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Adoption Strategy for Cloud Computing in Research Institutions: A Structured Literature Review

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Abstract

Currently, Kenyan research institutions Information Technology operations use external storage, within or without institutional network environments. This study presents a structured literature review of a cloud computing adoption strategy for research institutions in Kenya. The reviews objectives are: 1) to establish the characteristics/peculiarities and IT environments of research institutions in Kenya, 2) current cloud computing technologies, adoption approaches and drivers in the adoption of cloud computing. The findings are that there is need for an adoption strategy for Cloud computing in the Kenyan research Institutions that will use a DOI and TOE combined approach while addressing technological, organizational and environmental factors. The findings are used to propose a cloud computing adoption strategy for the Kenyan Research Institutions in future research.

Keywords

Cloud Computing, Research Institutions, Strategy, Adoption

1. Introduction

Cloud computing offers enormous advantages in its usage, which includes diminished equipment upkeep cost, easy access around the world and adaptability of profoundly computerized measures. In recent years, the cloud computing viewpoint has witnessed a massive shift toward its adoption, and it has become a trend in Information Technology (IT) due to its benefits [1]. Cloud computing, as defined, is a method of arranging computers to provide easy, ubiquitous, on-demand network access to a shared pool of customizable IT resources [2].

The potential of cloud computing is to promote cooperation, agility, scalability and flexibility and to save costs by using calculating resources efficiently and optimally [3]. It is viewed as a game-changer in the way information technology is provided since it allows computer resources like storage, processing capacity, network infrastructure, and applications to be offered as a service via the internet [4]. In business, it seems to have become strategic, with the potential for use in crucial parts of an organization's IT infrastructure as it offers a potential alternative to traditional Enterprise Resource Planning (ERP) systems.

The Kenya Vision 2030 [5] recognizes the role of science, technology and innovation in modern economy; hence, in the setting up of twenty one (21) research institutions in Kenya, eight are public institutions, nine are international organizations and four are private (National Commission for Science, Technology and Innovation [NACOSTI], 2022) [6]. The public research institutions are funded by the government, and are established under the Science and Technology Act, Cap. 250 of the Laws of Kenya which was enacted in 1977 to provide for the establishment of national research institutes.

There are a number of valid reasons for corporations to transfer their processes to the cloud. Cloud computing adoption needs a relatively small initial outlay. Cloud services can also be assigned and de-allocated on demand, cutting operational expenses [5]. Because cloud providers pool enormous quantities of resources that are easily available based on individual demand, scalability in cloud computing allows enterprises to demand computer resources and services as needed. The majority of cloud-hosted services are web-based and may be accessed from any device with an internet connection [7]. Finally, cloud computing lowers company risks and costs of maintenance, which are passed on to the cloud service provider [7].

In adoption parameters like data sharing, research dissemination and simulations are in place to develop an interoperable and portable IT service platform. The service platforms should offer a choice of operating systems or environments to their customers, offer a choice of software development, tools programming languages and runtime environments, standardized programming interface whereby each provider has its own application programming interface (API), strategy offered by multiple users to avoid provider specific extensions and data and application federation support from service providers [8].

There are several regulations [9] that are important to any attempt to shift to cloud services, both those that facilitate cloud service use as well as those that impose restrictions on how cloud services are acquired and utilized (Microsoft-Kenya, 2022). Cloud computing standard provides compliant requirements for design, installations and management of cloud computing infrastructures for Government (ICTA-2.001: 2016). [9] encourages the provision of accessible information and communication services, at affordable cost nationwide.

For efficient and effective service delivery to people, the Cloud Computing Standard (ICT-Authority-Kenya, 2022) mandates all government agencies to ensure that they completely comply with the standard. The ICT Authority is also

required by this Standard to conduct quarterly audits of all Ministries, Counties, and Agencies ("MCAs") to guarantee compliance with the Standard. One of the Standard's objectives is that MCAs guarantee that cloud service providers follow regulatory legislation in terms of privacy and public record keeping requirements (ICT-Authority-Kenya, 2022).

