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Topic: Adoption of Cloud Computing by IT-based SMEs in Zimbabwe

BY

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CHAPTER 1

INTRODUCTION

1.0 Background

Numerous businesses make up the worldwide economies, with Small and Medium Sized Enterprises making up the majority of them (SMEs). By considerably boosting each nation's Gross Domestic Product (GDP) and labor market, they play a crucial role in each market. Therefore, it is advantageous for both SMEs and the economy as a whole to propose new ideas or build new systems that can help SMEs become more productive and efficient. Use of proper information and communication technologies (ICT) is one of the ways that might help SMEs become more effective (Tehrani, 2018). One such tool for improving SMEs' performance in terms of growth and profit is cloud computing.

By 2018, it's anticipated that the global market for cloud computing would expand at a compound annual rate of 28%. By 2015, spending on cloud services would lead to the creation of up to 14 million jobs globally, and information technology (IT) innovation brought on by cloud computing may result in annual new business revenues of US$1.1 trillion. Cloud computing has emerged as a significant trend and is anticipated to fundamentally alter how businesses operate (Pornwasin, 2018).

Information technology (IT) has been viewed as a crucial component of modern business in the United Kingdom, as demonstrated by the way it helps organizations with communication, information storage, retrieval, and reporting, among other crucial business functions (Davenport, 2018). IT has been found to assist Small and Medium Enterprises (SMEs) in a number of ways, most notably as an enabler of productivity, efficiency, and an influencer of competitive advantage (Davenport, 2018; Ong, Habidin, Ithnin, &Fuzi, 2016). However, research indicates that SMEs generally, and particularly those in developing economies like Kenya, have a poor adoption of IT (KNBS, 2016; Agboh, 2015). The main issues with traditional IT systems have been the high setup costs and the complicated management of networking, software, and hardware, which also necessitates specialized personnel for deploying and maintaining IT services (Alshamaila, Papagiannidis, & Li, 2018).

Michael, Makarius, and Samuel (2009) assert that Small and Micro Enterprises (SMEs) are crucial to the economies of many nations. SME failure is a real threat since, according to prior data, three out of every five fail during the first few months. For instance, the SME sector in Indonesia generated almost 50% of new jobs created in 2005.

The adoption of the cloud as a new paradigm in computing has several benefits for American businesses, particularly smaller ones. A few of the many benefits that cloud computing offers to SMEs include flexibility, scalability, and lower costs. Cloud computing improves businesses' ability to compete (Throng, 2020). Additionally, it makes it possible for SMEs to use advanced technologies without having to pay a lot of money. These benefits enable SMEs to concentrate on their primary business, which in turn helps them expand and become more productive, efficient, and inventive. This is applicable to both new and established businesses. Additionally, it should be mentioned that cloud providers are experts in offering IT services; as a result, the services offered by these businesses are superior to those offered by SMEs' IT departments. By relying on enormous, centralized data centers, economies of scale are achieved (Ryan, Merchant & Falvey, 2011).

Due to a surge in demand for cloud computing services from local SMEs, Kenyan fiber optic cable firm Seacom Ltd. entered the market for cloud services in 2018 through its subsidiary Pamoja Cloud Services (Sunday, 2018). According to Khisa (2018), a statutory obligation for businesses, whether large and small, to have a solid backup that should be available for a lengthy period of time has fueled the rising usage of cloud services by local SMEs. A single inaccurate tape backup will require a manual redo, making the traditional type of backup—tape backups—time-consuming and error-prone. Data is captured each day and stored offsite.

The utility computing model, in which computing resources are given and consumed as a service on demand, is made possible by the cloud computing paradigm, which lowers entry barriers and makes it easier for businesses to employ IT (Junior, Biancolino, & Antonio, 2018). More so than larger companies, Small and Medium-sized Enterprises (SMEs) would find cloud computing to be an appealing alternative because they might not have as many resources to devote to IT (Carcary, Doherty, & Conway, 2018).

Because it provides a new way of computing by combining already existing technology, cloud computing is seen as an invention in South Africa (Behrand, Wiebe, London & Johnson, 2020).

Similar to earlier advances, there are additional considerations that affect whether or not to use cloud computing in addition to its costs and advantages. SMEs pay for the services they use and just use the computing resources. SMEs can lower their project risk, investment costs, and operating and maintenance expenses by using cloud computing (Khan, Zhang, Khan & Chen, 2011).

The cloud computing payment model in Zimbabwe is what sets it apart from traditional computing (which includes building internal infrastructure). Pay-as-you-go payment models enable businesses to only pay for the service they have really used. Without having to make a big upfront investment, businesses may access and utilize the most advanced computing services. They are not required to make an upfront payment to purchase, install, or license the system. Additionally, firms are not accountable for updating and maintaining hardware and software. Although cloud computing has many benefits for businesses, there are also negative aspects to this new development. The security, dependability, and availability of the cloud are a few of the problems that other researchers have raised.

The virtualization of servers, apps, desktops, storage, and other enterprise infrastructure components can be a key element of the shift towards the Plataea of Productivity phase in the current economic climate in Zimbabwe and, in fact, the whole of Africa. As evidence that digital disruptors are creating a new world that uses technologies to transform their respective industries, AIRBNB, Alibaba, and Uber have been mentioned. One-third of large businesses are aware of the basics of cloud computing, but two-thirds are unaware of the advantages of one of the biggest shifts in the ICT environment. A private cloud should be the best option for many businesses to achieve their objectives, but getting there requires a step-by-step process that starts with virtualization and concludes with migrating mission-critical apps to the cloud. While some businesses perceive applications as a logical fit but are less certain about their hardware infrastructure, many businesses fail to overcome the security barrier.

1.2 Statement of the Research Problem

Budget constraints prevent Small and Medium Enterprises (SMEs) from having enough money to invest in IT services (Venkatraman & Fahd, 2016). The majority of SMEs then frequently employ low-cost IT solutions and manual processes, which may only be adequate for short-term

use and may not be able to scale as the firm grows (Widyastuti&Irwansyah, 2018). Utilizing cloud services could become essential to SMEs' success (Ahmad & Siddiqui, 2018; Widyastuti&Irwansyah, 2018). This is due to the fact that many IT services used by SMEs are typically delivered through the cloud, which requires less setup capital than traditional IT setups (Alshamaila, Papagiannidis, & Li, 2018). In the past, investigations were undertaken by researchers in both developed and developing nations to determine the levels of adoption, such as in universities, insurance, and industry, which influenced research into frameworks for adoption (Ahmed, 2011; Lamba & Singh, 2011; Akhusama&Moturi, 2016; Akin, Matthew, & Y, 2018). However, there is little research that identifies the current levels of cloud computing in the context of SMEs in developing nations (Oguntala, Abd-Alhameed, &Odeyemi, 2017). The current state of SMEs in Zimbabwe must therefore be determined. This could serve as a starting point for more investigation into SMEs' use of cloud computing as an ICT solution.

