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Mofokeng, Ayanda Mohaba

2023
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Mofokeng, Ayanda Mohaba. (2023). The readiness of Johannesburg Forensic Pathology Services for cloud computing adoption [Master's dissertation, University of the Witwatersrand, Johannesburg]. WireDSpace.https://hdl.handle.net/10539/40626

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The readiness of Johannesburg Forensic Pathology Services for cloud computing adoption

Ayanda Mohaba Mofokeng

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Supervisor

Ayanda Magida

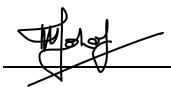
A research article submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

February, 2023

Protocol number: WBS/BA2422190/892

DECLARATION

I, Ayanda Mohaba Mofokeng, declare that this research article is my own work except as indicated in the references and acknowledgments. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.



Ayanda Mohaba Mofokeng

Signed at: Johannesburg

On the 25th day of February 2023

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank my supervisor, Ms. Ayanda Magida, for the guidance and support throughout this study.

Additionally, I want to thank Dr. Ngude, the principal specialist at the Johannesburg Forensic Pathology Service, for ensuring that the request to perform this research at that organisation was met with ease. Also, to all participants who availed themselves and made time in their busy schedules to partake in this study.

Finally, I would like to thank my family, Mapiti, Hlonolofatso, Reatlehile, and Oratilwe for their support despite not understanding the reasons behind my educational goals and Lethabo for the encouragements and motivation.

SUPPLEMENTARY INFORMATION

Supervisor:	Ayanda Magida
Word count :	16024
Supplementary files:	Consent forms
	Interview transcripts
	Submission form

EXECUTIVE SUMMARY

Keywords:

The research explored if Johannesburg Forensic Pathology Services is ready for the adoption of cloud computing. The readiness test uncovered some of the aspects that the adoption of cloud computing requires prior to its adoption. The use of Johannesburg Forensic Pathology Services as a case study demonstrated that the technology is flexible enough for use in any industry and/or environment. The readiness of the adoption was tested using known theories such as TAM, TOE and UTAUT to expose the possible adoption methodologies that can be implemented. The cloud computing readiness investigation has been documented to demonstrate the benefits that can be attained. The mentioned theories have shown the level of readiness of the case study based on the findings that this research has attained with the use of population sampling and other sources from past literature that had similar or corresponding intentions. The reasoning for the readiness is based on common findings from past investigations and inductions made in this research. This was based on the general understanding of the research that the adoption must be fitting for a government institution that belongs to the public administration in a developing country. Cloud computing has been used in the public space by several different governments with varying economies and leadership traditions. Some international governments have been used as examples after adopting cloud computing, either partially or fully, in their government. This served in demonstrating the possibility of a public entity in using the technology to harness the capabilities of cloud computing.

The case study is a government institution that requires a high level of security and control measures for the sensitive and confidential information kept in the facility. The research has demonstrated how the institution can gain greater control of the challenges. The readiness of the case study has been presented herein after intensive data collection and analysis of the findings.

ABBREVIATIONS

DIA	Defence Intelligence Agency
IaaS	Infrastructure as a Service
ICT	Information Communication Technology
IEEE	Institute of Electrical and Electronic Engineers
IT	Information Technology
JFPS	Johannesburg Forensic Pathology Services
PaaS	Platform as a Service
PDF	Portable Document Format
QoS	Quality of Service
SaaS	Software as a Service
SAPS	South African Police Services
SME	Small and Medium-sized Enterprises
TAM	Technology Acceptance Model
TOE	Technology Organisation Environment
UTAUT	Unified Theory of Acceptance and Use of Technology

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1 INTRODUCTION

1.1 Study background

1.1.1 Overview

This research focuses on exploring a government institution's readiness to adopt cloud computing. Cloud computing has gained popularity in many countries in both the private and government sectors due to its unique benefits and the ability to simplify data storage methods and processes (Mutula & Mostert, 2010). Although such benefits may inspire the adoption and implementation of the technology, it is crucial to explore and understand all the influential factors in order to seamlessly and effectively adopt the technological advancement. This is crucial for a government entity that functions in a developing nation where the socioeconomic environment may present issues that are unique to that country.

This chapter provides a brief background of the government institution under study i.e. Johannesburg Forensic Pathology Services (JFPS) and introduces the problem statement. It further describes the aim and objectives of the study, provides the assumptions to the research problems, discusses the delimitations and concludes by providing the significance of the study.

1.1.2 Johannesburg Forensic Pathology Services

The Johannesburg Forensic Pathology Services provides pathology services for medico-legal cases with the South African Police Services (SAPS) (Tshabalala-Msimang, 2005). The organisation's main services are to conduct medico-legal post-mortem examinations and investigations of death cases deemed unnatural, provide expert testimony in some cases, investigative processes, evidence collection, and academic training (Thompson, 2013). The investigation records are manually stored at the facility before being handed over to the SAPS for court proceedings. Since the organisation's inception, this storage system has been entirely manual with no backup systems in place (Thompson, 2013).

1.2 Problem Statement

Manual data storage and retrieval processes typically have poor access control methods, limited capacity, aging cupboards and shelving, and little to no fire protection equipment (Masita, 2013). Considering that it is paper-based, numerous losses and damages have been reported on multiple occasions (Rothrock, Myers, & Wang, 2006). Manual retrieval of files requires very specific details and it is time consuming (Masita, 2013). It would be virtually impossible to find a file based on hinted details such as a date, times, handler, or editor. Files are generally kept in storage for several years before they are relocated to another storage facility or destroyed, this implies that data will not be indefinitely available (Masita, 2013).

