



CLOUD COMPUTING IMPLEMENTATION IN A ZIMBABWEAN UNIVERSITY

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Abstract

Cloud computing has emerged as a transformative technology in higher education, offering universities cost-effective, scalable, and flexible solutions for data storage, computing power, and collaborative learning. This study investigates the implementation of cloud computing in a Zimbabwean university, focusing on the factors influencing adoption, the challenges faced, and the opportunities available for advancement. The study employs the Technology Acceptance Model (TAM) as a conceptual framework to analyze how technological, organizational, environmental, and individual factors affect cloud computing adoption. Using a qualitative research approach, purposive sampling was applied to select key participants, including IT staff, faculty members, and students. Data was collected through surveys, interviews, and document analysis, ensuring a comprehensive understanding of the adoption process. Findings reveal that technological factors, such as security and infrastructure readiness, significantly impact cloud computing adoption. Organizational factors, including leadership support and budget constraints, also play a critical role. Additionally, environmental influences, such as government regulations and internet connectivity, and individual perceptions, including user familiarity and resistance to change, affect the implementation process. Despite these challenges, the study identifies opportunities for advancing cloud computing, such as leveraging international partnerships, improving local ICT policies, and enhancing digital literacy among university stakeholders. The research contributes to the existing literature by highlighting the Zimbabwean context and proposing strategies for successful cloud computing adoption in higher education. The findings will assist university administrators, policymakers, and IT professionals in making informed decisions to enhance cloud computing integration, ultimately improving teaching, learning, and administrative efficiency.

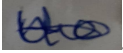
Keywords

Cloud Computing, Higher Education, Technology Acceptance Model (TAM), ICT Adoption, Zimbabwean Universities

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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Student's Signature.......... Date..... 27 March 2025

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Dedication

List of Acronyms and Abbreviations

ICT Information and Communication Technology

TAM Technology Acceptance Model

IT Information Technology

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Table 1: Africa University Stakeholders

DEPARTMENT	NUMBER OF STAKEHOLDERS
ICT	8
CEAS STAFF	10
ADMINISTRATIVE MEMBERS	10
CEAS STUDENTS	20

Table 2: Selected Research Participants

NAME	DEPARTMENT	EMAIL	CONTACT NO.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The enhancement in the information and communication technology (ICT) has brought about changes in different aspects of life in different parts of the globe with education not being left behind. A paradigm shift in the provision of computing service, referred to as cloud computing is a relatively new concept that models computing services as on demand, easily accessed services that can easily be scaled up or down to match the consumer's needs while being affordable, which can improve the learning environments. Cloud computing also avails opportunities of enhancing the teaching, learning, research, and administration in higher learning institutions since the institutions can access and use computing resources regardless of their own physical infrastructures. Several advantages have been attributed to the use of cloud computing among universities among that are flexibility, collaboration, and innovation. (Almaiah et al., 2020).

1.2 Background to the Study

1.2.1 Background to the Study

The major challenges encountered by Zimbabwean universities are many and include having limited resources, obsolete infrastructure, and lack of IT support. Cloud computing has transformed how businesses and institutions function, providing several advantages such as scalability, flexibility, and cost-effectiveness and it also has the ability to alter Zimbabwe's higher education scene. The adoption of cloud computing is seen as an option for Zimbabwean

institutions' challenges thus enabling them to get advanced technology and function effectively. But on the other hand, cloud computing integration in Zimbabwean universities is still a child and it demands a detailed study to understand its implementation possibilities. The aim of this research is to analyze the use of cloud computing in Zimbabwean institutions, looking at advantages, challenges and future outlook.

1.2.2 Statement of the Problem

Even though cloud computing has its rewards, Zimbabwean institutions are still struggling with considerable obstacles that stand in the way of embracing this technology. The challenges to be encountered consist of lack of structural resources and manpower, limited technical know-how, and apprehensions regarding data protection as well as confidentiality issues. It is important to carry out an exhaustive research that delves into the adoption of cloud computing in Zimbabwean universities despite these challenges and a study that also proposes possible strategies for addressing these issues.

1.3 Research Aim and Objectives

1.3.1 Research Aim

The objectives of this study include: Establishment of the status and level of adoption of cloud computing in Zimbabwean Universities The purpose of this study is to evaluate the implementation of cloud computing, the strengths, weaknesses, opportunities and threats for enhanced improvement in Zimbabwean universities.

1.3.2 Research Objectives

The objectives of this study are to:

1. Evaluate the current scenario of cloud computing in the universities of Zimbabwe
2. Analyze the implication of adopting cloud computing environment in Zimbabwean universities and get the general advantage and disadvantage of cloud computing environment.
3. To assess the quality of education and efficiency of administration before and after the introduction of cloud computing services.
4. To suggest ways we can adopt cloud computing in Zimbabwean universities

1.4 Research Question

1.4.1 Research Question

What are the advantages and disadvantages of cloud computing in Zimbabwean universities, as well as the current state of its adoption?

1.4.2 Sub-Research Questions

1. To what extent are the stakeholders in Zimbabwean universities aware and knowledgeable about cloud computing?
2. What are the technical and infrastructural factors that hinder the use of cloud computing in Zimbabwean universities?

3. That is, what measures can be taken to counter the challenges facing and promote the use of cloud computing within the Zimbabwean universities?

1.5 Significance of the Study

This study is significant for several reasons:

1. Contribution to knowledge: The outcomes of this research will expand the literature base of cloud computing in higher learning institutions; especially in Zimbabwean Universities.
2. Practical applications: This paper will endeavor to contribute knowledge for policymakers, university administrators, and IT personnel in the advancement of cloud computing in Zimbabwe's learning institutions.
3. Addressing challenges: This research will reveal the key factors potential in the implementation of cloud computing in Zimbabwe's universities and recommend ways of overcoming them.
4. Improving education: Therefore, the purpose of this study will be; Forging the analysis of the positive and negative implications of cloud computing to education in Zimbabwean universities, this study seeks to advance education in Zimbabwe.

1.6 Delimitation of the Study

1.6.1 Delimitation

It must also be noted that this study is exclusively on cloud computing in Zimbabwean universities and does not consider other technologies or settings.

1.6.2 Limitations of the Study

This study has several limitations:

1. Limited sample size: The study will involve participants in a small sample size, meaning it will not be a vast research.
2. Limited geographical scope: This is to state clearly that the study will only be confined to Africa University.
3. Limited time frame: Nonetheless, the study will only sample the population for some time maybe a week, a month, or a year.

1.7 Dissertation Structure

This dissertation is structured into five chapters:

- Chapter One: Introduction (current chapter)
- Chapter Two: REVIEW OF RELATED LITERATURE
- Chapter Three: Research Methodology
- Chapter Four: Data Presentation, Analysis, and Interpretation
- Chapter Five: Summary, Conclusion, and Recommendations

1.8 Chapter Summary

In this chapter, the research topic has been presented, the background information given, the problem defined, and the research aim and objectives are given. The variables used in this research including the independent and the dependent variable have also been described while establishing the following facets of the investigation, namely: Significance of the study, assumptions, delimitations, and limitations of the study. Last but not the least the structure of the dissertation and the meaning of terms used in it have also been defined.