1.3 Justification/Rationale of the Study

Complications may occur in the adoption of cloud computing due to concerns with reliability, effectiveness, vendor lock-in, management skills and expertise, as well as the absence of accepted standards, which are also thought of as obstacles to cloud computing adoption (Leavitt, 2009). Additionally, users of cloud computing may encounter additional technology hesitancy, uncertainty about demand, different types of required software features, a lack of institutional motivation, an absence of intended significance for IT applications, and assimilation (Xin and Levina, 2008). Prior to adopting cloud computing, customers must also address difficulties with service availability, pricing, organizational transformation, the choice of suitable service providers, and legal matters (Heinle and Strebel, 2020). Additionally, while considering the adoption of cloud computing, some "socio-technological" issues relating to privacy, control, the impact on work practices, and, of course, the limitations of adopting business models face difficulties that need to be overcome (Hosseini, et al., 2020).

It is evident that SMEs encounter several challenges both within and internationally. For instance, although the demand for technology-based services is steadily increasing, funding for SMEs is steadily declining. The advancements in technology have made it easier for business owners and managers to use it, but doing so is challenging for them due to the high cost of implementation and maintenance and their limited access to funding. However, the cost of using

technology can be minimised and IT-based services could improve significantly if technology is implemented and used collectively by SMEs.

Also contributing to the lack of adoption of cloud computing is the fact that many consumers do not fully comprehend it. In order to improve consumers' awareness and help them fully appreciate the advantages of new technologies, especially for SME owners and managers, realistic information about these technologies is necessary. The majority of earlier study in this field has been centred on industrialised nations and/or European nations, with relatively little attention paid to underdeveloped nations or those in Africa. Therefore, more research is advised to explore thoroughly and identify obstacles to cloud computing adoption in emerging nations like Bangladesh while taking into account concerns with adoption processes in every country. In addition, SMEs' information and technology infrastructures need to be modified through the efficient support of virtualization and the incorporation of functional procedures, which may be accomplished by adhering to the Cloud business model.

1.4 Research Objectives

The overall goal of the proposed research project is to investigate the adoption of Cloud Computing in Zimbabwean SMEs.

Specific objectives of the study are to:

- Analyse barriers to adoption of Cloud Computing in Zimbabwean SMEs.
- Evaluate the effectiveness of Cloud Computing in Zimbabwean SMEs.
- Ascertain key result areas of Computing in Zimbabwean SMEs
- Proffer recommendations on best practices in Cloud Computing in Zimbabwean SMEs.

1.5 Research Question

- What are barriers to adoption of Cloud Computing in Zimbabwean SMEs?
- How effective is Cloud Computing in Zimbabwean SMEs?
- What are key result areas of Computing in Zimbabwean SMEs?
- What are the recommendable best practices in Cloud Computing in Zimbabwean SMEs?

1.6 Operational Definitions of Key Terms and Concepts

Cloud Computing: The on-demand availability of computer system resources, in particular data storage and processing power, without direct active supervision by the user is known as cloud computing.

Small and Medium Enterprises:Small and medium-sized enterprises, also known as small and medium-sized firms, are companies with staff and income below a particular threshold. International entities like the World Bank, the European Union, the United Nations, and the World Trade Organization all use the acronym "SME."

ICT Adoption: The acceptance of information communication technologies in organisations.

1.7 Outline of the Research Proposal

The section above provided an outline of how the research problem originated. Furthermore, study objectives, justification and definition of inherent key terms has taken place. The next major section details a review of current body of literature concerning the problem under investigation. Furthermore, the last section will describe the methodology and setting under which the study will occur.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

Background information and the circumstances that led to the investigation's inspiration were presented in the preceding chapter. The associated literature to the study is examined in this chapter. The goal of a literature review, according to Fink (2018), is to provide a summary of the sources that the researcher would have looked into when researching the topic and to demonstrate to readers how their research fits into a larger field of study. According to Wisker (2009), a literature review is a survey of books, academic papers, and any other materials connected to a topic, field of study, or theory that provides a description, summary, and critical assessment of these works in relation to the research problem under consideration. The study's underlying models will be the Diffusion of Innovations (DOI) model, the Technology-Organisational Environment (TOE) model, and the Unified Theory of Acceptance and Use of Technology (UTAUT), which explained why Cloud Computing adoption varied from one organisation to the next (Chiboiwa et al, 2020).

2.2.1 Barriers to adoption of Cloud Computing in Zimbabwean SMEs

Since cloud computing is a new paradigm for computing, many people still worry and doubt how advanced the technology is (Sultan, 2011:273). These apprehensions and uncertainties prevent SMEs from utilising the cloud. Some of the obstacles to ICT adoption in general and cloud computing in particular are highlighted in the section that follows.

Because SMEs often have fewer personnel and less sophisticated technology, "firm size is one of the most crucial elements that determine," whether a SME should utilise the cloud (Abdollahdehgan et al., 2018:71; Low & Chen, 2011:1012). SMEs with less than 10 employees are less likely to use cloud computing than bigger SMEs, according to Kannabiran and Dharmalingam (2011:193). This is because there is less of a need for modern IT if the SMEs only deal with a small amount of information on a daily basis.

"The security of the cloud is one of the most studied and frequently discussed issues surrounding cloud computing" (Kshetri, 2020:51; Choo, 2020:2). Organizations interested in adopting cloud computing have serious concerns about the security or vulnerability of their information. For many SMEs, the loss of physical control over data is a source of anxiety (Clear, 2007:14; Kannabiran&Dharmalingam, 2011:194). One of the biggest barriers to cloud computing adoption is security (Misra, 2011:273; Kshetri, 2020:51; Kannabiran&Dharmalingam, 2011:194). Sultan (2011:273) asserts that IT departments and organisations are probably "wary of ceding control of their resources to outside suppliers" who might be able to tamper with the data without the customers' authorization. Managers worry that competitors or spies could steal their company's data via the cloud, according to Choo (2020:4). Numerous cyber-spying and cyber-warfare incidents to date demonstrate how vulnerable cloud-stored data is (Clear, 2007:2; Kshetri, 2020:54; Choo, 2020:4).

Research conducted by International Data Corporation, according to Misra (2011:273), shows that "75% of respondents claimed they were anxious about security." This was further supported by Aleem and Sprott's (2018:2) study, which involved 200 interviews with ICT experts across the globe. Security was the top issue raised by respondents, as expressed by 93.4% of those questioned (ibid.). Cloud security flaws may impair business operations and possibly result in a company's failure (Durowoju et al., 2011:243). "A typical example is the recent PlayStation Network (PSN) breach by Sony, which caused service to be unavailable for weeks and cost the company billions of dollars to repair" (Durowoju et al., 2011:243).