The legal and regulatory environment in Kenya requires among others 1) Data Security: The Information Security Standard established by the ICT Authority lays out the requirements to which all public sector entities are encouraged to follow in order to safeguard information from security risks [10]. To ensure effective data security across all categorization systems, these guidelines require all public organizations to have an information security strategy, an information security plan, and the creation of an information asset register [11]. 2) Collaborate governance and interoperability—The (Government Enterprise Architecture) GEA Standards aim to put the GEA Principles into practice, which include the significance of delivering high-quality information and technology, safeguarding privacy, securing data, and offering a public service. As a result, the principles are designed to aid in the alignment of cross-services and solutions with goals and strategies reached at all levels of government. The Integration Architecture Principles identify common components that aim to bring interoperability domains, standards, as well as procedures closer together.

Without a common vocabulary and a standardized frame of reference, it is difficult if not impossible for research institutions to have a cogent discussion about cloud computing adoption strategies. External factors like data security and privacy issues have not been addressed by the current adoption strategy. Likewise, the strategies assume the technical capability and human resource capacity to adopt cloud computing in the research institution whose mandate is not in ICT; provide thin lines for the key stakeholders to contribute or participate in the strategies of adopting cloud computing. Finally, the strategies design is generic not targeting any particular industry or organization yet the needs, purposes and intentions are different for different industries.

In simple terms, a cloud computer is a combination of computing technology and a platform that provides holding and storage servicing through the cyber space. It depicts an Internet phenomenon in which people, corporations and even governments may spend time in a shared computer infrastructure, consisting of interchangeable computing, data-storage and communications components instead of acquiring and operating their own computer systems. If an element fails or has to be updated, programs and data are automatically transferred to others. A cloud's service model determines an institutions capacity as well as management of its computing environment, and the degree of the vague notion of its usage [12]. Infrastructure, Platform and Software as services; that is IaaS, which offers the following services;-computing as a service includes virtual central processing units and virtual main memory for the Vms that is provisioned to the end users, provides back-end storage for storing files, provides networking

components such as routers, switches and bridges for Vms and load balancing capability at the infrastructure level [13]. The second level is platform as a service (PaaS) which provides a runtime environment, back and scalability is managed by the cloud service provider, so end users need not to worry about managing the infrastructure [14] and the third service model is Software as a service (SaaS) which is also known as on demand software that provides an agile updating for applications as a service [15]. SaaS respectively form part of three prototypes that computing cloud providers use [16]. The lower prototypes provide derived specifics for the higher prototypes, with Infrastructure as service being the primary model in use.

There are essential characteristics that need to exist within the cloud computing environment for the users to enjoy its benefits. These are: The measured service—This indicates a cloud platform's ability to track how much time a consumer has spent using IT resources. The consumer is only charged for the resources utilized or the time they were used based on the measurements [17]. Rapid elasticity—This alludes to a cloud's capacity to optimize available IT resources based on runtime parameters or as agreed upon by the cloud client and provider [17]. The customer has access to a large range of materials that may be altered in any amount and at any moment [2]. Broad network access—This suggests that Cloud services should be widely available. Support for a variety of devices, protocol, as well as interfaces may be necessary, according to [17]. Resource pooling—Cloud consumers should enjoy a multi-tenant approach that combines computer resources. In response to client demand, a range of physical and virtual resources are deployed. On-demand self-service—Cloud computing users' expectations for on-demand, immediate access to resources. Customers must be able to request, personalize, pay for, and use services without requiring any human intervention [2]. This feature provides the service-based and usage-driven features seen in popular clouds [17].

Models of cloud Deployment

The regulation and propensity of computing materials for service delivery to customers, and the distinction between categories of consumers, are all described by prototypes for deployment (as depicted in **Figure 1**).

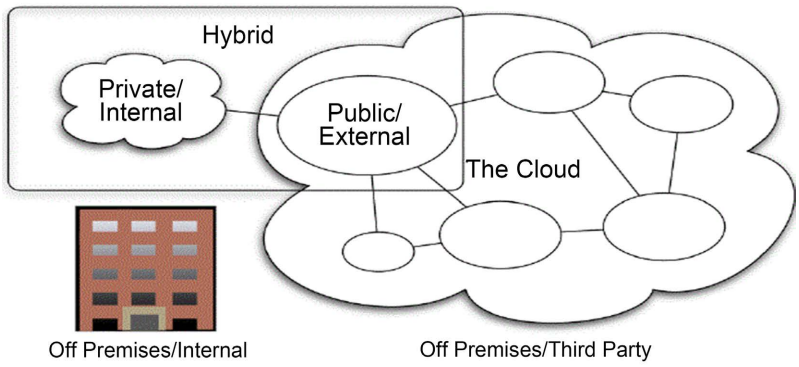

Figure 1. Cloud computing prototypes for deployment (Johnstone, 2009).