Chapter Two: REVIEW OF RELATED LITERATURE

2.1. Introduction

Cloud computing is now one of the imperative technologies which aids in the renewal of many industries such as education. It is characterized by being able to provide computing services to anyone over the internet and at a cheap, adaptable, and elastic manner. In the context of this study cloud computing is therefore defined as a concept that holds great promise in improving teaching, learning, research, and administrative activities in context of higher education. This chapter presents the literature review section and it aims to discuss on implementation of cloud computing in higher education, particularly in Zimbabwean universities. It first defines the conceptual framework and then presents a literature review pertinent to the objectives of the present study.

2.2. Conceptual Framework

The conceptual framework for this study is based on the Technology Acceptance Model (TAM), a widely used framework for understanding user acceptance of technology. Developed by Davis (1989), TAM posits that two main factors influence technology adoption: perceived usefulness and perceived ease of use.

2.3. Factors Influencing Cloud Computing Adoption in Universities

Based on the purpose of this study, social factors that affect cloud computing adoption in universities include technological factors, organizational factors, environmental factors, and individual factors. Therefore, it is essential to consider these determinants to be able to organize and enhance the usage of cloud technologies within the educational segment successfully. This

section also uses of literature review to discuss the above factors individually and in relation to the adoption of cloud computing in universities.

2.3.1. Technological Factors

The technological factors are considered as one of the most influential drivers that facilitate the adoption of cloud computing in universities. These factors include the perceived benefits of cloud technologies, compatibility of the technologies, complexity of the technologies, and data security.

1.Perceived Benefits:

One must understand that cloud computing come with a number of advantages like scalability, flexibility of use, and relatively low cost as well as accessibility, which make it a great solution for universities. This feature makes it possible for institutions to adjust the IT resources as per the requirement thus controlling the overall expenditure and at the same time free from the cost of physical establishment (Owolabi et al. , 2020). Besides that, its share-ability of educational materials makes it easier for students and faculties to inter-act and access resources at any place at any time. (Almaiah et al., 2020).

2.Compatibility:

This category concerns the ability of the cloud computing services to work with other systems in a university. Some of the key adoption factors include the ability of the cloud solutions to effectively integrate with the institution's architecture, learning management systems and other education technologies as described by Park and Ryoo (2018). Some institutions with weak or old infrastructures may find it difficult to adopt the cloud technologies hence, will incur more costs to upgrade their systems.

3.Complexity:

Advanced technologies involved in cloud computing can be a limitation to adoption. Imperatively, the respective universities may consider cloud services as complicated and involving many challenges when being deploying for want of the personnel and technical know-how. Sustaining this barrier calls for the provision of training and development to ensure that the faculty and staff are ready to use the adopted cloud based tools and platforms.

4.Data Security and Privacy:

The challenges inherent to the use of computing clouds are key issues to be dealt with by universities: data security and data privacy. Education organisations process and store customers' information such as student records and research data therefor data security is crucial in institutions (Sithole et al. , 2019). In light of this, universities need to make sure that the CSPs they contract are able to meet the required levels of security standards and compliance to prevent exposure of clients' information to the wrong hands.

2.3.2. Organizational Factors

Organizational factors pertain to the internal characteristics of universities that influence cloud computing adoption. These factors include institutional policies, financial resources, and the technical expertise of faculty and staff.

1.Institutional Policies:

The decision-makers' policies and organizational strategies are significant enablers of cloud computing services. It implies that universities with well-stipulated ICT polices and or strategies have higher chances of procuring cloud technologies and thus are poised to gain from the possible opportunities that arise from the technologies (Khumalo, 2020). Organizational commitment from

leaders is fundamental to the uptake process and the attainment of organizational objectives.

2.Financial Resources:

Champion et al., 2011 acknowledged that the most constraints that discourage university to adopt cloud computing are; Among these, the financial constraints are the most acute hurdles for the universities within the developing countries such as Zimbabwe. Skilled human resources and capital investment are also a constraint because; it can be expensive when and if it is only fully deployed with limited budgets for ICT infrastructure and training to make sure that the cloud solutions work (Mutambara & Mawere, 2022). However, in the case of the cloud computing model, cost reduced through virtual resources and the use of the pay-as-you-go model which seems to solve some of the cost issues (Chitanana & Madzima, 2021).

3.Technical Expertise:

Human resources are also an organizational factor that plays a major role in the adoption of cloud computing; in this case, it is the technical know-how possessed by faculty and staff members of any given institution. In contemporary universities, there is need to hire professional personnel that can operate, maintain, and support cloud based systems and applications. The aspects such as training and professional development should be promoted in a university so that the ICT human capital can be endowed with skills necessary for optimizing cloud technologies (Gumbo & Maphosa, 2020).

2.3.3. Environmental Factors

Environmental factors encompass external pressures and influences that affect cloud computing adoption in universities. These factors include government regulations, competitive pressures, and technological advancements.

1.Government Regulations:

Based on the analysis of the information, the following conclusions can be drawn: The government of a country can either contribute to the process of cloud computing implementation or restrain it in the sphere of higher education. Policies that create awareness on the adoption of ICTs and grant funding for innovation in technology can greatly enhance cloud computing adoption (Sithole et al. , 2019). On the other hand, poor regulations that may either restrict the kind of services offered through cloud or lack of support of the government may slow the progress of cloud services and reduce the options available for its use.

2.Competitive Pressures:

Industry pressures within the context of education may influence the uptake of cloud computing. The universities wanting more reputation and more number of students may use the cloud technologies to provide new and diversified services in education and to increase organizational performance (Yang et al. , 2021). The urge of maintaining the Institution competitiveness when it comes to offering education forces institutions to embrace innovative tools and solutions such as the cloud computing infrastructures.

3. Technological Advancements:

Apart from the factors like cost, organizational strategies also dictate the deployment of cloud computing which is socially impacted by the change in technology like high-speed internet, mobile technologies and so on. With the growth of Internet connection and increase in number of mobile devices in Zimbabwe, the universities can seize the applications of cloud computing for educational needs (Ncube, 2020). With the advancement in technology, universities are forced to work with new trends and ensure they integrate the new inventions in their day to day running.

2.3.4. Individual Factors

Individual factors refer to the personal characteristics and perceptions of university stakeholders, including faculty, students, and administrators, that influence cloud computing adoption. These factors are rooted in the Technology Acceptance Model (TAM) and include perceived usefulness, perceived ease of use, and behavioral intention.

1.Perceived Usefulness:

Perceived usefulness is the perceived advantage gained from using cloud computing to improve on one's academic and or administrative performance. Therefore, when both faculty and students self-perceive the availability of the cloud technologies which is favorable in enhancing the delivery of teaching, learning and research, they are inclined to use the cloud technologies as posited by Venkatesh and Bala (2008). Stressing on the application benefits of cloud computing may have a positive impact on perceived usefulness and clouds uptake.

2.Perceived Ease of Use:

Ease of use is defined as the extent of compliance of the individuals with the proposition that using cloud computing will be trouble-free. Campus related cloud platforms which are easy to navigate and seamlessly incorporative as an application in everyday work and academic undertakings will therefore be embraced by the university stakeholders. Training and support are a way to improve perceived ease of use since the learners are going to have self-confidence in their ability to use the technologies afloat cloud solutions.