Manual Filing systems have long been going through phase out in most industries and operating environments because of their shortcomings. These shortcomings include limitations to data confidentiality, integrity and availability which are the fundamental intentions of data storage and handling (Masita, 2013). Information is constantly at risk of damage, theft, loss, and unauthorised alterations. As a result, the entire system is volatile and cumbersome (Blakley, McDermott, & Geer, 2002). Manual filing systems can also be costly and difficult to manage (Blakley, McDermott, & Geer, 2002). Data storage methods should be able to keep the information in its original and integral state. The physical contents of a manual file are susceptible to elements such as water and fire that can cause permanent damage. In addition, if the storage facility catches fire, water may have to be used to extinguish the flames and damage will be unavoidable at that point (Blakley, McDermott, & Geer, 2002). Therefore, this study seeks to address the issue of manual data storage and filing system at JFPS. Moreover, it seeks to determine if whether the organisation is prepared to adopt cloud computing as a solution.

1.3 Aims and Objectives of the study

This study seeks to explore the readiness of the organisation for cloud computing adoption and the feasibility thereof. This will be accomplished by investigating potential roadblocks, what may or may not work, what is currently present and how it works, and any other issues that may or may have not been addressed or anticipated. Based on the findings, it will also provide recommendations and suggest possible ways to

ensure the success of cloud computing adoption at JFPS. In summary, the identifiable objectives of the research study are: -

- Explore the feasibility and readiness of cloud computing.
- Examine participants' perceptions with regard to cloud computing.
- Explore the identifiable factors that influence the adoption of cloud computing.

1.4 Delimitations of the study

This study will exclude non-managerial employees, contractors, service providers, general healthcare workers, customers, visitors and other 3rd parties. This study will not focus on any individual not holding a managerial position. Individuals that are outside the managerial scope will only be described as users.

The study will be limited to the management and flow of information, information resources and hardware resources, ensuring the confidentiality, integrity and availability of information. This study will not focus on any other organisation out of the JFPS facility. It will not focus on any medical procedures, processes or activities as an aspect. All involved individuals will form part of the study as potential cloud computing users although with different roles.

The adoption of the cloud computing study will not involve the existing IT infrastructure and IT personnel as part of the research. The rest of the organisation's employees will not be included in the data collection.

1.5 Assumptions of the study

The general assumption is that the organisation's staff have meagre experience with cloud computing. It is also assumed that the perceptions are influenced by generational advancements and may have different levels of reluctance to use the technology, their attitude towards change and their behaviour towards technology (Davis, 1989). Participants may assume that technological advancements may cause job losses and make certain positions redundant (Venkatesh, Morris, Davis, & Davis, 2003). The study draws attention to the assumption that some, if not all, of the organisation's staff are from specialised fields as it is a specialised industry. Furthermore, the study will assume that an individual can learn cloud computing with

some training and guidance. But adoption, on another hand, cannot be easily influenced (Andrews, 1993).

From an infrastructural perspective, the assumption is that the organisation does not have the necessary resources to enable cloud computing. The introduction of cloud computing will come with severe cost implications and operational issues that the organisation is not well equipped to handle (Saya, Pee, & Kankanhalli, 2010).

1.6 Significance of the study

The study intends to identify and address specific challenges that a developing country's public sector organisation faces when implementing technological advancement. The majority of technological advancements are seen in developed countries. It should be noted that technological support structures in the public sector of developed countries are not always present in developing countries, which may necessitate the use of additional resources when implementing new technology. This will be achieved by assessing the readiness of the JFPS for adoption as a case study. By highlighting identified gaps and demonstrating how the confidentiality, integrity and availability of information can be maintained, the study will challenge the current process challenges against possible benefits.

2 APPLICATION OF PRIOR RESEARCH

2.1 Introduction

This chapter reports on the literature review, which will include the following: outlining the definition and background of cloud computing, discussing the benefits of cloud computing in other sectors as well as various governments, providing factors that influence the adoption of cloud computing and issues faced by the government, and technology adoption models. The research conceptual approach for exploring the readiness of cloud computing adoption at JFPS concludes this chapter.

2.2 Cloud computing definitions and background

The IEEE defines cloud computing as “a paradigm in which information is constantly stored in servers on the internet and cached temporarily on clients that include desktops, entertainment centres, computers, notebooks, handhelds, etc.” (Kho, 2019 as cited in Mohammed & Ibrahim, 2015, p13). Others described it as a large scale computing archetype where a dense environment of virtualised, scalable and managed infrastructure can be provisioned upon request to customer over the internet (Foster, Zhao, Raicu, & Lu, 2002) . The National Institute for Standards and Technology described it as “a model for providing ubiquitous, adequate and on-demand access to a shared and configurable computing resources with minimal effort and service provider interaction” (Mell & Grace, 2011, p2). Based on the three definitions provided above, we can conclude that cloud computing is a platform that allows users to store and access data resources over the internet using their own internet-enabled devices.

Cloud computing has unique characteristics that set it apart from other architypes of computing such as client-server and grid computing (Mohammed & Ibrahim, 2015). It has four features: ser-centric interfaces, on-demand services, quality of services (QoS) and autonomous system (Wang, et al., 2008). Basic cloud computing models are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) (Mell & Grace, 2011). In SaaS, the service provider will manage the computing resources, operating systems and applications; and in PaaS, the service

provider takes the responsibility of providing, running and maintaining system software and computing resources, which the user has little control over; whilst, in IaaS, a virtualised environment of computing resources is provided to a customer who manages it as their own (Mell & Grace, 2011). The mentioned models are deployable in one of four deployment models, namely public, private, hybrid and community. In public cloud, the services are rendered over an open network for public use, private cloud restricts the services to a single private organisation, the hybrid cloud combines the public and private cloud models, and the community cloud renders the services to a related group of organisations with related concerns and requirements (Mell & Grace, 2011).

2.3 Benefits associated with the adoption of cloud computing

Businesses have realised the unique advantages that cloud computing can provide, and use of cloud computing is rapidly increasing (Abubakar, Bass, & Allison, 2014). The majority of services are now being supplied over the cloud, whether it be public or private (Anjomshoaa & Tjoa, 2011). Examples of such advantages include the reduction of operating costs and efforts (Kiwatra & Kumar, 2018). In theory, costs may be reduced for infrastructure, it can leverage the service demand and resource supply (Xi & Mitrovic, 2014). Other acknowledged benefits within business environment include scalability, better data storage, accessibility to data from anywhere at any time, improved security, energy savings, lower costs for infrastructure and maintenance, improved employee collaboration platforms, space savings, flexibility to use a variety of mobile devices for data access, and environmental advantages (Sether, 2016).