There are three sorts of clouds that are important to most enterprises, organizations, or government agencies: hybrid public and private also known as; mixed, external, and vendor-hosted respectively [18]. Every infrastructure from cloud contains its own set of characteristics, benefits and drawbacks.

Enterprise private cloud: Businesses can employ cloud technology on their own facilities, behind their own firewall, with a private cloud. Businesses are deploying private clouds in areas of their infrastructure where it makes the most sense to use a cloud model [19]. Cloud-private offers a range of advantageous services with an exception on security and management concerns that are common for traditional cloud prototype on infrastructure. In a cloud-private, virtual technologies are used in improving scaling, system use and resource control; this involves automatic data center provision, pricing based on services offered, and metering chargeback for usage. Thanks to identity-based security measures, only authorized persons can access necessary apps and infrastructure [20].

Private clouds-vendor hosted commonly termed partner cloud is not a rare type of cloud-private. It has gained popularity amongst users and is hosted in a secure storage center for the vendor. The host utilizes the tools of support for cloud enterprise, technologies for testing, and processes to transfer virtualized apps to vendor data center servers [21].

Public cloud: Public cloud allows enterprises connect to cloud-based software applications and infrastructure on cyberspace which shares many a similarity with electric utility bills. The collective combination of networks, software applications, storage data and services can be used by several persons or enterprises. End users who do not own these resources can obtain them quickly and easily through cyberspace use on their personal computers or basic terminals, on needs basis and minimal effort from the managing and servicing providers. The iTunes Stores provide a great example of a famous public cloud consumer [22]. Cloud infrastructure (Hybrid): To get the best of both worlds, a hybrid or mixed cloud system combines characteristics of cloud infrastructure both private and public. The approach here allows for the supplementation of an internal cloud or its enhancement through the use of cloud-public. In example, companies may use an internal cloud to exchange resources that are virtual or tangible through cyberspace only when it's absolutely necessary, such as at peak processing times [23]. Businesses can choose whether their apps should be hosted on a public or private cloud using a hybrid cloud infrastructure. An example of this is the strategy that allows applications that are finance related and have the most to be covered by a firewall while customer service and collaboration related apps including those of chain supplies are housed in the public cloud.

Long periods of high capacity are possible with hybrid cloud architecture, while security issues for applications that are mission-oriented critically are reduced. Positively it allows you make use of the benefits from cloud public for flexible and suitable programs while managing older and important systems that require higher adherence, safety and performance needs [24]. Because companies may mix local infrastructure with scalable and provisioned-on-demand infrastruc-

ture, the hybrid model provides an ideal architectural strategy. As a result, a mixed approach delivers significant cost savings while still providing nearly limitless flexibility. It is worth noting, though, that by employing this strategy, businesses are foregoing extra cost savings in exchange for increased security.

Factors that determine successful adoption of Cloud computing

Research by Gutierrez *et al.* stipulated that three components are relied upon to determine the intention of organizations to embrace cloud computing, these are: Technological, Organizational and Environment [23]. In a later study by [25], validation of measurement and structural model test found out that, data security and risk among technological factors, Government regulation and peer pressure categorized as environmental factors, management and privacy as internal-external factors, proved to be a statistically significant challenge in implementing the cloud computing adoption model in South African Universities; A study that integrated DOI and TOE done in South Arabia found that from among the three dimensions of technological context, security was found to have a statistically significant relationship with cloud adoption. In Malawi, each Institution adopted a different model of cloud computing depending on needs of the Institutions, aspects such as suppliers, customers, competitors and effectiveness of hardware and software's [26], following a protocol akin to many technological stages to maturity.