2.2.2 The effectiveness of Cloud Computing in Zimbabwean SMEs

In underdeveloped nations, cloud computing has created a wide range of options. It has been hailed as the answer for small and medium-sized businesses (SMEs) looking to expand and enter the global market (Makena, 2018:517; Kapurubandara& Lawson, 2006:1).

SMEs are the main beneficiaries of this computing paradigm, according to Marston et al. (2011:178), who discussed the value of the cloud to enterprises. "The cloud provides the possibility for new entrants among the SMEs in various business sectors to leapfrog, and compete with larger firms in the market," claim Marston et al. (2011:178). Makena (2018:517)

adds that SMEs "may possibly produce products and services that, in the past, only major firms could deliver" if they have access to scalable technologies.

Because SMEs face initially significant investment costs, cloud computing technologies allow them to access IT infrastructure while only paying for the services they actually use, rather than having to purchase servers, applications, and other relevant tools (Makena, 2018:517; Choo, 2020:2). According to Kshetri (2020:50), cloud computing enables companies to rent storage and computing resources as needed, on demand. This aids businesses in overcoming the drawbacks of their small size and raising their level of competition (Makena, 2018:517).

When it comes to initial investments, cloud computing enables businesses to spend less because it is "cheaper to rent server space for a few hours than to maintain property servers" (Choo, 2020:2, Kshetri, 2020:50). Cloud computing, according to Choo (2020:2), can enable SMEs to utilise the most cutting-edge technologies without having to be "responsible for operating and maintaining the technology."

Because upfront capital investments and other costs like maintenance are the responsibility of the cloud provider, cloud computing technologies can assist SMEs in evolving and developing inexpensive business models, where they simply have to pay for operating costs (Mehta and Suriyanarayanan ,2018:7). Because the concept of a "pay as you use" model is extremely appealing to SMEs, especially in a chaotic global economic environment, cloud computing enables the efficient use of business resources (Aleem and Sprott, 2018:8, Alshamaila et al., 2018:251). By offering all apps online, cloud computing "may eliminate IT barriers to innovation" (Makena, 2018:517). Because cloud computing is location-independent, unlike traditional computer models, it enables access to business services from everywhere there is Internet connectivity (Yeboah-Boteang&Essandoh, 2018:14; Bayrak, 2018:5; Dwivedi &Mustafee, 2020:265). Without moving around computers filled with company data stored on their hard drives, company data can be accessed from anywhere in the world (Sharma et al., 2020a:146; Kshetri, 2020:53). This is crucial because employees can telecommute, lowering their carbon footprint.

The ICT industry has liberalised in Zimbabwe in recent years (Zindiye& Roberts-Lombard, 2020). ICT in Zimbabwe over the past 10 years has been marked by a number of players who have fought to remain viable while providing reliable internet, broadcasting, and telephony

services (Ruhode, 2016). The government has formed regulating organisations, such as the Postal and Telecommunications Authority of Zimbabwe (POTRAZ), in order to recognise the crucial role that ICT has played in the nation's economic recovery (Zanamwe, Bere, Zungura, Nyamakura&Muchangani, 2020). However, most organisations continue to rely on conventional strategies to acquire a competitive edge, making the integration of ICT through online business operations platforms a pipe dream (Ruhode, 2016).

2.2.3 Key result areas of Computing in Zimbabwean SMEs

Service/System Availability

The proportion of time that a service or system is accessible is the measure in question. It is the proportion of a system's or component's functional time to the overall time during which it must or should operate. This can be stated as a percentage (such as 90%) or as a direct proportion (such as 9/10 or 0.9). It can also be expressed as the total amount of downtime for a specific week, month, or year, or as the average amount of downtime per week, month, or year. Availability can also be described qualitatively, describing how well a system can function even if a large component or group of components fails.

Reliability (Mean Time Between Failure and Mean Time To Repair)

Mean Time Between Failures (MTBF) and Mean Time To Repair are two measures that are combined to indicate the reliability of repairable electronic components (MTTR). Mean Time To Fail is how it's represented for non-repairable components (MTTF). By similar, MTBF and MTTR can be used to gauge the dependability of cloud services—and they frequently are.

The term "mean time between failure" (MTBF) describes the typical length of time that a device or product operates without malfunctioning. Only operational time between failures is included in this unit of measurement; repair times are excluded. The average amount of time needed to repair a broken device or component and get it back into production is called the mean time to repair (MTTR).

Response Time

The time it takes for any workload to request work be done on a virtual environment and for the virtual environment to fulfil the request is what this statistic measures. A study by Modern Education and Computer Science Publisher found that the average overall response time is 50.35 milliseconds when the user base and data centres are in the same area. The response time dramatically increases to an average of 401.72 millisecond when the user base and data centres are in separate geographical areas.

Security

Information, data applications, and infrastructure related to cloud computing use are all protected by a set of control-based technologies and policies known as cloud computing security. These policies and technologies are designed to adhere to regulatory compliance requirements. In the event of a cloud security breach, the procedures will probably include involve a business continuity and data backup plan.

Throughput (aka Bandwidth)

A computing service or device's throughput is the number of jobs it completes in a predetermined amount of time. It is typically expressed in terms of transactions-per-second for systems that process transactions. It is evaluated as a data rate for systems processing massive data, such audio or video servers (e.g., Megabytes per second). The number of supported users on a web server is a common way to describe throughput, although this clearly depends on user activity, which is challenging to measure reliably.

Capacity

IBM claims that the capacity needed to serve 95% of all workloads can be determined by measuring the average utilisation over time of workloads with changing demand and working from the mean. In order to balance supply and demand, capacity is crucial. This indication can be quite helpful because it allows for the definition of the minimum amount of RAM that must always be accessible on the system.

In the cloud model, every service request must be evaluated and screened to make sure there is enough capacity to provide the requested service.

2.3 Theoretical Framework

This paper utilised three theoretical frameworks: the Diffusion of Innovations (DOI) model, the To make it easier to identify and categorise the elements associated to the government that influence SMEs' adoption of ICT in Zimbabwe, two models have been developed: the Technology-Organisation Environment (TOE) model and the Unified Theory of Acceptance and Use of Technology (UTAUT).

The DOI model emphasises how three crucial components are closely related to innovation in organisations. These consist of individual characteristics, external factors, and internal organisational qualities (Rogers, 1995). The DOI offers an all-inclusive guide to examining the adoption of ICT in SMEs since it includes relational viewpoints and adoption policy-making processes that conceptualise the adoption of ICT in Zimbabwean SMEs. The theory also clarifies the fundamental components and characteristics of ICT innovation adoption, which will help with the creation of the ICT adoption framework.

