations. Future research could focus on another industry or organization as the result of this research cannot be generalized. The results from different research across several industries could be combined in future in order to come up with solution that could be applied across several industries.

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APPENDIX
INTERVIEW QUESTIONS

This interview aims to assess the cloud computing readiness of organizations from three perspectives which are technology, organization, and environment. The answers to the questions in this section will be used in answering the research questions and developing a strategic guideline which will serve as a tool by Ethiopian organizations to measure their cloud computing readiness.

General Questions

1. What is the Name of your organization?
2. What is the nature of your Organization?
3. What is your organization's core business?
4. How many employees does your organization have?
5. How long have you been working for your organization?
6. What is your role in your organization's IT decision?
7. What is your understanding of cloud computing?
8. Do you have any cloud computing experience?

Questions from the context of organization

9. Does your ICT strategic plan include a migration to Cloud Computing?
10. Which kind of management and planning issues is your concern if you are migrating to Cloud Computing?

Questions from the context of Technology

11. Is your organization already using cloud computing?
12. What cloud computing services do you use or plan to use?
13. What features influence you to use cloud computing?
14. What factors do you consider to be the most important when using cloud computing?

15. How do you feel about the cost of cloud computing services?
16. What are your views of cloud computing usage in your organization?
17. What is the state of your cloud computing architecture?
18. If your Organization is planning to migrate to Cloud Computing, which of the deployment model will it give impetus to in the first instance?
19. If your Organization has plans to migrate to Cloud Computing, how important is the integration of Cloud Computing into the existing Organization Architecture?
20. If your Organization is planning to migrate to Cloud Computing, does your Organization believe that interoperation of Cloud Computing into its existing Organization Architecture is an issue?
21. If your Organization is planning to migrate to Cloud Computing, does your organization see interoperability of convergence of Cloud Computing, Organization Architecture and enabling technologies such as Service Oriented Approach as a challenge?
22. Organizations that migrate to cloud computing tend to do on a service by service basis. In your organization, which of the services is most likely to get migrated to cloud computing?

Questions from the context of environment

23. How will you identify the right cloud computing service provider for your organization?
24. What are the indicators that make a cloud service provider reliable?
25. What are the legislations and laws relating to cloud computing?
26. In relation to Service Level Agreement, if migrating to cloud Computing, would your Organization Extend the existing SLA with your infrastructure and networks vendor or Set up new SLA based on the specific service provided by a Cloud Computing vendor?
27. Is there any government support for cloud computing that can benefit your organization?
28. As a senior member of the organization executive team, what strategic directions will you be directing/setting in terms of the paradigm shift to cloud computing. What will be your business drivers to migrate to cloud computing?
29. Do you have anything else you would like to say?