3. Behavioral Intention:

Actual use of the respective technology is determined by behavioral intention which, in turn, depends on perceived usefulness and perceived ease of use. If university stakeholders have positive attitudes toward cloud computing and have intentions to use these technologies, then they will increase on interaction with cloud tools and resources (Venkatesh & Bala, 2008). Recognizing and

managing the factors that affect the intention to perform a specific behavior can go far in enhancing the effectiveness of the diffusion of cloud computing in universities.

2.4. Challenges in Implementing Cloud Computing in Zimbabwean Universities

Considering the operations of cloud computing in universities, this concept has several benefits for improving both the educational process and the management of institutions. However, several challenges affect Zimbabwean universities and limit the chances of effective implementation of cloud technologies. Some of these challenges are the infrastructural binders, financial issues, data security issues, and change resistance. Realizing these challenges is the key to the formulation of efficient measures that will counter them and make the required improvements in the use of the concept of cloud computing in higher education.

2.4.1. Infrastructure Limitations

One of the primary challenges facing Zimbabwean universities in implementing cloud computing is infrastructural limitations. The country's ICT infrastructure is often inadequate to support the widespread adoption of cloud technologies. This inadequacy is reflected in several key areas:

1. Limited Internet Connectivity:

The connectivity to the internet in Zimbabwe is still a challenge to this date and it is most often slow especially in the rural areas where most universities are situated (Mutambara & Mawere, 2022). This means that cloud services can hardly be fully implemented because universities cannot support adequate high-speed internet which many cloud services rely on for the required data connectivity and access to cloud resources.

2. Insufficient Bandwidth:

While most of the regions now possess Internet connection, the bandwidth is usually inadequate to cater for the cloud computing applications. These challenges cause low transfer speeds, high latencies and poor performance of cloud applications that if incurred by a learning institution affects students and faculties (Chitanana and Madzima, 2021).

3. Lack of ICT Infrastructure:

Most universities in Zimbabwe are in a position to have poor ICT infrastructure for example modern machines like computing and network equipment to support cloud environments. This deficiency hinders these institutions' capacity to leverage and operate cloud-based solutions efficiently (Gumbo & Maphosa, 2020).

2.4.2. Financial Constraints

Financial constraints pose a significant barrier to the implementation of cloud computing in Zimbabwean universities. Several factors contribute to these financial challenges:

1.Limited Funding:

Frequently, the Zimbabwean universities are financially constrained universities, which receive rather small amounts of funds for improving the ICT (Mutambara & Mawere, 2022). For this reason, financial limitations become a problem for university management due to the high costs of deploying and supporting cloud computing solutions, implementing new hardware, software, and training activities.

2.High Costs of Internet Access:High Costs of Internet Access:

Indeed, the cost of interconnectivity in Zimbabwe was relatively high compared to other regions, making the issue even more costly to universities (Sithole et al. , 2019). Lack of affordable and secure internet connection can be a factor for the institution not fully adopting the cloud computing technologies since they are expensive to sustain.

3.Budgetary Prioritization:

Due to the limited availability of funds, most spend their presupposed budgets focusing on basic needs like employee remunerations and facility management, meaning that ICT investments are commonly given lower priorities. Such prioritization can help promote the establishment of cloud computing solutions but also slows down the adoption of cloud solutions and restricts the available funding for technology projects (Khumalo, 2020).

2.4.3. Data Security and Privacy Concerns

Data security and privacy concerns are significant challenges for Zimbabwean universities considering cloud computing adoption. Educational institutions handle sensitive information, such as student records, research data, and financial information, which must be protected from unauthorized access and breaches.

1.Lack of Trust in Cloud Provider:

Scholars identified the following risks that may prevent universities from trusting third-party cloud providers with their data: data breaches and misuse of data (Sithole et al. , 2019). This lack of trust can be a major hindrance to cloud adoption considering institutions go to cloud with the belief that their data will be protected and managed with compliance to laws.

2.Data Sovereignty Issues:

Data sovereignty issues are raised when the data is stored in cloud service providers' data centres located outside Zimbabwe. Universities may also concern themselves with the legal repercussions of data stored in foreign countries concerning data protection laws and policies (Ncube, 2020).

3.Compliance with Regulations:

From the analysis of the challenges discussed in this paper, it can be concluded that meeting the stipulated data protection regulation and standards poses a significant problem to universities implementing cloud computing. Institutions face serious challenges of various cloud service legal compliances of national and international data protection laws (Almaiah et al. , 2020).

2.4.4 Resistance to Change

Resistance to change among university stakeholders can impede the successful implementation of cloud computing initiatives. This resistance can manifest in several ways:

1.Cultural Resistance:

Faculty members, especially from traditional universities, may not accept the use of the cloud-based solution as they prefer traditional ways of teaching, learning, and administrative work (Khumalo, 2020). One of the techniques of addressing cultural issues as a barrier is through change management where means of addressing the concerns of stakeholders is done and where the need to promote cloud computing is done effectively.

2.Lack of Awareness and Understanding: Lack of Awareness and Understanding:

The insufficient knowledge of the cloud technologies among the members of the faculty and staff becomes the problem. This paper has identified key considerations for universities when adopting cloud computing, and the main Jim has been:

Universities have the responsibility of training and availing awareness programs that will create awareness of benefits of cloud computing among the stakeholders hence leading to its adoption.

3.Concerns About Job Security:

The staffers might also resist because they worry that cloud computing will result in job loss or changes in their position to another that is less desirable to them (Alshamaila et al. , 2019). Engaging these concerns through communication and promotion of professional development can assist reduce resistance.

2.5. Opportunities for Advancing Cloud Computing Adoption

A wider use of cloud technology in the learning institutions in Zimbabwe has a great potential of improving on quality output of teaching, efficient working, and creation of innovation. Despite the mentioned barriers, there are many opportunities through which institutions can embrace cloud computing. Thus, the possibilities for development are associated with the use of new technologies, the strengthening of cooperation and the exchange of materials and experiences, the increases of access to educational resources for minorities and other groups of the population, and the promotion of the creativity in the educational process. They have given these opportunities and if Zimbabwean universities can exploit it to the maximum then cloud computing offers the best way to enhance higher learning.

2.5.1 Leveraging Technological Advancements

Advancements in technology offer a solid background to the disambiguation of cloud computing in the universities of Zimbabwe. They are for example enhanced and widely available internet connection, ubiquity of mobile platforms, as well as availability of high level cloud services.

1. Improved Internet Connectivity:

In the last few years, there has been increased advancements in internet connection in Zimbabwe due to growth in broadband and mobile networks (Ncube, 2020). The following developments

presented to universities a great chance to utilize a reliable and fast internet connection. The advantages of cloud computing services can be completely integrated into education and administration processes.

2. Proliferation of Mobile Technologies:

The current increased use of mobile devices such as smartphones among the students and faculties offer universities a chance to adopt mobile cloud computing solutions (Almaiah et al. , 2020). Mobile technologies offer users the opportunity to connect to the cloud resources and applications and therefore support learning at any time and any place making educational content more accessible.