Though majority of existing cloud adoption literature addresses cloud computing as if it were just another type of IT adoption problem, there are several distinct cloud characteristics that distinguish it from conventional IT advances, such as its target consumers, pricing mechanism (pay-as-you-go), and deployment patterns (public, hybrid, private). TOE components as depicted in [27] are grouped into three as:

- Environment: Industrial characteristics and market structure, Technological support, infrastructure and government regulation
- Organization: Formal and informal linking structures, Communication processes, size and slack
- Technology: Technological Innovation, decision making; availability and characteristics

On the other hand, Technology adoption is connected to independent factors like personal qualities, internal institutional structured features, and external institutional characteristics, according to the DOI model at the company level [28]. Diffusion of Innovation (DOI) also known as Innovation Diffusion Theory (IDT) categorizes organizations and individuals into five groups of pioneers, early adopters, early majority, late majority, and laggards. Innovation is linked to independent aspects at the corporate level, such as human (leader) traits, internal organizational structure features, and external organizational characteristics [28]. The DOI first factor includes:

- Individual (leader) characteristics that are to do with the attitude toward change

- Internal characteristics of organizational structure components include Centralization, complexity, formalization, interconnectedness, organizational slack and size
- External characteristic of the organization such as system openness.

This research intends to propose an adoption strategy for research institutions in Kenya by seeking answers to the following Research Questions (RQ):

RQ1. What are the characteristics/peculiarities and IT environments of research institutions in Kenya and if they are amenable to cloud solutions?

RQ2. What are the current cloud computing technologies, adoption approaches and drivers in the adoption of cloud computing?

The organization of the rest of the paper is as follows: Section 2 represents Research background and overview; Section 3 Research Methodology; Section 4 Findings; Section 5 Discussion and Results and Section 6 conclusion and future work.

2. Research Methodology

We conducted our research into two sections in order to answer these questions. The systematic review researched by [5] proposed the review guidelines and characteristics in an IT environment of research Institutions. The review focuses on Google search and cross referenced articles in Google and Google scholar for general information and peer reviewed articles respectively. Questionnaires were distributed in order to gather information about the current cloud computing technologies and drivers. Data collection and analysis was done and we drew conclusions and recommendations on future research.

In order to evaluate how Technological, Organizational and Environmental factors affect the cloud computing adoption decision, a quantitative research will be conducted, where data will be collected through a questionnaire, which will attempt to help Institutions a better understanding about how these three factors affect their decision to adopt and deploy a cloud computing model in Kenyan Research Institutions. The population of the study consisted of three representative Institutions in the Coast *i.e.* Kenya Agricultural and Livestock Research Organization (KARLO), Kenya Marine and Fisheries Research Institute (KMFRI) and Kenya Medical Research Institute (KEMRI). A total number of 60 questionnaires were distributed to ICT Department in representative institutions as the sample size for the research. The three factors that affect the decision to adopt cloud computing will be measured through 15 variables; Technological factor which includes 5 items; strongly disagree, disagree, neither agree or disagree, agree and strongly agree as suggested by [29]. Environmental factor includes 3 items; where competitive pressure, trading partner pressure and vendor readiness are also derived from [30]. Lastly, Organizational factors that includes 7 items. In order to investigate the hypotheses associated with this research, the collected data will help examine the relationship between the variables of interest to the study [31]. The results will provide the foundation for accepting or reject-

ing the hypotheses and answering the research question. The study employs a systematic review approach originally attributed to [29] to examine current literature on cloud computing adoption strategies. The review was based on a review protocol that details the stages to be followed to summarize the existing contributions and identify the gaps for the study as well as provide a background for the study. According to [30], a review protocol consists of research questions, data sources, search strategy, study selection strategy, data extraction, and data synthesis that has been adopted in this study.

2.1. Data Sources

The sources used include a search in Google and Google scholar for general information and peer reviewed articles respectively. The following keywords were used to identify the articles: "Cloud Computing", "Cloud computing + Research", "cloud Computing + Research Institutions", "Kenya + Research Institutions", "Research + Cloud Computing", "Research + Regulations in Kenya" and "Research + Data privacy".

2.2. Study Selection

The study included articles that provide general information as well as empirical evidence on cloud computing strategies that also have some details on Cloud (IaaS, SaaS and PaaS), adoption approaches, drivers and efficiency of IT deployment in research institutions. The criteria used on Google Scholar include: Google search on cross referenced articles; articles on cloud computing; search of cloud computing +Research; articles on Cloud Computing + research Institutions; Kenya + research institutions; Cloud computing + Adoption strategy and research + Cloud Computing.