According to the TOE paradigm developed by Tornatzky and Fleischer (1990), an organization's adoption of ICT is influenced by three factors: technology, the organisation, and the environment. These components make it possible to pinpoint key ICT adoption variables in the framework. The TOE model's and the DOI model's core components, which emphasise unique, internal, and exterior qualities, respectively, are in line with one another.

The Venkatesh, Morris, Davis, and Davis (2015) UTAUT model is the most widely used framework in the field of technology acceptance since it links perspectives from several technology acceptance models. Four fundamental constructs—performance expectancy, effort expectancy, facilitating factors, and social influence—form the basis of the concept. The UTAUT model is being used to investigate the connections between various variables and the drivers of ICT adoption in SMEs in Zimbabwe. The degree to which the expected usefulness and purpose align with gender and age was revealed using the UTAUT model. The main constructs upon which the ICT adoption framework is built were easier to identify thanks to the UTAUT model.

2.4 Chapter Summary

This chapter discusses the theoretical and empirical foundation for this inquiry. It views the Technology-Organisational Environment (TOE) model, the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Diffusion of Innovations (DOI) model as being crucial to comprehending the meaning, development of cloud computing, and SMEs performance. The research approach was covered in the chapter that followed.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The chapter discusses the research procedure, technique, approaches, and setting in which the study was carried out. The method and resources employed to gather data and information for the study are also covered in this chapter. The chapter also describes the strategies and techniques employed, along with the thinking behind their choice. The study examined how Cloud computing affected SMEs, where the installation was intended to give businesses a competitive edge. The general approach to the research process is referred to as methodology.

3.2 Description of the Study Area

Gweru is a city in the Midlands Province of Zimbabwe. During the year ending in October 2022, approximately 13 000 small to medium-sized businesses (SME) in Gweru provided the government with about $1 billion in taxes and other services.

3.3 Research Design

This study will employ the descriptive research approach since it is well-suited to answering the study's who, what, when, and where questions. According to Kothari (2005), a descriptive design displays a population's views. Another author argues that a "descriptive survey could assist academics in collecting data on similar groups" (Kumar 2005, p.141). According to Rahi (2017), descriptive research is concerned with acquiring information on the current state of phenomena as well as providing an accurate image of the situation. The descriptive approach enables the investigation of both quantitative and qualitative information derived from raw data. Bernard (2020) defined descriptive research as an approach that uses words or data to paint a picture, defining research questions such as who, when, what, and where.

Rahi (2017) asserts that descriptive research provides a clear sketch of occurrences in addition to seeing and documenting examples that cannot be assigned an object value. Descriptive research will be used in the proposed study since it examines the factors affecting the efficacy of installing a Cloud Computing system and gives information on the present situation. It goes into

great detail about how high schools may increase efficiency by utilising AI technologies and addresses the research concerns as well. After taking into account all of the aforementioned concerns, descriptive research will be used in this study. The scholar gave a thorough overview of how cloud computing has affected society.

3. 4 Population and Sampling Procedures

3.4.1 Study Population

The target population, according to Leslie Satenstein (2009), is the group of people who are interested in the study. The population of the proposed study consists of all SMEs in Gweru. As of September 30, 2022, there were around 13 000 active SMEs in the city, only 300 of which had implemented cloud computing (Finscope, 20222). The SME was required to have a cloud computing system to meet the admission criteria.

3.4.2 Sampling procedures

According to Anita (2016), sampling is a statistical analysis technique that selects a specific number of data points from a broader population. In order to pick a sample from the population, the researcher will employ stratified random selection. Stratified random sampling is a type of systematic sampling. The same rules apply as before, but a mechanism is built into the participants and activities that are selected (Denscombe, 2020). Stratified random sampling ensures that each unit has an equal probability of being chosen. At predetermined intervals along the list of population units, a sample is chosen.

A sampling method known as stratified random sampling is used to separate diverse populations into homogenous subgroups (Alvi, 2016). In stratified random sampling, the components of the population are divided into strata, and then distinct random samples are obtained from each stratum (Wilson, 2018). The constituents of each stratum vary from those of the other layers in a number of ways. In this study, stratified random sampling will be employed to distinguish between the various strata that can be found in high schools.

Stratified random sample will be used in this inquiry due to its ability to represent all demographic groupings. The organisational divisions of each company chosen for this study, the

SME's geographic location in terms of district, and the size of the enterprise in terms of turnover will be its subcategories. Stratified random sampling ensures that all subgroups are represented and allows strata to be compared. Owners, Data personnes, clerks, and IT employees would be targeted by the researcher. According to early research, there are around 250 eligible individuals from the city.The sample size can be arrived at with the aid of the following formula by Yamane (1967):

$$n = \frac{N}{1 + N^e}$$

Where N= population size

e= margin of error

In this case:

N= 250

e=5%

Therefore:

n=$\frac{250}{1+250^{0.05}}$

n= $\frac{250}{2.32}$

=108

3.5. Data Collection Methods

The systematic gathering of observations or measurements is known as data collection (PrethaBrandari, 2020). In the proposed research, the study would try to gather both primary and secondary data. The researcher will submit an academic letter from the university to the Public Relations office at each institution to request permission to use the organisation and its staff for the research. The researcher will be given contact details for the targeted staff members as well as access to them.

Selected employees will be given online questionnaire links after clearance and asked to respond. Before the poll is closed, the researcher will give respondents three weeks to complete the

questionnaires. A Microsoft Excel spreadsheet was immediately created using the online survey responses, and this file will be used to sort the data

3.5.1 Data collection instruments

108 selected respondents will be asked to complete electronic questionnaires for the researcher to collect primary data. A questionnaire, according to Malhothra&Malthothra (2020), is a group of pre-determined questions that are generally asked of interviewers in a particular order, allowing the same information to be gathered from each participant in the sample. Electronic questionnaires will be used to gather primary data. Both closed-ended and open-ended questions must be included in the questionnaire. As a result, using a questionnaire will be advantageous because the data gathered will be current, pertinent, and unique to addressing the study's research objectives. Additionally, it will allow for group management and is flexible for any uses (Chetty, 2016).

3.6 Data management

The organisation, storage, preservation, and sharing of data gathered and used in a research project is referred to as research data management (or RDM) (Malhothra&Malthothra, 2020). The procedure entails the ongoing administration of research data during the course of a project. It will be taken into account to use consistent file naming practises. To prevent data from being corrupted and/or altered, efforts will be done.

3.7 Data Analysis

In order to turn a big volume of data into insightful knowledge, researchers present the data and analyse it (Brittany, 2020). Data collected through a questionnaire will be quantitatively analysed for the proposed study. Field advises contemporaneous interpretation after evaluating and contrasting the study results with the body of literature (2018). Microsoft Excel will be used to organise quantitative data before being uploaded to SPSS software version 27.2.1 for analysis.