3. Advanced Cloud Services:

Some of the newly available cloud services, for instance AI, ML, and big data analytics create the opportunities for universities to improve on their research function (Yang et al. , 2021). Through these services, institutions are in a position to gather useful information from data, minimize human interactions in the processes of daily administrative work, and thus enhance decision-making.

2.5.2 Fostering Innovative Teaching and Learning Practices

Cloud computing provides a platform for universities to foster innovative teaching and learning practices, enhancing the quality of education and preparing students for the future workforce.

1. Blended Learning Models:

Thus, cloud computing enables the provision of blended learning in which face-to-face instruction is supplemented with online learning elements (Gumbo & Maphosa, 2020). These models are very

flexible and makes it easier for students to follow lessons at their own pace encouraging the acquisition of knowledge, skills and attitudes.

2. Interactive and Engaging Content:

Technological advances allow for the creation of the lessons through cloud-based applications which entail development of contents that can include simulation, virtual laboratory and game-like lessons (Ncube, 2020). These interventions can be helpful in reforming how knowledge is transferred in a classroom setting and thus be of help in boosting the motivation of learners besides improving performance.

3. Continuous Professional Development:

Cloud computing presents chances for learning that is continuous and lifelong for the faculty and staff through online courses, webcasts, and Groups of professional learning (Khumalo, 2020). Ongoing professional learning, So that the educators can continue their knowledge and know how on how to adoption cloud technologies into their practice.

2.5.3 Improving Accessibility and Inclusivity

Cloud computing can significantly improve accessibility and inclusivity in higher education by breaking down barriers to learning and providing equal opportunities for all students

1. Access to Educational Resources:

Cloud computing creates an opportunity to avail the universities' students with a tremendous number of educational means comprising e-books, online classes, and multimedia data (Owolabi et al. , 2020). These resources are available to the students courtesy of their devices and can be accessed anywhere and at any time which is helpful to students in far or developing countries.

2. Inclusive Learning Environments:

Cloud based platforms can adopt to enhance the inclusion of students with special needs because they allow for differentiated instruction based on the learner needs (Almaiah et al. , 2020). Introducing adaptive learning technologies and using the information technologies that are based on the artificial intelligence, it is possible to address the individual differences fundamentally and offer equal opportunities to all learners.

3. Remote Learning Opportunities:

The case of COVID-19 clearly brought the question of distance education into focus, and cloud computing was instrumental in universities' continued offering of classes during lockdowns (Yang et al. , 2021). The use of innovative platforms such as learning management systems, cloud technologies, and collaborations enhances institutions' possibilities to provide remote learning during emergencies.

2.6. Gap in Knowledge Identified

There is an abundance of literature written on the adoption of cloud computing. However, much of this literature is vague and cannot be used to examine specifically the Zimbabwean higher education context. This serve as the first gap in knowledge that can be filled with localised research: that is, the existing literature cannot be used to identify those factors, both challenges and opportunities that are unique to Zimbabwean universities. Why is a localised project worthy of our attention? In order to generate targeted action plans based on tangible evidence it is imperative that there be a focus on the particular challenges and opportunities for universities in Zimbabwe.

2.7. Chapter Summary

This chapter reviewed current literature on cloud computing adoption in Higher Education, focusing on factors which might influence adoption and barriers to adoption, including the challenges and ways to move forward. Future research has been also proposed to narrow gaps in what is currently known about this topic. The following chapters will fill these gaps, starting with the next one.

Chapter Three: RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the research methods that were adopted to study the phenomenon of cloud computing use at Africa University. They cover the context of the study, research paradigm, research methods and design, the population, sample and sampling techniques, measurement instruments, data collection, results presentation and analysis, validity and reliability, and research ethics.

3.2. Research Approach

This research study adopted a mixed method research approach, which entails both quantitative and qualitative methods. This approach creates a solid understanding of the study subject by integrating quantitative information with detailed contextual information.

3.3. Research Philosophy

Hence, the research philosophy used in this study is pragmatism. It is also coupled with the notion of practical utility which aims at applying results of research studies while it acknowledges both the quantitative and qualitative experience. This philosophy is suitable for issues that requires quantitative data and qualitative understanding such as when adopting cloud computing. (Saunders, Lewis, & Thornhill, 2019).

3.4. Research Design

The study format chosen is descriptive and comparative in approach. Descriptive research gives an idea about the extent of implementing cloud computing while exploratory research identifies

the reasons for and against and the possibilities for cloud computing. There is an attempt to make use of a case study format in an effort to focus on a single Zimbabwean university namely, Africa University for granular analysis. (Yin, 2018).

3.5. Population

The target population for the study entails all beneficiaries who would benefit from the shifting of the organization to cloud-based structure. This includes IT employees, lecturers/faculty members, administrative members, and college of engineering students.

3.6. Sample and Sampling

A purposive sampling technique is used to identify the population of stakeholders at the university and obtain a sample. The use of this method is significant in covering all the respondents with less or more engagement and knowledge about the cloud computing adoption. So for this research, I will use the stratified sampling technique to randomly pick groups of people from the population chosen.

Sample Size

The sample size consists of:

- 8 ICT members of staff
- 10 members of the college of engineering
- 10 administrative members
- 20 CEAS students

3.7. Research Instruments

The research instruments used in this study include:

- **Questionnaires:** Questionnaires based on structured questions are administered to gather data in relation to factors that determine the use of cloud computing technology
- **Interviews:** The view of challenges and opportunities is also obtained through qualitative analysis of key informants using administration of semi-structured interviews.
- **Document Analysis** Secondary data sources include looking at Institutional reports and policy documents to accompany the primary data collected.

3.8. Data Collection

Data collection is carried out in two phases:

Phase 1: Quantitative Data Collection: Knowledge questionnaires are sent electronically through google forms to the identified participants. They help to achieve high response rate, follow-up reminder is usually used as a tool.

Phase 2: Qualitative Data Collection: Every key informant participates in in-depth interviews with the aid of an interview guide for standardization of the responses. This creates transcripts for evaluation, from interviews that have been recorded.

3.9. Data Presentation, Analysis, and Discussion

Data presentation and analysis are conducted as follows:

- Quantitative Data: The quantitative data analysis entails the use of means, frequencies as well as percentages thus making it descriptive. Analytical statistics (Regression) are used in the study to establish connections between variables or factors.

- Qualitative Data: Data analysis of the interviews conducted is done using thematic analysis because it enables the coder to search and locate similar themes and patterns from the interview transcriptions. Qualitative data is coded and organized with the help of NVivo computer software.

3.10. Issues of Validity and Reliability

To ensure the validity and reliability of the study:

- Validity: Instrument triangulation is used by integrating data collected from various parts (questionnaires, interviews, and documents) to confirm the results. Questionnaires are properly developed and prepared through pre-testing before they are administered to the target respondents.

- Reliability: Considering the fact that standardization is kept intact by applying homogeneity of data collection procedures and instruments, this is achieved. To ensure quality of the quantitative data, inter coder reliability is achieved through having many researchers manually transcribe and code the qualitative data.