For a government institution, it means greater control in both demand for IT and challenging economic conditions (Wyld, 2010). Government institutions have challenges of service delivery, managing and reducing costs, and technology maintenance (Nengwekhulu, 2009; Mutula & Mostert, 2010). Amongst those, the government can have an improved level of mobility and flexibility, reduced Total-Costs of Ownership (TCO), lower energy consumption and reduced levels of carbon emissions with the adoption of cloud computing (Mutula & Mostert, 2010). It will be freed from the expensive maintenance and upgrades in infrastructure and redirect funds to providing services to citizens with optimally performing technological

resources (Mutula & Mostert, 2010). For government, this means that improved levels of automation, employees mobility and higher value will all be experienced (Wyld, 2010).

2.3.1 Rationale for the government to adopt cloud computing

Adopting cloud computing can provide various advantages for a government institution, including improved service delivery and decreased overall expenses (Lam, 2011). The use of onsite resources optimisation can be accomplished by leveraging the purchasing power across departments with cloud computing technologies (Creeger, 2009). Moreover, it can greatly improve the way government interacts with its citizens (Wyld, 2010).

2.4 The use of cloud computing in government institutions and related issues

The adoption of cloud computing in governmental entities has been the subject of various researches (Martens, Poeppellus, & Teuterberg, 2011). These studies are typically undertaken in developing and developed countries as contexts. For instance, Abubakar et al. (2014) studied adoption issues in Sub-Saharan African SME in Nigeria. According to the results of their study, the determining factor to cloud computing adoption in Sub-Saharan SMEs are requirements for computing resources that the SMEs in that region are struggling with. Furthermore, their research showed that whereas security, privacy, and trust issues were the main determinants in the global north, this was not the case for Sub-Saharan African nation. Instead, it offered a solution for data losses brought on by unstable electric power in that region (Abubakar, Bass, & Allison, 2014). According to Mudawi et al. (2020), in their study of issues and challenges of cloud computing adoption in developing nations, senior management influence appeared to be particularly important for the adoption of cloud computing, which is in most instances lacking (Mudawi, Beloff, & White, 2020). Moreover, Xi and Mitovic (2014) assessed the adoption of cloud computing within the provincial level of South African government and discovered that lack of adoption strategies from senior management influenced the adoption of cloud computing (Xi & Mitrovic, 2014).

Mudawi et al. (2020) also described unique challenges of adopting cloud computing that governments in developing nations are often faced with. Such challenges included; inadequate ICT infrastructure such as internet network coverage and communication tools, senior management influence and commitment, social influence resulting in lack of education to operate and access the service, poor socio-economic conditions and lack of awareness (Mudawi, Beloff, & White, 2020).

Although adopting cloud computing in government institutions has significant benefits, there are several considerations that will need to be addressed. Almarabeh et al. (2016) raises the following issues of concern that any government institution will have to consider in the pursuit of cloud computing adoption:

- Security and privacy requirements must be fulfilled to acceptable levels in order to avoid cybercrime and hacking of systems.
- Data protection and compliance must be upheld in order for the cooperation to comply with regulatory authorities' requirements. This is mostly crucial in instance where the data kept and shared is of sensitive nature.
- There has to be a guarantee that the change of service provider will come at minimum risk and cost.
- Since the technology depends on the internet, the speed and availability of the internet connection is one essential issue that will have to be maintained.

Some governments in developed countries have explored cloud computing and successful adopted it. One example is the UK with G-cloud, in this instance success was seen due to the development of a technically advanced cloud computing policy that avoided restrictions of the initiatives to a superficial role without the holistic benefits of it (DIA, 2012). Other governments that have explored the cloud are the Japanese government with “Kasumigaseki Cloud”, China with their regional level developments and New Zealand’s “cloud-first” which intended for an “all-of-government direction” (DIA, 2012). South African government still has the adoption in its early stages among its various departments (Mitrovic & Klaas, 2013).

In many instances, government is expected to be the leader across the wider economy in the implementation of cloud computing (Wyld, 2010). Some efforts will have to be put on assessing the readiness of this particular government entity such as the change of routine capabilities of staff, addressing of socio-technical challenges and the development of policies that supports the adoption (Xi & Mitrovic, 2014). The abilities of policies and regulations must not be taken for granted in the adoption of the technology along with the legal framework.

2.5 Factors associated with the readiness of the cloud computing adoption

The literature points towards direction of using indicators to identify socio-technical and technical challenges that require some form of addressing before adoption (Niazi & Mahmood, 2011). Further categorising the challenges into three groups capable of influencing the adoption of cloud computing, namely, Organisational, Infrastructural and Environmental indicators (Niazi & Mahmood, 2011).

The infrastructure indicator assessment is based on the availability and reliability of the electrical infrastructure and the broadband connectivity (ITU, 2012; Maurice, et al., 2012). This can include: Electricity Source: The adoption of cloud computing will be significantly influenced by electricity, largely because it is an electronic system (Maurice, et al., 2012). A stable connection will be required to access the information and information resources such as fibre or satellite internet.

The organisational indicator include developing a strategy of migration (Kundra, 2011), support for capable personnel, skills management to ensure expected results (Lam, 2011) and the service vendor and management selection considering speciality, pricing capability, and the service-level agreements (Bollineni & Kumar, 2011).

Assessing the environmental indicator involve understanding the operating environment of the organisation, this means that governing bodies and regulatory bodies processes will have to be identified (Bollineni & Kumar, 2011). The sort of compliance that is required for the adoption of cloud computing will also have to be addressed (Bollineni & Kumar, 2011). The body responsible for implementing

technology or technological solutions is the State IT Agency (SITA) and they will have to comply with national and international regulation which may take time, according to the literature (Xi & Mitrovic, 2014).