The same criteria were used on Google Scholar for articles published recently (between 2017 and 2023).

The initial cross database search yielded 231 articles on cloud computing. After duplicates were discarded, this number was reduced to 175. In the Google Scholar search a total of 164 articles were found.

2.3. Data Extraction

We extracted data based on source and full reference of articles. The first selection was based on "title of article and its abstract" before classifying them into three categories of relevant, irrelevant and moderate (those that are difficult to place). Articles classified as moderate were subjected to a different reviewer other than the initial one, resulting in reclassification in one of the first two. The final collection of relevant articles forms the primary studies for the review. Through inspection of title and reading of the abstracts on cloud computing were. Based on the initial review, 60 were identified as potentially eligible based on the criteria for inclusion and after retrieving full articles, 20 met the eligibility criteria for the final inclusion. The following adoption strategy features were rea-

lized through the literature. A review of previous literature shows that there are different adoption strategy that not only provides the technological aspects of cloud adoption, but also the people, processes and business.

3. Findings

RQ1: Characteristics/peculiarities and computing environments of research institutions in Kenya

Researchers in Institutions apply for grants for research through the high quality performance metrics and proposals. This is done through research meetings, large group webinars and academic conferences [32]. Institutional grants are also provided for fieldwork by the Government and partnering Institutions. The information by researchers is shared to different networks that are in collaboration with the partnering Institution, between themselves locally and internationally and different beneficiaries of the Research. There is therefore, need for the alignment of the cooperate strategy and the ICT strategy should provide enabling technology to efficiently and effectively deliver the research organization core mandate. There are outright shortcomings among most Kenyan research institutions systems as well as known cases of system rigidity that do not allow these institutions to effectively meet their mandate particularly when they want to access services from home via the internet. The research institutions lack efficiency, flexibility, security, enhanced productivity, strategic value, automatic software updates, remote access of information and cutting of costs (ISSN (Online): 2320-9801).

3.1. Policies

The ICT function is cross cutting among the Kenyan research institutions and seeks to address the connectivity and harnessing of the emerging technologies to enhance research capacity. Modernizing the relevant infrastructure and services that support research activities of the organization is in most cases prioritized. They have in place ICT policies necessary for improvement, consistency of decision making and focusing of decisions towards support of research goals. Among other objectives associated with most policies include provision of guidelines and standards for ICT use, enhance security of the ICT systems and information, efficient use of ICT systems, ensure availability and reliability of the ICT system. Other policies relevant to this research are on ICT disaster recovery and services enhancement.

3.2. Staff Training

Staff in the said Institutions undergo continuous training so that they can fulfill their duties by providing appropriate guidance, support and awareness of current and emerging ICT and information governance approaches, solutions and standards including: provision of technology, infrastructure and expertise to enable the Institute staff to be effective in their jobs; support operations,

ensure security by enforcing confidentiality, integrity and availability (CIA) of information systems and the information held and or processed by those systems.

3.3. ICT Deployment

ICT helps in improvement of institutional management especially in collection, distribution and empowerment. Among services offered include online services and reporting to the public and ICT based collaboration, leading to capacity strengthening, empowerment and sharing [33].

RQ2: Current Cloud computing adoption strategies

In general, an adoption strategy is a physical or conceptual structure that supports or guides the creation of anything that will in turn make the structure useful. An adoption strategy is more prescriptive than a structure and more thorough than a procedure [34].

IBM Cloud adoption strategy, IFCA (2010)

The IBM cloud computing adoption strategy specifies two overlapping variables to consider when establishing clouds computing strategies: methods of delivering plus the nature of the services offered. Opportunities arise for assessment of clouds deployment needs through basic adoption strategy and this occurs when the two main criteria are merged. Comprehension of the mentioned needs will aid a business decide on the optimum services and delivering prototype for tasks it wants to put on the cloud.

When developing a cloud strategy, the first factor to examine is the delivering prototype to be used, and this refers to the dimensions of the adoption strategy-horizontal (the x axis). The most frequent clouds delivering prototypes are both private and in public spheres. Hybrid is a third prototype which combines the two. The second component is the services prototype. This represents dimensions of the adoption strategy vertically (the y axis). Cloud service categories specified in the strategy are IaaS, PaaS, SaaS, and a Business Processes as Services (BPaaS). Customers pay for business services rather than applications when they use BPaaS.