3.8 Ethical Considerations

Rahi (2017) claims that the philosophy field of ethics is concerned with the methods of identifying what is right and wrong. According to Patton (2021), ethics is the use of moral

concepts to be polite, equitable, and to sustain good relationships. Ethics, according to Chetty (2018), is the study of right and wrong as well as moral obligation and duty. The following ethical guidelines will be followed by the researcher:

3.7.1 Obtaining informed Consent

According to Niknejad et al., (2019) informed consent shields a person's freedom and integrity by avoiding attacks on the respondent. The research has been given based on participant honours, which will be briefly stated in the consent form.

3.7.2 Confidentiality and anonymity

According to Parker (2020), the rights to beneficence, loyalty, and dignity are intrinsically linked with the right to privacy and anonymity. The researcher will take care of the issue of confidentiality and guarantee the participants' anonymity. To accomplish this, data will be labelled with participant codes rather than names, and a separate list of code-to-name matches will be maintained.

3.8 Study limitations

for the researcher, some of which might have affected the investigation. One of the drawbacks is that some study participants could not understand concepts like accounting information quality. The researcher will need to spend more time explaining the scope and key terminology of the study to the respondents in order to establish intellectual common ground.

There's a potential that some responses will be changed to skew the research findings. Responses might be sugar-coated since respondents' views on the targeted research findings will vary. To prevent this, the researcher will first conduct interviews with participants to adequately explain the purpose of the study, the confidentiality agreement, and the importance of providing accurate responses.

3.9 Chapter Summary

The chapter outlines the researcher's approach to reaching the goal of the study. The study's demographic, sample, sampling strategy, instruments, instrumentation process, ethical

considerations, and data gathering procedures were given the most attention. The presentation, analysis, and interpretation of data will be covered in the following chapter, Chapter 4.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter displays, analyses, and interprets field study data using the approach developed in the previous chapter. The purpose is to provide a comprehensive picture of the study findings and analyse them in relation to SME cloud computing adoption. Data presentation, according to Chambers and Skinner (2015), is a method for researchers to offer a summary of findings, organise and exhibit information using pie charts, tables, distribution charts, histograms, and graphs. This chapter displays, analyses, and interprets field study data using the approach developed in the previous chapter. The purpose is to provide a comprehensive picture of the study findings and analyse them in relation to SME cloud computing adoption. Data presentation, according to Chambers and Skinner (2015), is a method for researchers to offer a summary of findings, organise and exhibit information using pie charts, tables, distribution charts, histograms, and graphs. The researcher attempted to connect the data to the findings of the desktop research reported in Chapter 2.

4.2 Profile of Respondents

The researcher investigated data from demographic and socioeconomic respondents, such as age and gender, to see if these characteristics are related to their thoughts toward cloud computing adoption. According to Navaratnaseelan and Elangkumaran (2018), demographic and socioeconomic characteristics such as age and level of education have the greatest influence on competitive managerial abilities. Because the researcher wanted to collect data, demographic information on respondents was also collected in a structured manner. This section covers statistics collected from SMEs respondents on response rate, gender, age, sector, and tenure.

4.2.1 Response rate

Although the targeted sample totalled to 108, a total of 91 links to electronic surveys were given to the sample of management personnel and SME business owners. The % response rate of the circulated questionnaire is shown in Table 4.1.

Table 4.1 Response rate

Variable	Questionnaires administered	Number of Responses
Questionnaires distributed	91	86

Table 4.1 reveals a significant response rate (95%) obtained through follow-ups. Five respondents did not finish the questionnaire due to a scarcity of equipment and demanding schedules. A response rate of less than 50%, according to Leedy and Ormod (2011), raises questions about the sample's representativeness. According to Wagner (2018), the minimum response rate for trustworthy data display and analysis should be set at 80%. A higher response rate, according to Lungree (2017), indicates more views and thus better study findings. Furthermore, if one follows Wagner's idea, they still reach the conclusion that the current research satisfied the respondents' criteria, hence widening the extent to which the researcher and academics can generalise the results.

4.2.2 Gender

This section provides gender distribution statistics for all of the SMEs covered in the sample. Table 4.2 summarizes the results of the frequency study.

Table 4.2 Respondents' gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	36	41.9	41.9	41.9
	Male	50	58.1	58.1	100.0
	Total	86	100.0	100.0	

According to the statistics in table 4.2, the respondents were overwhelmingly male, with 58.1 percent indicating that they were men and 41.9 percent indicating that they were females.

4.2.3 Tenure in the SMEs sector

Respondents from various organizations were then asked to indicate their duration of practice in the SMEs sector in order to establish their experiences and understanding of the industry's use of technology. The details are provided below.

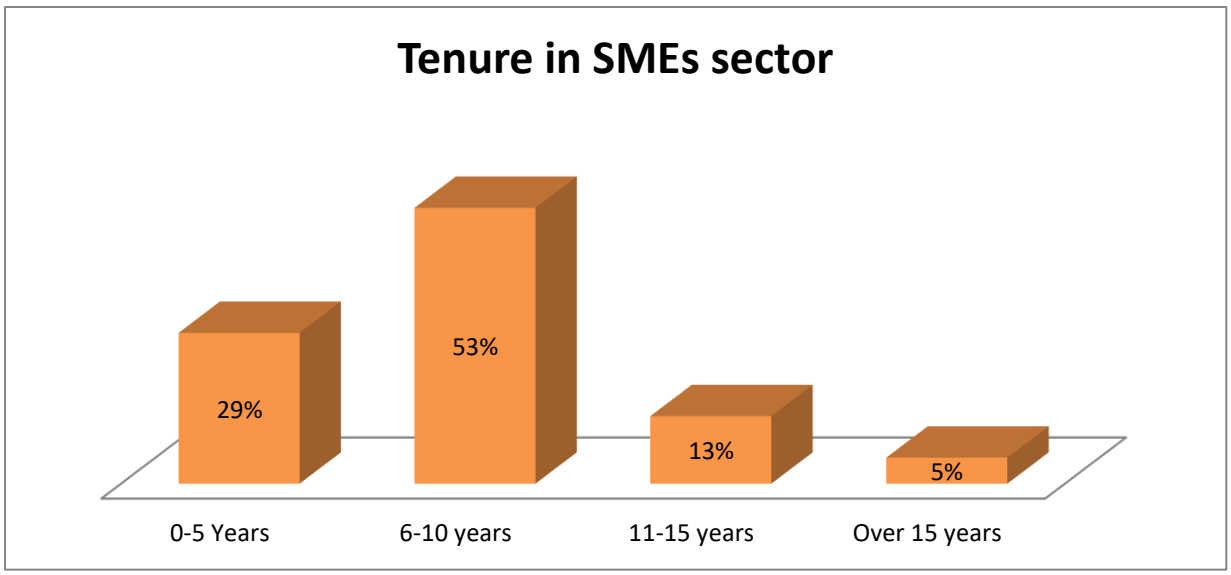

Figure 4.1 Tenure of respondents in the SMEs sector

According to Figure4.1, the majority (53 percent) of respondents had been working as either owners or managers of SMEs for a period of 6-10 years, followed by those who had been with the sector for 0-5 years, 29 percent, 13 percent who had been with the sector for 11-15 years, and finally 5 percent who had been with the sector for more than 15 years. The data shows the respondents' invaluable knowledge and experience in SME cloud computing adoption and competitive strategies, implying that the respondents were knowledgeable on the implementation of cloud computing in line with corporate goals, resulting in an accurate response, as Mbogo also noted (2011).