Attitude of the potential users towards Cloud Computing plays a crucial role in assessing readiness, this is the mind-set or habit of conducting work which may be influenced by an individual's experiences and character (Pickens, 2005). This primarily depends on the reflection of a person's experience and influences in various positions, job experiences, and personalities that hold diverse conceptions of cloud computing and their comprehension of it in this specific facility operating in South Africa (Mutula & Mostert, 2010).

2.6 Technology adoption models

Technology has become profusely integrated into our daily lives and our economies (Oliviera & Martins, 2011). It is essential to understand the factors influencing IT adoption and the theoretical models that seek to resolve or mitigate the challenges faced with technology adoption. This review will put focus on three, although not placing comparison, namely, Technology, Organisation and Environment (TOE) framework (Tornatzky & Fleischer, 1990), Technology Acceptance Model (TAM) (Davis, 1989) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003).

2.6.1 Technology, Organisation and Environment (TOE)

The framework was found in 1990 (Tornatzky & Fleischer, 1990). The intention of this framework is to identify three aspects of an organisation's context that may influence the process by which a technology innovation will be adopted. Its involved contexts that are technological, organisational, and environmental relevant to that particular organisation (Lippert & Govindarajulu, 2006). This include factors of internal concerns (practices and equipment) to the organisation (Hage, 1981). Measures such as scope, size and managerial structure or concerns of organisational contexts and Environmental contexts refers to the operational domain of an organisation, viz., the industry, competition, government dealings (Tornatzky & Fleischer, 1990).

2.6.2 Technology Acceptance Model (TAM)

TAM mode was developed by Fred Davis in 1986 (Davis, 1989). This adoption model is particularly tailored for modelling a user's acceptance of technology (Lai, 2017). TAM intends to identify the determining factors of computer acceptance and that will be the guidance to explaining user's behaviour over a wide range of end-user computing and user populations (Davis, 1989). TAM contains two specific principles: Perceived Usefulness (PU) and Perceived Ease of Use (PEU) (Lai, 2017); where PU is the perceived likelihood that a computer system will enhance their livelihood and PEU seeks to describes the expectancy in the effort required to operate it (Davis, 1989).

2.6.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

Developed by studying previous models by Venkatesh et al. (2003), UTAUT involves the use of four constructs of a user's behavioural intention which also includes performance expectancy, social influence, effort expectancy and facilitating conditions (Lai, 2017). In retrospect, UTAUT has its roots set on the eight models (Venkatesh, et al., 2003). UTAUT suggests that the biggest predictor is attitude over the four predictors (Venkatesh et al., 2003).

2.7 Conceptual framework

Legris et al. (2003) noted that TOE has a generalised construct and Riyadh et al (2009) mentioned that it is unclear whereas Wang and Wu (2015) argued that TAM has unclearly defined extended variables. To have clear constructs, they will have to be used in conjunction with one another. This advocates for the need to strengthen the models by integrating three models to reduce inefficiencies. UTUAT is based on TAM but further demonstrates behavior and attitude towards the adoption of cloud computing (Lai, 2017).

The conceptual framework should intend on building upon the combined constructs of the models in order to cover the gaps that each may present. TOE covers the internal and external organisational factors regarding operations, TAM concentrates on user expectations and technological expectations, whereas UTAUT focuses mostly on behavioral intent and the attitude of the prospective users.

Based on the integration of above-mentioned three technology adoption models, a conceptual framework comprising TAM, TOE and UTAUT constructs can be formulated to assess the readiness of JFPS to cloud computing as follows:

TAM:

- Perceived usefulness – This will be done by assessing the perceived relative advantages cloud computing may bring to the organisation and the added value it will bring to existing operations (Gangwar, Date, & Ramaswamy, 2014).

- Perceived ease of use – The complexity of the technology may have a negative impact to the users perceived ease of use (Gangwar, Date, & Ramaswamy, 2014). In assessing perceived ease of use in this research, there will be questions investigating the degree of difficulty in comprehending and employing cloud computing (Gangwar, Date, & Ramaswamy, 2014).

TOE:

- The current technology in use, the skills available in operating the technology as well as using it. Will there be a need for acquiring further skills after the adoption or can the current skills be used (Schillewaert, Ahearne, Frambach, & Moenaert, 2005). Managers support is crucial and their understanding and believe of the status quo to adopt the technology will influence the success of the adoption (Tan, Tyla, & Manica, 2007).

- What have the competitors achieved with adopting cloud computing and what challenges have they pointed out. Will it improve our competitive advantage and/or service efficiency (Low, Chen, & Wu, 2011).

UTAUT:

- Lai (2017) mentioned that the users' behavior, attitude and expectancy will determine the readiness of the organisation in adopting cloud computing. It has four constructs which are focused on the behavioral intention of the user; performance expectancy, social influence, effort expectancy and facilitating conditions (Lai, 2017). In that regard, questions relating to the previous use of

cloud computing will be posed, and then inquire as to how they found the technology.

- The focus of UTAUT is on the attitude of the users (Venkatesh, Morris, Davis, & Davis, 2003). To assess the users attitude, the focus will be on how participants' would feel if cloud computing was to be adopted at their workplace.

2.8 Conclusion of Literature Review

This chapter has provided a broad overview of cloud computing, which includes the background and definition of cloud computing, various features and basic cloud computing business models deployable as well as its benefits. It further looked at the issues faced by government in relation to adopting technological advancements. Moreover, it provided a review of the factors that influences the readiness of cloud computing adoption and the models for technology adoption. Lastly, the literature has been contextualised to formulate a strategic model that will be utilised in assessing the readiness of cloud computing adoption for this study.

3 DATA COLLECTION AND ANALYSIS

This section of the research project concerns the research methodology, which includes the research approach, population and sampling, research design, data collection method, and data analysis method.