3.11. Ethical Considerations

Ethical considerations include:

- Informed Consent: The participants are educated on the intended study, and permission is sought to make the collections.

- Confidentiality: Participants' identities and their answers are kept secure and anonymity is provided when reporting the findings.

- Voluntary Participation: Subjects have choice to be in the study and they are free to drop out the study at any given time.

3.12. Chapter Summary

This chapter has expounded on the research design for assessing the case of cloud computing implementation at Africa University. This work has explained the research method, paradigm, plan, population, sample and sampling technique, research instruments, data collection, presentation and analysis, concerns of validity and reliability, and issues of ethics in research. The analysis section is the topic of the next chapter, which will discuss the results obtained from the collected data.

CHAPTER 4: DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.1 INTRODUCTION

This chapter presents the findings from the survey conducted on cloud computing implementation in a Zimbabwean university. The collected data is analyzed and interpreted to understand respondents' familiarity with cloud computing, their experiences with external cloud services, perceived benefits, their support for cloud adoption and also their reservations when it comes to the technology and usage of it. The analysis is organized according to the research objectives and survey themes.

4.2 Data Presentation and Analysis

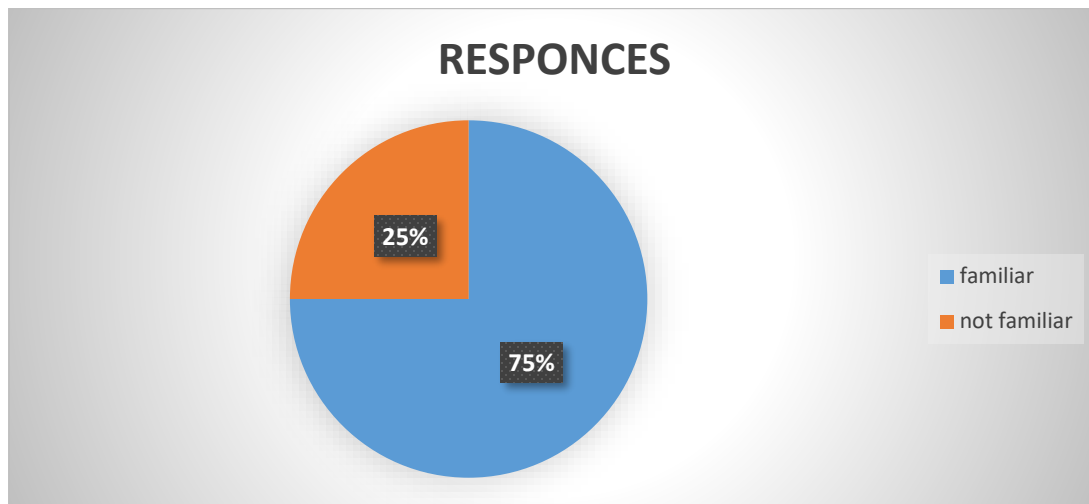
4.2.1 Response Rate

A total of 48 questionnaires were distributed using a stratified random sampling method, ensuring representation across various university groups. 40 responses were received, yielding an 83.3% response rate, which is considered sufficient for reliable analysis and interpretation.

DEPARTMENT	NUMBER OF SURVEYS SENT	NUMBER OF RESPONCES	PERCENTAGE
I.C.T	8	5	62.5%
CEAS STAFF	10	8	80%
ADMINISTRATIVE STAFF	10	8	80%
CEAS STUDENTS	20	19	95%

4.2.2 Familiarity with Cloud Computing

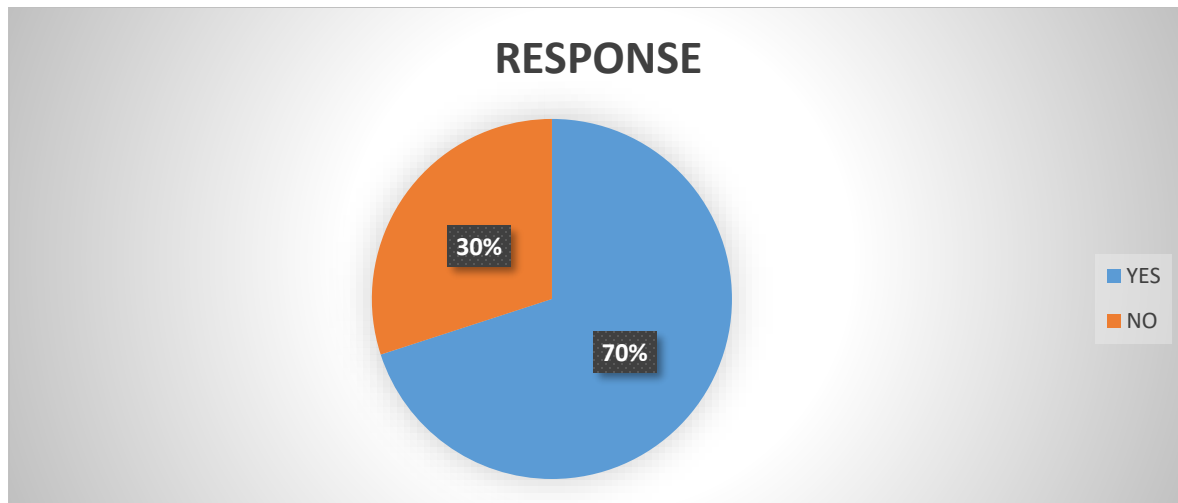
Participants were asked whether they were familiar with cloud computing. The responses are summarized below



The answers revealed that out of 40 respondents, 30 people (75%) had at least some knowledge of cloud computing while 10 respondents (25%) indicated that they had little or no knowledge on this subject. This generally high knowledge rate suggests cloud computing is not such an entirely new concept to the majority of respondents. This correlates well with Mukeredzi and Chitanana's (2021) findings that increasing awareness of digital tools is being felt throughout Zimbabwean higher education. However, 25% of those in the survey who do not have that knowledge presents an opportunity for targeted educational initiatives to bridge this gap.