4.2.4 Job roles

Respondents were also requested to divulge the level of their separate organizations where they worked in order to determine the degree of sample distribution at each level. The findings were summarized and shown in table 4.3 below.

Table 4.3 Job roles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I T specialist	21	24.4	24.4	24.4
	Executive manager	42	48.8	48.8	73.3
	Other	10	11.6	11.6	84.9
	Owner and/or Director	13	15.1	15.1	100.0
	Total	86	100.0	100.0	

According to Table 4.3, 48.8 percent of the participants in the sample were top executives, 24.4 percent were middle management, and 13 percent and 10% were owners and/or directors, respectively. This indicates that the sample consisted of a subset of the people who, in an ideal world, would be involved in the design, implementation, and evaluation of cloud computing systems (Isaac et al 2015).

4.3 Barriers to adoption of Cloud Computing in Zimbabwean SMES

To ascertain the barriers to adoption of Cloud Computing in Zimbabwean SMEs, the researcher prompted the problems with Cloud Computing in Zimbabwean SMEs from the respondents. The findings were presented in table 4.4 below.

4.3.1 Problems with Cloud Computing in Zimbabwean SMES

The researcher prompted the challenges the challenges faced by SMEs in usage of cloud computing the results of which were analysed and presented in table 4.4 below.

Table 4.4 Challenges associated with cloud computing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cybersecurity issues	15	17.4	17.4	17.4
	Cost management	13	15.1	15.1	32.6
	Lack of expertise	15	17.4	17.4	50.0
	Compliance	32	37.2	37.2	87.2
	Other	11	12.8	12.8	100.0
	Total	86	100.0	100.0	

The results presented in figure 4.4 indicate thatcompliance requirements are the major challenges affecting successful adoption of cloud computing as implicated by the majority (37.2%) of the respondents. According to the respondents, depending on the company's industry and service type, a business may be required to comply with rules such as HIPAA, GDPR, PCI DSS, or SOX. Such rules impose principles, methods, and policies that aid in the protection of sensitive data and the improvement of information security.

Furthermore, cybersecurity issues were also found to be among top challenges affecting adoption of cloud computing in the SME sector as confirmed by 17.4 % of the respondents. According to the data acquired, comprehensive cloud cyber security is required to prevent data loss and assist the firm in maintaining compliance with data privacy standards.

According to 17.4 percent of respondents, a lack of experience is a barrier to the use of cloud computing in the SME sector. The finding implies that a lack of technical skills in IT staff, particularly in cloud computing, has become a major challenge, to the point where organisations are losing market share and revenue due to a lack of cloud expertise, which prevents them from reaping the benefits of the cloud and emerging technologies.

Cost management has been touted by 15% of the respondents as a source of challenges for adoption of cloud computing. Cloud prices are continuously moving, and decision-making in large enterprises is frequently decentralised, making visibility into expenses challenging. Rapid scalability is one of cloud computing's key advantages, but it also makes it simple for IT employees to spin up services without regard for cost. Implementing a cloud cost management strategy, according to respondents, can assist a company in planning for future expenses and usage.

This finding is not an unique one, as it verifies the findings of Kannabiran and Dharmalingam (2017), who noted that "firm size is one of the most critical criteria that define" whether a SME should use the cloud because SMEs often have fewer staff and less sophisticated technology (Abdollahdehgan et al., 2018:71; Low & Chen, 2017:1012). SMEs with less than 10 employees are less likely to use cloud computing than bigger SMEs, according to Kannabiran and Dharmalingam (2017:193). This is because there is less of a need for modern IT if the SMEs only deal with a small amount of information on a daily basis.

Misra (2017) supports the same conclusion, claiming that for many SMEs, the loss of physical control over data is a source of worry (Clear, 2007:14; Kannabiran&Dharmalingam, 2017:194). Security is one of the most significant impediments to cloud computing adoption (Misra, 2017:273; Kshetri, 2020:51; Kannabiran&Dharmalingam, 2017:194). According to Sultan (2017:273), IT departments and organisations are likely to be "wary of relinquishing control of their resources to outside vendors" who may be able to tamper with data without the customers' authorization.

4.3.2 Efforts by SMEs to improve performance of cloud computing

The researcher went on to probe the steps being taken by individual firms to overcome the challenges hindering successful adoption of cloud computing. The results were summarized and tabulated in table 4.5 below.

Table 4.5 Improving performance of cloud computing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Caching services	9	10.5	10.5	10.5
	Microservices architectures	2	2.3	2.3	12.8
	Event-driven architectures	48	55.8	55.8	68.6
	Select appropriate instances	26	30.2	30.2	98.8
	Monitoring service	1	1.2	1.2	100.0
	Total	86	100.0	100.0	

The majority, (55.8%) of the sampled firms are adopting to Event-driven architectures so as to improve performance of cloud computing. The respondents indicated that an event-driven architecture is a software design pattern in which microservices react to changes in state, called events. Events can either carry a state (such as the price of an item or a delivery address) or events can be identifiers.

A sizable proportion of respondents (30.2 percent) believe that selecting proper instances can improve cloud computing performance. Respondents demonstrated an understanding that each cloud provider has many instance types tailored to handle various sorts of workloads. They validated that they chose an instance that meets the workload's requirements, whether it's compute-intensive, memory-intensive, or requires high-speed graphics calculations.

Caching services were mentioned by more than 10% of respondents as the method they are currently using to increase cloud computing performance in their organisations. Caches increase file access speed, therefore consider employing a content delivery network for files that don't change frequently or are frequently requested.

However, when the application is hosted on a public cloud platform, developers face significant issues. The infrastructure on which the programme operates is shared with other apps, and high activity on one application might suck resources away from other applications—this is known as the noisy neighbour effect.

The finding backs up Choo's (2020) hypothesis that one of the tactics individuals use when they have high-load services on Amazon Web Services (AWS) is to use the largest available AWS instances. This usually results in exclusive access to the hardware, which alleviates some of the noisy neighbour issue.