3.1 Research approach

Qualitative research method was applied for this study. The primary aim of this study was to explore the extend of JFPS readiness to adopt cloud computing as well as the factors that would influence its adoption. In order to answer and satisfy the objectives of this study, an appropriate research methodology was required in order to explore, explain and provide in-depth understanding of factors affecting cloud computing adoption at this particular institution. The qualitative research method was consequently the most appropriate for this research because according to Bowen (2009), it offers the opportunity to explore a meaningful understanding of how the participants perceive study problem and provides rich and contextual picture that is not hampered by the researcher's limited focus (Bowen, 2009).

This study focused on an on-going process rather than a process with a clear end-result. For that reason, it was essential for the researcher to gather a clear understanding of practical issues influencing the adoption of cloud computing that are specific to the institution as opposed to pre-determined general factors that may not necessarily be relevant or sufficient to address the study's objectives. Qualitative research method allowed the researcher to assess the possibility of quality improvement and operational efficiency, as well as eliciting other issues that the literature review did not address (Baboucarr & Soaib, 2014).

3.2 Research design

The goal of this study was to determine how people perceive the reality of cloud computing. This included their initial thoughts, perceived experiences, challenges and factors that may ease or prevent adoption, as well as ongoing challenges related to technological advancements in general. The participants' uniqueness, individual

contexts, and varying experiences were considered (Jahja, Ramalu, & Razimi, 2021). The study was conducted using qualitative research methodology, which does not limit the participants' responses to the questions posed or deny them a chance to express opinions that goes beyond the scope of the research questions. It allowed for detailed descriptions of the views to the topic (Jahja, Ramalu, & Razimi, 2021). That allowed for generic qualitative research.

According to Jahja et al. (2021), the purpose of generic qualitative design is "not to explore, analyse and interpret someone's experience as in narrative inquiry, not to understand the substance and underlying structure of phenomenon as in phenomenology, not to discover substantive theory about the phenomenon as in grounded theory, not to seek, understand, or explain the interaction between individuals and with their culture as in ethnography, and not to explore a process as in a case study" (Bradshaw et al., 2017; Merriam & Tisdell, 2016 as cited in Jahja, Ramalu, & Razimi, 2021, p5). The role of the researcher entailed acting as a tool that only analysed the data collected and did not influence subjects to achieve a specific goal.

3.3 Population and Sampling

The population consisted of employees of JFPS. This population was selected on the basis of it being an academic institution with affiliation to the University of Witwatersrand, and provided a platform for research and development (Barreiro & Albandoz, 2001). Initially, the SAPS members were to be included in the study, but it became evident that the SAPS doesn't fall under the department of health as with forensic pathology services and SAPS will not be directly using the programme.

Purposive and snowball sampling were used (Taherdoost, 2016). Purposive sampling was suitable for this study because the number of participants from the population who could provide insightful data for this study was limited. Snowball sampling allowed the participants to refer the researcher to an individual who was able to provide more information to be included as a participant. The sample consisted of employees holding managerial positions. Mohsin (2016) stipulates that the primary responsibility

of managers is to plan, organise, and lead the organisation. They deal with day-to-day operational issues in order to improve efficiencies (Mohsin, 2016). With that experience and knowledge, they were in a better position to provide meaningful insights on the facility's readiness to cloud computing. The nature of the topic was one determining factor for the sample size, others are quality of data, study design and the use of shadowed data (Morse, 1994). Under circumstances where the topic is clear, and interviews can effortlessly provide information, fewer participants are needed (Morse, 1991). In that regard, the sample size targeted comprised of 8 participants. Ease of access and the likelihood of the selected sample being future users were other determining factors.

3.4 Data collection.

Semi-structured interviews were conducted for data collection. The method provided a focused environment where the participants' were given an opportunity and enough time to freely engage (Burkard, Knox, & Hill, 2012). In addition, it ensured rigour which was particularly crucial for this study (DiCicco-Bloom & Crabtree, 2006). The responses were gathered using voice recording and transcription tool from Microsoft Teams (Burkard, Knox, & Hill, 2012).

The interviews were done by appointment and took place at participants' natural environments to avoid intimidation and manipulation. The interview sessions took approximately 30 minutes (DiCicco-Bloom & Crabtree, 2006). They all took place between the period of September 2022 to January 2023. To maintain confidentiality, participants were given pseudonames. However, certain demographic information about participants were collected for analysis purposes. The questions were structured in such a way that they did not elicit a closed ended response. They were probing in nature to encourage a conversation. To avoid dichotomy, the questions were framed more around the "how" and "why".

3.5 Data analysis

Data gathered was analysed through thematic analysis. Common patterns, themes, ideas and topics of the data were identified (Braun & Clarke, 2008). Unlike other qualitative research methodologies, it was advantageous because it is not based on a

specific epistemological or theoretical perspective (Maguire & Delahunt, 2017). It is adaptable and did not limit data analysis.

The purpose of this study was to evaluate the readiness of adopting a technological solution as well as on going influential factors. It sought common or shared meanings rather than one individual's perspective. It did not seek to establish new theory, deep interpretations of data, or significant data transformation (Kiger & Varpio, 2020). Hence thematic analysis was the best choice for this study. It allowed for the creation of themes for reformation, re-interpretation, and connecting data elements.

The six-step framework developed by Braun and Clark (2006) was used because it established a clear and direct tool for using thematic analysis. Adopted from Maguire & Delahunt (2017), the six steps were followed in this manner:

Step 1: Familiarise yourself with the data.
This was accomplished by immersing oneself completely in data transcripts, re-listening to voice recordings, and jotting down initial ideas. The primary purpose of this step was to gain a thorough understanding of the contents of the data collected and become acquainted with the data gathered.

Step 2: Generating codes.
Provisional codes were identified after becoming acquainted with the data. These codes included data elements that appeared to be more significant and meaningful. Open coding was used, i.e. no pre-set codes were formed, but they were developed and modified as the process unfolds.