4.2.3 Use of Cloud Computing Services Outside the University

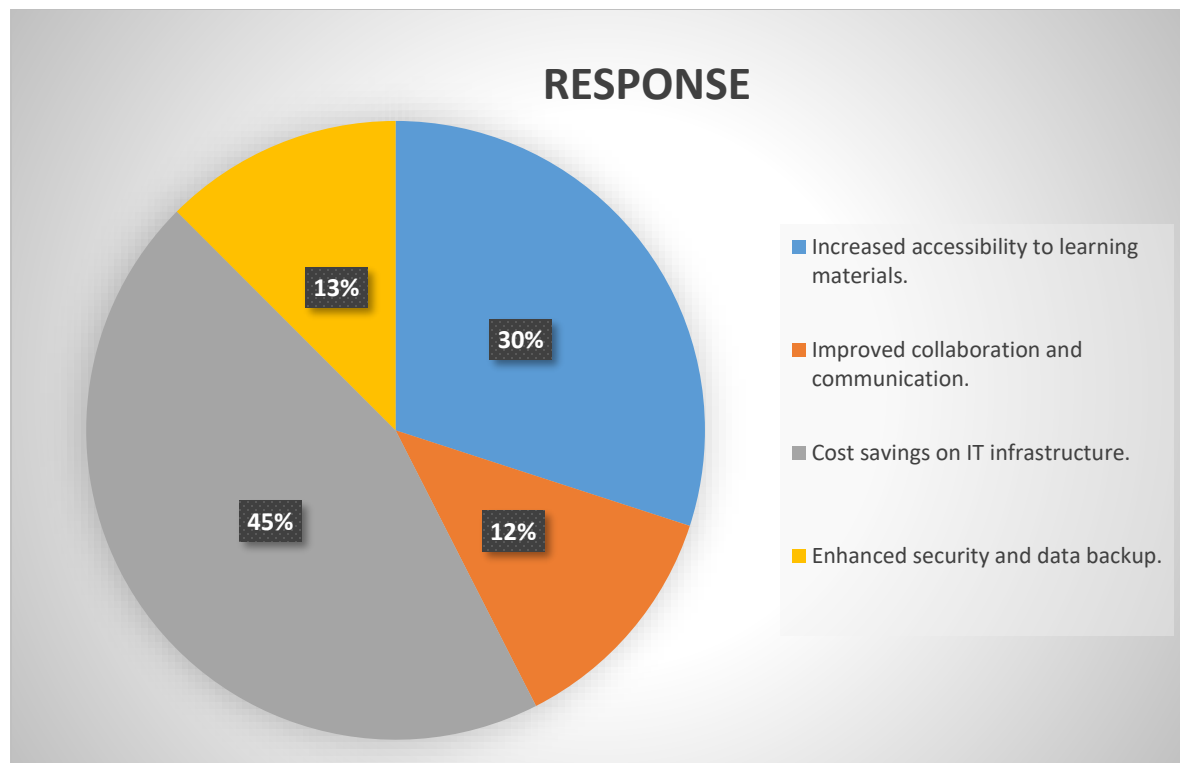
When asked if they had used cloud computing services outside the university (e.g., Google Drive, Dropbox, OneDrive, iCloud), participants responded as follows:



As many as 28 out of 40 respondents (70%) indicated that they have used these services, while the remaining 12 respondents (30%) have not yet had experience with them. This information suggests that quite a bit of the respondents have some first-hand use of cloud services, which could prove to be valued in encouraging readiness among them for similar systems in the university. According to Venkatesh and Davis (2020), users with prior experience with a technology are more likely to adopt it within a new context due to perceived ease of use and usefulness. The 30% who have not used cloud services reflect a challenge in introducing new technologies that would necessitate targeted training programs for sure smooth adoption.

4.2.4 Perceived Benefits of Cloud Computing Adoption

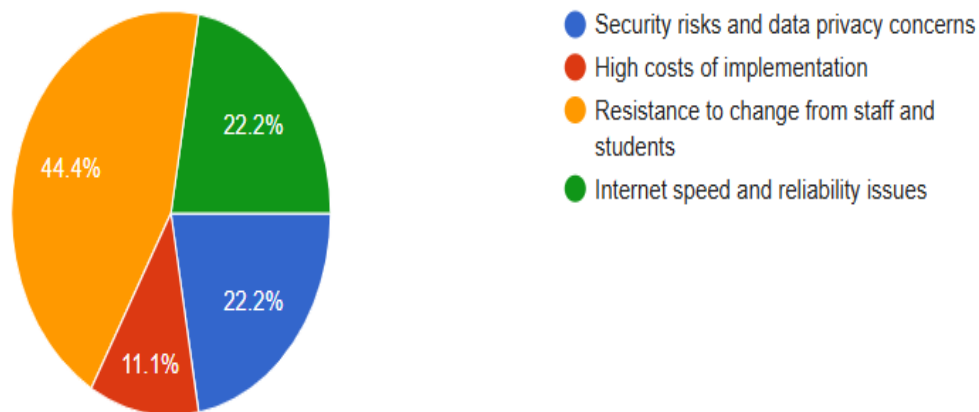
Participants were asked how they believe cloud computing could benefit the university. Their responses were categorized into four main areas:



The most important advantage is the "Cost savings on IT infrastructure," which reflects financial strains on Zimbabwean universities or any Zimbabwean organisations. As stated by Chigora and Zhou (2020), physical infrastructure cost reduction is typically the primary driver for adopting cloud solutions in developing regions. Meanwhile "Increased Accessibility" coincides with findings by Hashim and Idris (2021) arguing that the cloud enables improved access to educational materials. The low recognition of "Collaboration" and "Security" could reflect limited understanding of these advanced capabilities and therefore needing awareness creation campaigns.

4.2.5. Concerns for adopting the technology

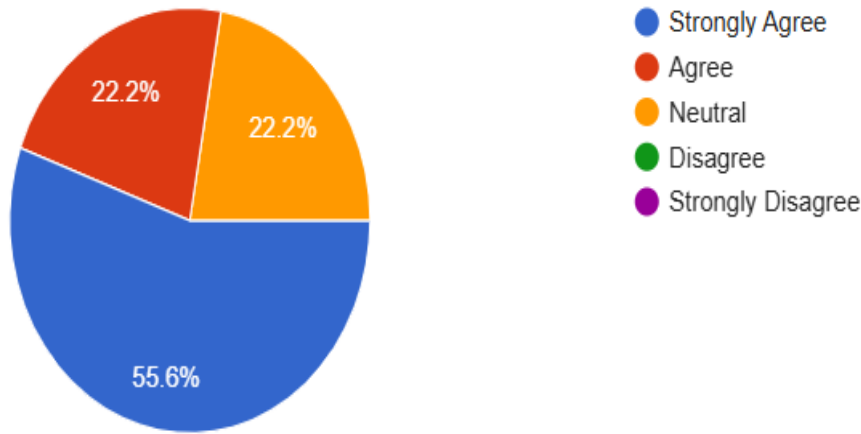
Participants were asked about their concerns on adopting cloud computing in the university. Their responses were categorized into four main areas:



Resistance to change emerged as the most significant concern, highlighting the need for comprehensive training programs and change management initiatives to improve user acceptance. Security concerns can be mitigated by adopting secure cloud providers, data encryption, and multi-factor authentication. Internet-related challenges could be addressed through infrastructure improvements and offline-compatible solutions, while hybrid cloud models and educational discounts may help reduce implementation costs. Addressing these concerns is crucial for ensuring the successful adoption of cloud computing in the university.

4.2.6 Support for Cloud Computing Adoption

When asked if they would support the adoption of cloud computing in the university, responses were distributed as follows:



A whopping 77.5% (strongly agree + agree) of participants favor the adoption, indicating that they are more likely to go to cloud-based solutions. This is an expectedly consonant view regarding the Technology Adoption Model (TAM) which states that positive attitudes and perceived usefulness drive technology adoption (Venkatesh & Davis, 2020). However, 22.5% remained neutral out of uncertainty, lack of technical know-how, or fear of security. Future cloud adoptions will aim at this group by addressing their queries through information workshops and pilot projects.

4.3 Discussion and Interpretation

4.3.1 Familiarity and Experience with Cloud Computing

The survey results indicate that most respondents (75%) are familiar with cloud computing, which suggests a baseline knowledge that can facilitate the adoption process. The fact that 70% of respondents have already used cloud services outside the university further implies a readiness to embrace similar technologies within the academic environment.