Important responsibilities in the consumption and delivery of cloud services are also outlined in the IBM cloud-based adoption paradigm. The roles are:

- Consumers (Subscribers/Users): Are in charge of making efficient use of cloud services while also ensuring that they are turned off when a task is completed.
- Providers: The cloud service provider provides customers with these services while retaining assets needed in developing and proving quality cloud services.
- The Integrator: Communication of the customer's IT needs properly to the provider is key hence an investigator provides the required level of IT literacy to achieve this.

Migration paths will differ depending on the institutions IT strategies, deli-

vering prototype, service supplied, and if either IT or the business is the driving force for migration to cloud.

Strengths of the IBM adoption strategy include Low capital costs of infrastructure and data centers while it also supports automatic scalability. It's and weakness with regard to the Research Institutions is that in case of poor IT services being offered, the client cannot be able to change the provider to alternative services offered.

Amazon Web Services Cloud Adoption strategy II, 2017 (AWS CAF)

The adoption strategy mentioned in this section, (AWS CAF) gives advice which helps units in institutions to understand methods of skills upgrading, current modification procedures and introduce new processes thus maximizing cloud computing's capabilities. The AWS CAF arranges instruction into six focal areas/perspectives at the highest level e.g., Business, People, Governance, Platform, Security and Operations.

Every cloud adoption strategy comprises a variety of abilities, which are a combination of responsibilities normally owned and/or controlled by multifunctional related shareholders, making up a point of view. Every capability defines "what" a shareholder is owning or administers in the cloud's adoption path. The abilities are standardized inside the CAF. Every capability is made up of a group of CAF abilities and procedures as a foundation for identifying skills and procedures that are currently lacking. Platform, Security, and Operations views focusing on technological abilities, while Business, People, and Governance are geared towards business abilities [35].

Its strengths are that it offers appropriate foundation for cost reduction and the development of a significant value chain [10]. Its weaknesses include inability to guarantee highest safety levels leading, insensitivity and cybercrime insecurity.

Oracle Consulting Cloud Computing Services Adoption strategy (2011)

Oracle Consulting created an adoption strategy to assist customers with the implementation of cloud computing technologies. The blueprint phase is where the strategy and roadmap are developed at the start of this adoption strategy. Thereafter, there are four more major stages in the route to the cloud: Standardize-Consolidate-Automate-Optimize. For example, it is feasible to iterate through these steps a number of unified cloud platforms, by repeating automation. Indeed, the entire architecture may be used to create numerous clouds.

Limitations: It's also difficult to see how non-Oracle clients would completely embrace and apply this architecture [36]. Customers should be able to pick other technologies plus providers that may function underneath various kinds and situations for Cloud deployment under a solid and legitimate adoption strategy. A functional adoption strategy should also allow consumers to pick their goods and technology for effective delivery, rather than requiring them to use only one method [35].

Masood adoption strategy (Masood *et al.*, 2016)

[36] suggested a five-phase roadmap for cloud computing program adoption. They are: analyzing, making plans, adoption, migrating and management as depicted in Figure 2.

Strengths and weakness of the strategy

The strategy is cost effective and efficient. Benchmarks for security, legal, and compliance problems are discovered. The models do not consider variables that may affect the adoption intent and the adoption process as well [37].

4. Discussion

Technology adoption is connected to independent factors like personal qualities, internal institutional structured features, and external institutional characteristics, according to the DOI model at the company level [30].

Likewise, the TOE model highlights three components of an organization's context that impact how it accepts and executes technical innovations: technological context, organizational factors, as well as environmental factors.

In order to efficiently and effectively carry out the fundamental mandate of the research organization, the integration of the cooperative and ICT strategy must offer enabling technology. After reviewing the current cloud computing adoption plan, the following weaknesses were identified:

- External forces such as privacy issues and data security have been left out by the existing adoption strategy.
- The adoption approach presupposes that the research institution, whose focus is not on ICT, has the technical and human resource capabilities to embrace cloud computing.
- The adoption strategy offers the main stakeholders a few chances to add to or take part in the strategies for embracing cloud computing.
- Since the requirements, goals, and intentions vary per business, the adoption methods are made to be a generic adoption of cloud computing rather than built towards a specific industry.