Step 3: Search for themes.
Themes were then generated from the codes. Codes with similar meanings were grouped together to form a common theme. To avoid losing the meaning of the participants' responses, a back-and-forth approach of reviewing, comparing, and assessing was made during this process. This was to determine whether the themes are fully defined and supported by the raw data, or if there was room for improvement.

Step 4: Review themes.

Themes generated were re-checked and contrasted against the data collected and codes generated. The following criteria was used:

- Is there presence of enough data to support each theme?
- Is data coherent to support the theme?
- Are the themes concise, understandable and to the point?
- Does data within each theme differ significantly to justify for separation?

Data extracts were remodelled and themes changed to capture the codes. Themes that were too broad were broken down further, and those with similar meanings were combined.

Step 5: Defining and naming themes.

The themes created were then redefined. The idea behind the redefinition was to ensure that they are brief and sensibly describe the intention.

Step 6: Producing the report/manuscript

The final write-up took formation with the analysis and description of the findings. Most of the tasks had taken place with the notes and information collection, theme description, and selecting data extracts that represented the themes. The flexibility of the thematic analysis gave direction of how to conduct data analysis.

The intention of this study was to explore the organisation's readiness to adopting cloud computing. The quality of the information acquired guided the assessment to being either conclusive or inconclusive, this depended largely on the responses received. The intention is not to produce quantitative results but rather to enhance the understanding of the status quo regarding readiness.

3.6 Quality assurance

In qualitative research, quality assurance refers to whether the research findings can be trusted (Korstjens & Moser, 2018). Lincoln and Guba (1985) developed a criteria for assessing research credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). The criteria was used in this study.

3.6.1 Credibility

In qualitative research, credibility is comparable to internal validation in quantitative research. It is concerned with the research's veracity. When it comes to credibility, several strategies are recognised, but depending on the type of research, not all must be met. They include prolonged engagements, persistent observation, triangulation, and member check (Korstjens & Moser, 2018). Given the time limit and the scope of this research, strategies that were employed included prolonged engagement, member check, and persistent observation.

3.6.1.1 Prolonged engagement

Prolonged engagements were crucial in this research because participants have varying set of expertise and some did not have extensive knowledge of cloud computing. Prolonged engagement allowed participants to gain a thorough understanding of the subject. This was accomplished by asking several topics-related questions and rephrasing them to the participants' understanding (Korstjens & Moser, 2018). Rapport was established to foster trust between the participants and the researcher (Arifin, 2018). It was accomplished through the use of empathy, orienting oneself with the participants' points of view by not dismissing or disregarding them prematurely if deemed unfitting. The participants were allowed to express their ideas without interruptions. Moreover, the participants' discomforts were alleviated by allowing them to express their ideas in simple terms and providing them with the opportunity to gain a clear understanding of the question presented (Korstjens & Moser, 2018).

3.6.1.2 Member-check

The member check process entails feeding back the data to the participants and allowing them to agree, disagree, or elaborate in cases where their ideas were not captured according to their point of view (Burkard, Knox, & Hill, 2012). Transcripts of the interviews were returned to the participants for validation before data analysis began. Corrections were made in instances where incorrect transcription occurred.

3.6.1.3 Persistent observation.

Persistent observation is a technique whereby the researcher form prolonged engagements with the study subjects to gain in-depth understanding of their experience (Korstjens & Moser, 2018). This was obtained by repeatedly listening to voice recordings and re-reading the transcripts. The data was deeply analysed until concrete and in-depth insight was established. More time was allocated in carrying out this step of the research.

3.6.2 Transferability

Transferability relates to the aspect of application (Lincoln & Guba, 1985). This involves giving broad description of the participants and methods of data collection process and data analysis in order for the readers to make clear judgements at their own settings (Lincoln & Guba, 1985).

Rich descriptions such as the setting in which the research was carried out, on what basis sample was it selected, the demographics of the participants, level of expertise, additional topics or themes gathered from the participants and reasons to delimitations were given (Korstjens & Moser, 2018).

3.6.3 Dependability and confirmability.

The term dependability is a concept used to evaluate quantitative research; the ideology it carries can be used in all sorts of research (Golafshani, 2003). In order to grasp an understanding of dependability and confirmability, the study presented the various definitions of dependability and confirmability demonstrated by various researchers from different perspectives (Golafshani, 2003).

The quality of a qualitative study can help us “understand a situation that would otherwise be enigmatic or confusing” (Eisner, 1991, p. 58). The terms neutrality or confirmability, consistency or dependability are essential criteria in qualitative paradigms (Lincoln & Guba, 1985). The strategy used in ensuring dependability is referred to as an audit trail. The audit trail assesses the process of inquiry for a dependability audit and the product(s) of inquiry for the absence of a confirmability audit (Lincoln & Guba, 1985).

3.7 Ethical considerations

The global safety of the participants was highly considered. Arifin (2018) considers six ethical issues to be crucial in qualitative research: informed consent and voluntary participation, anonymity and confidentiality, interview session, data collection analysis and dissemination of findings, ethical approval and access to participants, and data protection (Arifin, 2018).

3.7.1 Informed consent and voluntary participation

Consent was obtained voluntarily, and the subjects involved were mentally competent and clearly understood the consent details. They were adequately informed about the research and given the option to participate or decline. Furthermore, participants could withdraw from the study at any time, even after signing a voluntary consent agreement.

3.7.2 Anonymity and confidentiality

The names and identities of the participants are not revealed. The use of pseudo-names, ensured privacy.

3.7.3 Interview session

Each interview session took place in a private environment of the participants' choice. The participants were given the opportunity to have an additional person(s) in the interview session if deemed necessary. There was no sharing of information about the data collected from the participants, whether through social media or word of mouth. Only relevant individuals received anonymised data without comments (e.g. supervisor).