4.3.2 Perceived Benefits and Concerns of Cloud Computing

The data reveals that the most valued benefit is cost savings on IT infrastructure, as identified by 45% of respondents. This aligns with previous studies highlighting cloud computing's ability to reduce hardware and maintenance costs (Almorsy et al., 2022). Other significant benefits include increased accessibility to learning materials and enhanced collaboration, which can improve both

academic delivery and administrative efficiency. However, there is also concern over the resistance to change by the university stakeholders as stated by the Participants, were by 44,4% of them highly think so.

4.3.3 Support for Cloud Computing Adoption

The strong support for cloud computing adoption, with 77.5% of respondents expressing agreement, indicates a positive institutional attitude. However, the 22.5% of respondents who remained neutral may reflect concerns about implementation challenges, data security, or a lack of detailed understanding of the technology.

4.3.4 Implications for Cloud Adoption in the University

The findings suggest that cloud computing adoption is feasible and widely supported within the university. With most respondents already familiar with the technology, the primary challenge lies in addressing the concerns of neutral respondents and providing comprehensive training and support during the transition.

4.4 Chapter Summary

This chapter presented and analyzed survey findings on cloud computing adoption at Africa university. The data showed high familiarity and prior usage, strong perceived cost-saving benefits, and significant support for adoption. However, some participants were unaware of security and collaboration advantages, and 22.5% remained neutral, indicating areas for improvement. The findings align with the Technology Acceptance Model (TAM), suggesting that perceived usefulness and ease of use influence attitudes toward adoption. The next chapter will provide recommendations to address these findings and ensure a smooth transition to cloud-based solutions.

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a comprehensive summary of the study's findings, drawing conclusions based on the research objectives. It also discusses the implications of the research, offers practical recommendations for the adoption of cloud computing in Zimbabwean universities, and suggests areas for further research. The chapter aligns with the research aim of evaluating the implementation of cloud computing, including the strengths, weaknesses, opportunities, and challenges faced by Zimbabwean universities.

5.2 Discussion

This study aimed to evaluate the implementation of cloud computing in Zimbabwean universities by assessing the current adoption status, identifying challenges, and proposing strategies for effective implementation. The research followed a structured approach, progressing from understanding the background to analyzing empirical data collected through a Google Forms survey.

In Chapter 1, the study introduced the aim and objectives, focusing on evaluating the status of cloud computing adoption, analyzing its implications, and suggesting ways to adopt cloud computing in Zimbabwean universities. The research questions centered on the extent of awareness, technical and infrastructural barriers, and measures to facilitate cloud adoption. Chapter 2, This chapter examined the Technology Acceptance Model (TAM) to understand how perceived usefulness and ease of use influence adoption. Furthermore, the chapter discussed factors influencing adoption—technological, organizational, environmental, and individual—and highlighted challenges (such as security risks and resistance to change) and opportunities (such as cost savings and increased accessibility).

In Chapter 3, the study outlined the research methodology, adopting a quantitative approach through a stratified random sampling technique. A Google Forms questionnaire was distributed to 48 participants, and 40 responses were collected. The chapter also detailed the sampling process, data collection methods, and ethical considerations, ensuring participant anonymity and confidentiality.

Chapter 4 presented and analyzed the survey findings. Key results included:

Awareness and Usage: 75% of respondents were familiar with cloud computing, and 70% had used cloud services outside the university.

Perceived Benefits: Respondents highlighted cost savings on IT infrastructure (45%), increased accessibility to learning materials (30%), and improved collaboration and data security (25%) as major benefits.

Support for Adoption: 77.5% of respondents supported the adoption of cloud computing, with 55% strongly agreeing and 22.5% agreeing.

Challenges: The most significant barriers were resistance to change (44.4%), security concerns (22.2%), internet speed issues (22.2%), and high implementation costs (11.1%).

The discussion emphasizes that while there is substantial awareness and support for cloud computing adoption, successful implementation will require addressing technical, cultural, and financial barriers. The findings align with global research that suggests infrastructure improvements and user training are critical for successful cloud adoption. Additionally, the Technology Acceptance Model (TAM) proved useful in understanding how perceived benefits and ease of use influence stakeholder attitudes. The study underscores the need for a strategic, phased approach to integrating cloud computing in Zimbabwean universities.

5.3 Conclusions

This study aimed to evaluate the status, implications, and future possibilities for implementing cloud computing in Zimbabwean universities. Through an analysis of 40 survey responses, several key insights emerged regarding awareness levels, perceived benefits, challenges, and support for adopting cloud services.

Achievement of Research Objectives

1. Objective 1: Evaluate the Current Scenario of Cloud Computing in Zimbabwean Universities

The study reveals moderate awareness of cloud computing among university stakeholders, with 75% of respondents reporting familiarity with the concept. However, while 70% have used cloud services outside the university (such as Google Drive or Dropbox), institutional-level adoption remains limited. This suggests a disparity between personal familiarity and organizational implementation.

2. Objective 2: Analyze the Implications of Adopting Cloud Computing

The research identifies several positive implications of adopting cloud computing. Respondents highlighted cost savings on IT infrastructure (45%), increased accessibility to learning resources (30%), improved collaboration (12.5%), and enhanced data security (12.5%). However, there are significant concerns regarding data privacy, implementation costs, resistance to change, and internet reliability—challenges that must be addressed for successful adoption.

3. Objective 3: Assess the Impact on Education and Administrative Efficiency

Participants recognized cloud computing's potential to improve educational quality by providing 24/7 access to learning materials and fostering collaboration. On the administrative side, it could streamline data management and reduce operational costs. However, the success of these improvements depends on addressing infrastructural and technical challenges.

4. Objective 4: Suggest Strategies for Cloud Computing Adoption

The findings suggest that successful adoption requires:

- Investment in robust infrastructure to improve internet speed and reliability.
- Comprehensive staff training to reduce resistance to change.
- Clear data protection frameworks to address security concerns.
- Collaboration with cloud providers to reduce initial costs and provide technical support.

Summary of Key Findings

1. Awareness: Majority are familiar with cloud computing, though institutional-level implementation is minimal.
2. Benefits: Cost savings, accessibility, collaboration, and data security are recognized as primary advantages.
3. Challenges: Security concerns, high costs, staff resistance, and unreliable internet were identified as key barriers.
4. Support for Adoption: 77.5% of respondents either agree or strongly agree with the university adopting cloud computing.

Overall, the study concludes that while there is substantial support for adopting cloud computing, technical and cultural barriers must be addressed to ensure successful implementation.

5.4 Implications

The findings of this research have several implications for university management, policy makers, and technology providers. These implications cover both practical and theoretical perspectives:

Implications for University Management

1. Strategic Planning: University leaders must develop comprehensive cloud adoption strategies, including timelines and phased implementation to minimize disruption.
2. Infrastructure Development: Investment in high-speed internet and secure storage solutions is crucial to support cloud-based systems.

3. Training and Change Management: Faculty and administrative staff must receive ongoing training to ease the transition and reduce resistance to change.
4. Data Governance: Establishing data security policies and compliance frameworks is essential to protect sensitive information and **maintain user trust**.