Makena (2018), on the other hand, suggested Performance Optimization of Cloud Computing Environment, which entails making the components in the cloud satisfy component level criteria and customer expectations. It aims to improve the performance of a cloud service at the lowest possible cost given various constraints.

4.4 The effectiveness of Cloud Computing in Zimbabwean SMES

4.4.1 Level of effectiveness

To establish the relationship between cloud computing and operational efficiency, the researcher had to ascertain the extent to which customer satisfaction is being achieved. The findings are summarized in table 4.6.

Table 4.6 Effectiveness of Cloud Computing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	1	1.2	1.2	1.2
	Low	24	27.9	27.9	29.1
	Not effective	43	50.0	50.0	79.1
	Not sure	18	20.9	20.9	100.0
	Total	86	100.0	100.0	

From the data presented in table 4.9 above, the level of effectiveness is generally above average as confirmed by the majority (43%) of respondents who rated it as such. However, a significant portion of the respondents invalidated the claim as they rated the level of effectiveness as below average that is at 2 and 1.

This finding supports Kshetri's (2020) research, which claims that when it comes to initial expenditures, cloud computing allows firms to pay less because it is "cheaper to rent server space for a few hours than to maintain property servers" (Choo, 2020:2, Kshetri, 2020:50). According

to Choo (2020:2), cloud computing allows SMEs to use cutting-edge technologies without having to be "responsible for operating and maintaining the system."

Zindiye and Roberts-Lombard (2020), on the other hand, discovered that the ICT industry in Zimbabwe has recently liberalised. ICT in Zimbabwe over the past 10 years has been marked by a number of players who have fought to remain viable while providing reliable internet, broadcasting, and telephony services (Ruhode, 2016). In order to recognise the critical role that ICT has played in the nation's economic recovery, the government has established regulatory bodies such as the Postal and Telecommunications Authority of Zimbabwe (POTRAZ) (Zanamwe, Bere, Zungura, Nyamakura&Muchangani, 2020). However, most businesses continue to rely on traditional techniques to gain a competitive advantage, making ICT integration through online business operations platforms a pipe dream (Ruhode, 2016).

4.4.2 Regression analysis on the relationship between cloud computing and operational efficiency

The study sought among other things to evaluate the nature of correlation between cloud computing and operational efficiency. Following hypotheses were formulated:

H_0: There is a statistically significant relationship between cloud computing and operational efficiency

Versus

H_1: There is no statistically significant relationship between cloud computing and operational efficiency

Table 4.7 Descriptive Statistics

		Operational efficiency	Cloud computing
Pearson Correlation	Operational efficiency	1.000	.133
	Cloud computing	.133	1.000
Sig. (1-tailed)	Operational efficiency	.	.111
	Cloud computing	.111	.
N	Operational efficiency	86	86
	Cloud computing	86	86

Cloud computing and operational efficiency have a moderately favorable association. The Pearson's correlation coefficient value of .133 demonstrates this. Because the probability value of 0.000 is less than 0.01 and the association is statistically significant at 1%, it is statistically significant. These findings support the null hypothesis, which states that there is statistically significant association between cloud computing and operational efficiency. This means that when cloud computing improves, so does operational efficiency.

Ruhode (2016) achieved similar results, confirming that cloud computing can increase organisational efficiency in a variety of ways, including budget reduction, support for the work-from-anywhere trend, and dramatically reducing the time required to handle big data. Aside from these three, there are numerous other advantages of investing in cloud solutions for businesses.

According to Business.com, Frost & Sullivan discovered that cloud computing enhances productivity by 400%. Furthermore, 93 percent of institutional executives agree that the cloud enables rapid growth of innovation.

4.5 Ascertain key result areas of Computing in Zimbabwean SMEs

The researcher went on to prompt the result areas of Computing in Zimbabwean SMEs so as to get an understanding of the goals which SMEs want to achieve by adoption of cloud computing. The data obtained was analysed, summarised and presented in figure 4.2 below.

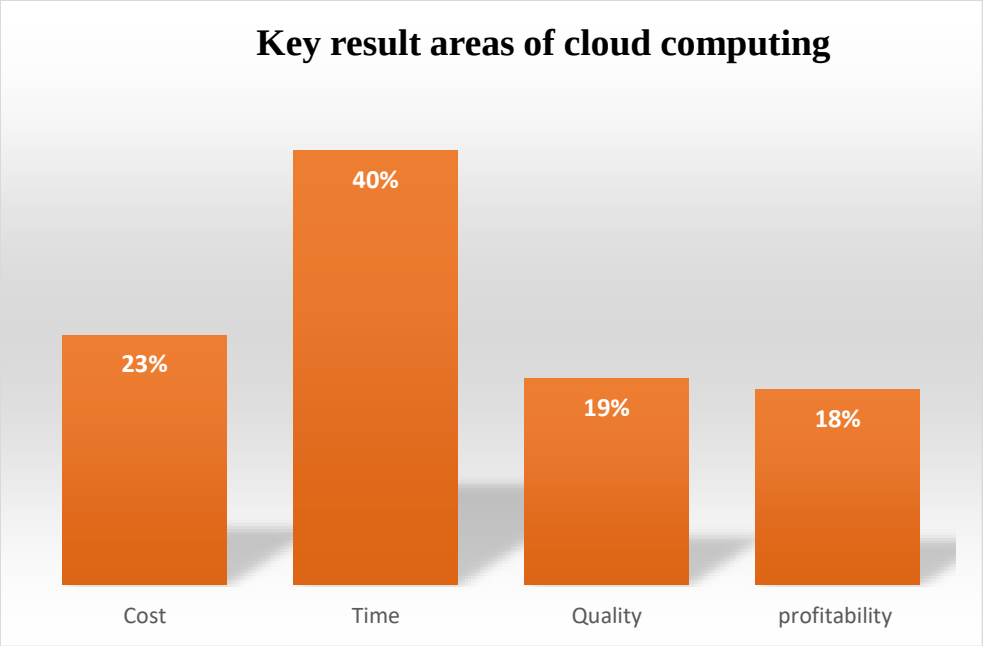

Figure 4.2 Key result areas of Computing

According to the data in figure 4.2 above, the primary purpose of implementing cloud computing is to enhance time management, that is, to save time and eliminate lead and idle periods. This was confirmed by 40% of those who responded. The use of cloud software for task management also makes it easier to consolidate data in a centralised database. Employees, partners, and clients may all access files through the same platform, which streamlines operations and makes collaboration easier.

Furthermore, 23 percent of respondents believe that the primary purpose of cloud computing is to cut costs. Cloud computing enables organisations to pay just for what they require due to natural economies of scale. This saves money by optimising software licences as well as hardware or storage expenditures made on-premises or in the data centre.