3.7.4 Data analysis and dissemination of findings

Microsoft Teams was used for the data transcription during the interview process and recordings were listened to using headphones at a discreet office. Any other aspects

of the participants' identities were not revealed on this study. All participants gave permission to have their inputs be quoted on the report.

3.7.5 Ethical approval and access to participants

Data collection only began after ethical approval from the University of Witwatersrand ethical committee (non-medical) and permission letter granted by JFPS to carry out the research.

3.7.6 Data protection

Interview stage:

The data collected during the interviews was stored in an encrypted device having password protection. Shared data was password protected and accessible only through university platforms (e.g. internal email). All anonymised data will be kept for a set period of time before being destroyed (Arifin, 2018).

Cultural and Linguistic Barriers:

There was no physical contact between the interviewer and the participants. The face-to-face semi-structured interview was conducted at a reasonable distance, i.e. not less than 2,5m apart. They were conducted in English. Participants were offered the option to have a translator with whom they are familiar if they so desired (Arifin, 2018).

4 FINDINGS

4.1 Introduction

This chapter has employed the conceptual approach demonstrated in Chapter 2 to draws upon a thematic outcome and demonstrate findings which have presented themselves from the interviews conducted with the participants and the subsequent analysis of the data collected from the interviews. Using inductive analysis, the following themes emerged from the data:

- Willingness to adopt
- Human Resource capacity
- Finance and ownership
- Training is required
- Infrastructure procurement
- Access of data and security

4.2 Background of participants

The sample size initially consisted of 8 participants, but the saturation point was reached with 5 participants. They consisted of one male and four females. Two of the participants were senior managers, while three had middle management roles. Two of the five individuals were between the ages of 30 and 35, two between the ages of 35 and 40, and one participant was above 50. Two of the interviewees had worked for the organisation for four years, one for two years, and the other two for more than seven years. The participants will be referred to as Participant one (P1), Participant two (P2) Participant three (P3), Participant four (P4), and Participant five (P5), in order to maintain privacy and confidentiality. Out of the five participants, one opted for contact interview and the rest opted for virtual sessions over Microsoft Teams. The shortest interview lasted for 20 minutes and longest 58 minutes.

4.3 Willingness to adopt

Majority of participants displayed interest in the topic of cloud computing being used, finding it more intriguing as it will simplify procedures. One participant also stated that the administration officers will be intrigued by the benefits of the technology.

> *"Of course they will be. They are a group of enthusiastic bunch of administration officers so I guess they will be and also, it will be beneficial to them, because they will be able to pick up soon what is missing by just checking on the cloud. It will appear quickly just by the click of a button. They will be able to see everything about this person and what is required. What still needs to be collected, so I think it's a program that they will be excited about." P4*

Participant two stated that the difficulties that the organisation is now having with its paper-based procedures will encourage users' willingness to adopt cloud computing.

> *"Yes, yes. I think the people who handle data and information will be willing, because there's a lot of challenges with paper based documentation, so I think the buy-in will be there. We unlikely to have much resistance." P2*

The idea put out by the previous participants was also supported by participant three. The younger employees were the subject of the idea, though. The older staff members might be resistant to change:

> *"So I definitely think that a lot of the younger staff members that are already more computer literate would be willing to accept this. The issue would be the people that are older within the organisation that are perhaps closer to retirement that might actually resist it a bit." P3*

That idea was supported by another participant who indicated that the older you get, the more set you become in your ways and new ways of doing things tend to be intimidating;

> *"I think most of them will probably avoid it. That's my honest opinion. People generally tend to stick to what is their comfort zone. So for that reason it's easier just to stick to what you know. And I suppose people are also set in their ways. The older you get, the more set in your ways you become. So they are more likely to want to stick to what they already know. So introducing something new, I suppose with this whole industrial revolution we are having to adjust ourselves, but a lot of people are intimidated by what it means." P5*

Participant one and three further added that with proper training and change management the older staff may show willingness to adopt the technology:

> *"I just think that they would need a little bit more training. Uh, and I guess more of an explanation to actually show how much easier it would make their lives and the ease of actual workflow. But I think that if you actually explain things to them properly and taught them how to use it, they might be amenable to it." P3*

"I think it's a very few people that always accept change, change is always difficult. But if it is managed properly. To explain the benefit, you may be able to win the peoples to go along with the project." P1

However, Participant five further thinks that the existing staff will be hesitant to accept cloud computing and may only be prepared to adopt later when they see the benefits:

"I suppose as more and more time goes by and they see that maybe the system works, they may gain confidence and be more willing to try, but with the current staff that we've got. I believe that a lot of them would stick to the old ways of doing things."P5

4.4 Human Resource capacity

When faced with a question of the sufficiency of resources, the participants were heard mentioning human resource, amongst other ones. Participant three was unsure about the capacity of the Human Resource. The participants were specifically asked about Human Resource and participant one gave the view that in order to be certain about human resource capacity, a pilot approach will be an effective way to determine if the human resource is enough or more will be required:

"Uh, you know, I'm not sure because again it will depend on what are the key required things, so usually when you run such a thing, you'll pilot. You do a pilot to see how feasible it is. So it's when doing the pilot stage, that's where you're going to decide whether I have enough resources to make it work or not or if I have resources, but maybe not enough, how much more should I have to make it work. So that is how you know, I'm not sure for the moment but to me, you may have people to maybe start." P1

Participants two displayed a different perspective when faced with the question, alluding to the issue of staff shortage and that new technology may complement the current staff:

"I think with the current staff, we can. As I said, what we will do is probably as we are currently short staffed. When we use such technology, we might be able to manage with the staff that we have. So I don't think we need to employ more, but we'll actually be able to manage with the staff that is here, which is currently short because of the amount of work." P2

All the participants share the same sentiment that cloud computing won't be a threat to peoples' jobs and none of the roles shall become redundant. Participant four further elaborates:

"*No one will lose anything. I actually think then they would hire more people instead letting people go" P4*

With another participant showing a combination of the other participants' ideas and gave a different perspective to the readiness of the facility with regards to the Human Resource topic stating that they should be familiarised with the system to ensure ease of use.