Implications for Policy Makers

1. Regulatory Framework: National education authorities should establish policies that promote secure and ethical cloud computing practices while encouraging innovation.
2. Funding and Support: Providing financial support to universities for cloud adoption can ease implementation costs and facilitate digital transformation.

Implications for Technology Providers

1. Tailored Solutions: Cloud service providers should offer customized packages for academic institutions, considering their budgetary constraints.
2. Technical Assistance: Continuous technical support and training partnerships can help institutions overcome operational barriers.

Theoretical Implications

1. Technology Adoption Models: This study supports the Technology Acceptance Model (TAM) by demonstrating that perceived usefulness (cost savings, collaboration) and ease of use (familiarity with cloud services) strongly influence support for adoption.
2. Innovation Diffusion Theory: Findings align with Rogers' Innovation Diffusion Theory, where early adopters shape how new technologies spread within an institution.

5.5 Recommendations

Based on the study's findings, the following recommendations are proposed for successful cloud computing adoption in Zimbabwean universities:

1. Enhance Infrastructure and Connectivity

- Invest in faster, more reliable internet connections to ensure smooth cloud service delivery.
- Consider hybrid cloud solutions to balance on-premise control with cloud scalability.

2. Prioritize Data Security and Privacy

- Establish data protection protocols to safeguard sensitive university data.
- Work with trusted cloud vendors who comply with international data privacy standards.

3. Conduct Training and Awareness Programs

- Implement ongoing training for staff and students to enhance cloud literacy.
- Offer workshops and seminars to address misconceptions and reduce resistance to change.

4. Foster Collaboration with Cloud Providers

- Partner with cloud service companies such as Kenac to access discounted education packages.
- Explore public-private partnerships to reduce implementation costs.

5. Develop a Cloud Adoption Roadmap

- Create a step-by-step adoption plan that includes pilot testing and feedback collection.
- Monitor and evaluate implementation progress regularly.

5.6 Suggestions for Further Research

While this study provides valuable insights, further research is needed to address remaining gaps and expand understanding of cloud computing adoption in Zimbabwean universities:

1. **Longitudinal Studies:** Future research could conduct long-term evaluations to assess the impact of cloud adoption on academic performance and administrative efficiency.

2. **Comparative Analysis:** Comparing cloud adoption across different universities or regions in Zimbabwe can reveal context-specific challenges and success factors.
3. **Qualitative Research:** Conducting interviews and focus groups with decision-makers can provide deeper insights into the organizational culture and resistance to change.
4. **Cost-Benefit Analysis:** Analyzing the financial implications of cloud adoption could guide budget allocation and investment decisions.
5. **Student Perspectives:** Investigating student experiences and expectations regarding cloud-based learning platforms can help tailor user-centered solutions.

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APPENDICES

APPENDIX 1

RESEARCH QUESTIONNAIRE

Title: Cloud Computing implementation in a Zimbabwean University

Introduction

Dear Participant,

I am conducting research on **cloud computing implementation** in a Zimbabwean university as part of my academic study. The objective of this questionnaire is to understand the factors that may influence the adoption of cloud computing, the potential challenges, and the opportunities it presents for the university.

Your responses will be **kept confidential** and used solely for academic research purposes. Participation is **voluntary**, and you may withdraw at any time.

Thank you for your time and cooperation.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender:

- ☐ Male
- ☐ Female
- ☐ Other (Specify): _____

2. Age Group:

- ☐ 18 – 25 years
- ☐ 26 – 35 years
- ☐ 36 – 45 years
- ☐ Above 45 years

3. Role in the University:

- ☐ Student

- ☐ Lecturer
 - ☐ IT Staff
 - ☐ Administrative Staff
 - ☐ Other (Specify): _____
4. **Level of Education:**
- ☐ Undergraduate
 - ☐ Postgraduate
 - ☐ PhD
 - ☐ Other (Specify): _____
5. **Are you familiar with cloud computing?**
- ☐ Yes
 - ☐ No
6. **Have you used cloud computing services outside the university (e.g., Google Drive, Dropbox, OneDrive, iCloud, etc.)?**
- ☐ Yes
 - ☐ No
-

SECTION B: PERCEPTIONS TOWARDS CLOUD COMPUTING ADOPTION

7. **How do you think cloud computing could benefit the university?** (Tick all that apply)
- ☐ Increased accessibility to learning materials
 - ☐ Improved collaboration and communication
 - ☐ Cost savings on IT infrastructure
 - ☐ Enhanced security and backup of data
 - ☐ Other (Specify): _____
8. **What concerns do you have about using cloud computing in the university?**
- ☐ Security risks and data privacy concerns
 - ☐ High costs of implementation
 - ☐ Resistance to change from staff and students
 - ☐ Internet speed and reliability issues
 - ☐ Other (Specify): _____
9. **Would you support the adoption of cloud computing in the university?**
- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Neutral
 - ☐ Disagree

- ☐ Strongly Disagree

10. What training or support do you think would be necessary for a smooth transition to cloud computing?

- ☐ Workshops and training sessions for students and staff
 - ☐ IT department should provide full technical support
 - ☐ Awareness campaigns to educate users on benefits and risks
 - ☐ Other (Specify): _____
-

SECTION C: FACTORS INFLUENCING CLOUD COMPUTING ADOPTION

11. What technological factors do you think will affect cloud computing adoption at your university? (Tick all that apply)

- ☐ Internet availability and speed
- ☐ Compatibility with existing systems
- ☐ Security and privacy concerns
- ☐ Accessibility and ease of use
- ☐ Other (Specify): _____

12. What organizational factors do you think will influence cloud computing adoption?

- ☐ University's IT infrastructure readiness
- ☐ Support from university leadership and management
- ☐ Policies on technology adoption
- ☐ Training programs for staff and students
- ☐ Other (Specify): _____

13. What environmental factors may affect cloud computing implementation?

- ☐ Government regulations and data protection laws
- ☐ Cost of internet services and cloud subscriptions
- ☐ Availability of reliable cloud service providers
- ☐ Other (Specify): _____

14. What individual factors do you think will influence cloud computing adoption?

- ☐ Digital literacy skills of staff and students
 - ☐ Willingness to adopt new technologies
 - ☐ Privacy and trust concerns
 - ☐ Other (Specify): _____
-

SECTION D: CHALLENGES AND OPPORTUNITIES FOR CLOUD COMPUTING ADOPTION

15. What challenges do you anticipate in implementing cloud computing at the university? (Tick all that apply)

- ☐ High cost of implementation and maintenance
- ☐ Resistance from staff and students
- ☐ Lack of IT infrastructure and support
- ☐ Data security and privacy concerns
- ☐ Other (Specify): _____

16. What opportunities do you think cloud computing could bring to the university?

- ☐ Enhanced remote learning and accessibility
- ☐ Improved collaboration between students and lecturers
- ☒ Cost reduction in IT management
- ☐ Increased efficiency in administrative processes
- ☐ Other (Specify): _____

17. Do you have any recommendations for a successful implementation of cloud computing at the university?

THANK YOU FOR YOUR PARTICIPATION! 🎓