Quality enhancement and profitability were picked by 19% and 18%, respectively. Cloud-based quality management solutions enable data centralization and better system integration, allowing for greater operational flexibility.

The conclusion is consistent with Sultan's (2017) discovery that this statistic represents the time it takes for any workload to request work be done on a virtual environment and for the virtual environment to fulfil the request. According to a study conducted by Modern Education and

Computer Science Publisher, the average overall response time is 50.35 milliseconds when the user base and data centres are located in the same area.

This is also consistent with Habidin, Ithnin, and Fuzi (2016), who proposed that the measure in question is the proportion of time that a service or system is accessible. It is the ratio of a system's or component's functional time to the total amount of time that it must or should run. This can be expressed as a percentage (for example, 90%) or as a direct proportion (for example, 9/10 or 0.9). It is also possible to represent it as the total amount of downtime for a certain week, month, or year, or as the average amount of downtime per week, month, or year. The availability of a system can also be characterised qualitatively, showing how well it can work even if a big component or group of components fails.

4.6 Chapter Summary

Data from primary and secondary research instruments were presented, analysed, and interpreted in this chapter. To depict questionnaire responses, frequency tables, bar graphs, and pie charts were employed. The chapter serves as the foundation for the subject's conclusions and recommendations in the following and final chapter. charts. The chapter serves as the foundation for the subject's conclusions and recommendations in the following and final chapter.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter offers a summary, conclusions drawn from the study's findings, suggestions for further research, and limitations. The study's conclusions are summarised in Section 5.2. The findings can be found in Section 5.3. The recommendations are found in Section 5.4. Section 5.6 makes suggestions for further study.

5.2. Summary of findings

Despite difficulties encountered, intriguing discoveries and observations were made, and the conclusions are provided in accordance with the study objectives to be consistent with the same.

5.2.1 Barriers to adoption of Cloud Computing

The study's main goal was to identify common causes of cloud computing in Zimbabwean IT-based SMEs. The researcher raised concerns about the difficulties SMEs have using cloud computing. According to the majority of respondents, compliance constraints are the main obstacles to a successful adoption of cloud computing. Additionally, it was shown that one of the biggest obstacles to the SME sector's adoption of cloud computing is cybersecurity concerns. A sizable portion of the respondents cited cost management as one of the obstacles to the widespread adoption of cloud computing.

5.2.2 Effectiveness of Cloud Computing

To determine the degree of cloud computing's success in IT-based SMEs, the researcher collected data in accordance with the study's objectives. The majority of respondents who rated the effectiveness as such concurred with the study's conclusion that it is normally above average. When rating the claim's level of efficacy, a sizable portion of the respondents refuted it. It has been discovered that there is a mediocrely positive correlation between cloud computing and operational effectiveness.

5.2.3 Key result areas of Computing

The study found that improving time management, or saving time and removing lead and idle periods, is the main goal of utilising cloud computing. Data consolidation in a centralised database is also made simpler by the usage of cloud-based task management software. Due to inherent economies of scale, cloud computing enables businesses to only pay for what they need.

5.3 Conclusions

Based on the data presented in chapter 4 above, the following conclusions were drawn:

- Users of a cloud system should have access to only the information they require to complete their tasks. No matter where sensitive data is housed, restricting who has access to it is essential for preventing compliance problems. Failure to abide by these strict regulations may result in legal challenges, sanctions, fines, and other unfavourable effects. The threat landscape is becoming more sophisticated, making cloud compliance and security more crucial than ever.
- Users can swiftly release their applications to market by developing on the cloud. Data security: Networked backups prevent data loss in the event of hardware breakdowns. Equipment savings: Because cloud computing employs remote resources, businesses can avoid spending money on servers and other types of equipment.
- Offering simple, scalable access to computing resources and IT services is the aim of cloud computing. Cloud computing assists with problem identification and analysis, solution algorithm design as a methodical means of processing the relevant data to provide the desired output, and solution implementation as a computer programme.

5.4 Recommendations

From the conclusions drawn from this study the policy and practice recommendations are as follows;

5.4.1 Policy Recommendations

SMEs should build the Cloud Center of Excellence: Like any big IT investment, cloud efforts require a well-organized and managed team that is capable of implementing cloud technologies in line with organisational objectives. For instance, the Cloud CoE team is in charge of handling

the operational, technological, financial, and communication problems related to the installation of the cloud.

SMEs have to adopt Look Beyond Tech policy: It takes much more than merely buying Infrastructure-as-a-Service (IaaS) from a cloud service provider to implement the cloud successfully. Organizations should use cloud management platforms, governance and compliance monitoring tools, disaster recovery solutions, and expert services to guarantee a seamless and successful cloud rollout. Additionally, platform- and software-as-a-service choices as well as artificial and machine intelligence should be a part of the cloud ecosystem.

Cultural Change Management: The IT industry must undergo a huge cultural transition to implement the cloud. The cloud migration initiatives can be expedited while lowering total change costs and increasing business agility when cultural change is supported and structured in the right way.

Phased Transition: Organizations must start with relatively small apps or use cases for a successful cloud adoption before gradually migrating more and more applications to the cloud as they build organisational expertise. Start with the services that are easy to transfer first, such as email and public website hosting, and work your way up to databases, multitier platforms, and specialised corporate applications.

Cost Management: Organizations' cloud strategy must take use cases into account as well as the total cost of cloud implementation and the best distribution of cloud and on-premise data centres.

Cloud Data Management: Organizations frequently find it more challenging to retrieve data from the cloud than to migrate it there, particularly when cloud instances amass a large volume of data over time. As a result, they need to make sure that they implement cloud data management as part of a disaster recovery strategy when moving their data to the cloud.

5.4.2 Recommendation for further study

Future research could take into account examining the relationship between digital leadership and cloud computing project success in Zimbabwe's SME sector with either qualitative or quantitative approach rather than mixed technique. Future researchers should also take VUCA circumstances into account as a moderating element.

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APPENDIX A: RESEARCH SCHEDULE

BY THIS DATE										
ACTIVITY	04/11	11/11	15/11	18/11	23/11	27/11	05/12	07/12	10/12	12/12
Submit proposal										
Devising research tools and data collection										
Review of literature										
Data analysis										
Write chapter 1										
Write Chapter 2										
Write chapter 3										
Write chapter 4 &5										
Editing and										

finalizing										
Submission										

Research budget

Description of Item	**Total CostUSD$**
Printing Services	10
Data collection	30
Inter-City Movement Fuel and Logistics	100
Refreshment and Snacks	30
Internet Data Services	50
Covid-19 Pre-requisites {Hand Alcohol based Sanitizer, face mask,}	20
Sub-Total Cost	**240**
Contingency Allowance of 10%	
Grand Total Budget	**264**