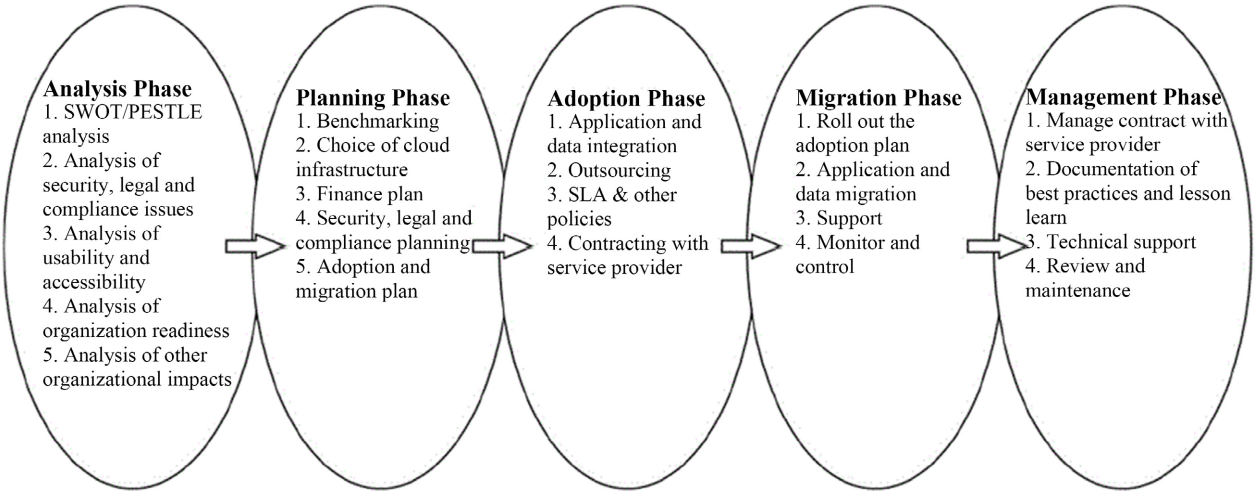

Figure 2. Cloud computing adoption strategies (Masood *et al.*, 2016).

Technology adoption is connected to independent factors like personal qualities, internal institutional structured features, and external institutional characteristics, according to the DOI model at the company level [30]. Likewise, the TOE model highlights three components of an organization's context that impact how it accepts and executes technical innovations: technological context, organizational factors, as well as environmental factors. The models discussed above do not consider such variables that may affect the adoption intent and the adoption process as well.

Research institutions are purely driven by funds from themselves, and mostly profits and therefore the alignment of the corporate strategy and the ICT strategy should provide enabling technology to efficiently and effectively deliver the research organization core mandate. Through review of literature, existing cloud computing adoption strategies lack in some aspects that are important in the research Institutions such as:

1) External factors like data security and privacy issues have not been addressed.

2) Assumption that all organizations have technical capability and human resource capacity to adopt cloud computing.

3) The strategies provide thin lines for the key stakeholders to contribute or participate in the strategies of adoption.

4) Have a generic adoption approach that does not address needs of certain industry most of which happen to be unique.

5. Conclusion and Future Work

We have followed the SLR methodology and identified 20 primary studies out of 60 papers. Our analysis is concerned with both service provider and consumer in cloud computing. The review and analysis of the selected studies identify the characteristics/peculiarities and IT environments of research institutions in Kenya and indicates that there are still enormous opportunities for researchers to contribute in this area. Some topics such as data security and privacy are widely investigated, while others, e.g. physical and organizational security, have received less attention. By answering the research question about the current cloud computing technologies, adoption approaches and drivers in the adoption of cloud computing, the research proved that the three main factors that include technological, organizational and environmental, work hand in hand and influence the adoption strategy in cloud computing. Moreover, it is also established that each organization has unique attributes that require a tailored cloud computing strategy. The research findings will help ICT Managers understand clearly why and how Research Institutions chose to adopt cloud computing. Future work will address the development of the adoption strategy and its validation.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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