"Uh, because it would be a new thing, like a new program and we would want it to run smoothly without the need of always demonstrating what needs to be done when they're stuck at a certain point." P4

4.5 Finance and ownership

The participants share a common idea that there is finance to carry out cloud computing. Participants three and four mentioned that most of the financial investment will only be needed at initial phase of implementation and once the system is up and running, the organisation will actually be saving:

"So I think with a little bit more expenses as an initial out payment for the internet connection, cloud storage and laptops it could actually work out." P3
"With the cost, I wouldn't say it will be costly. But maybe, most finances will be needed at the initial stages of the implementation. But if you look in the long run, you will be saving a lot and because I mean stationary is part of the budget. So then if we don't need as much stationary, printer servicing, and less paper or ink we will be saving a lot" P4

Participants one and five highlights that even though finance may be present, a lot of leadership convincing and buy-in will be necessary.

"The issue is, if you motivate and convince the leadership of the benefit, they may invest. So to me, the finance is not really an issue. The issue is to be able to convince the leadership that this is a worthwhile project for the service." P1

Participant five added that there is always a shortage of finances with the government and in contrast to other departments, the forensic pathology department is not frequently viewed as a priority by the government:

“I think reality in South Africa, being in South Africa, being at a government facility, there’s always a shortage. But I think the positive thing about South Africans and maybe working as a government employee is that we always try to find solutions to problems instead of listing problems. So yes, finances will always be an issue with Department of Health and especially our service because it is seen as less of a priority.” P5

The common view was also shared by participant two who further gave an explanation that the leadership do not necessarily understand the work that forensic pathology do as compared to other units within the health department and that the staff is not often given an opportunity to give their input resulting in proposals often takin long to be approved or not approved at all:

“*This organisation that I am currently in requires a lot of buy-in from stakeholders who sometimes don't understand the nature of work that the staff do. So, certain things can be valued, but the people who use that information, or who use that equipment are very few, and then they're also not given an opportunity to say, even if they say something it’s important and it's required, but the people who are meant to approve that procurement will take long and sometimes don't approve it at all.” P2*

However, participant one acknowledge the budget constraints that the government is faced with, going on to further mention that with a lot of lobbying and demonstration of benefits cloud computing could bring, the leadership will give financial approval over time:

“It will never be easily adopted because now especially nowadays with all the constraints that government has. But I think the issue is just to lobbying, because over a long term the benefit will outweigh the cost in the history. But of course, it won't happen on one day. So it's a lot of lobbying at the leadership level I believe.” P1

In order for cloud computing to be a success in the organisation, the participants share the common view that it should be outsourced and managed by a private entity. Participant four added:

“Ideally because the government has all the resources to hire the relevant people to carry out the duties of this cloud. But with the experiences we have with the government if something is broken or if something has an issue. You literally have to wait forever for it to be sorted out. There's a high level of incompetence in certain departments within the government. So I think it will be best if the people who come

with this cloud computing program, be the one reliable for anything that could happen to it" P4

4.6 Training is required

The participants all share the common idea that with new technology adoption, training is crucial to the success of the adoption.

"Maybe some training into basic computer because before you go to a specialised thing like that, people must be at least be good with the basics of what we call computer literacy" P1

One participant further clarified that the users already possess an understanding of computers and that the training that will be necessary is introductory in nature to acquaint the users with the program:

"Uh, because it would be a new thing, like a new program and we would want it to run smoothly without the need of always demonstrating what needs to be done when they're stuck at a certain point. I think the initial training would be necessary just to familiarise them with the system. So the introductory training will be necessary, but I don't think they will struggle. They wouldn't need refreshers like refresher courses or anything. I think, just an initial introductory training would be necessary." P4

There is a mutual agreement amongst the participants that cloud computing is understandable and easy to use, they've all used in one way or another at one point in their individual capacities. Participant five added:

"I think for anybody who's got basic training in computer management or somehow to how to work your way around computers it should be easy to understand. Some may need refresher courses or some type of course just to assist them the first time. But I think once you get the hang of using them it does become easy. I don't find any challenges with using such systems." P5

Participant two highlighted that it is very pleasant to use:

"Well, I would actually be happy to have that because I've used it at a personal level and I enjoyed using such, so I think it would be great for the organisation as well." P2

What was exceptionally interesting with the participants is how they all displayed the ideology of training of the staff to achieve the greatest success with the technology and the facility handling sensitive data with the expected confidentiality and have the

data keep the intended integrity. Another common ideology that was shared with the participants regarding training points to the belief of the consideration of ages of the staff in providing training and education. It seems to trace logic to also consider the experience the staff may possess in order to determine the level of training required for the staff.

4.7 Infrastructure procurement

The participants seemed to understand the nature of the technology up to the infrastructure that may be required to adopt the new technology. Another participant mentioned that cloud computing reduces the amount of hardware required to operate compared to the general way of in-house use. The participants described what they understood to be usable infrastructure at current and what more would be required for cloud computing to be successfully adopted. One participant mentioned, in some detail, what they have seen as the current infrastructure and their belief that it can be enough for the moment.

> "*Personally, I do, and I mean the actual building itself isn't in the best state, but it already has a fibre connection. It already has servers and as I mentioned before, most of the staff have access to a computer or a laptop, so I think it could be done.*" *P3*

Another participant mentioned a more inline understanding that due to the nature of the technology, the computers that are there will be usable.

> *"So I'll say for instance, each and every doctor has a laptop that's already plus, but what we need is a network infrastructure to link that with the administration office so that we transmit our things electronically, which is not yet there, but I think it is feasible if we are able to convince the management, they should be able to invest in that. And the other advantages is, you will be able to store data for long time given the fact that we are a medico-legal institution and so there are kind of legal requirement to have data well stored and with the integrity not being tampered with. Yeah, definitely cloud computing will have." P1*

In a number of instances, when the participants were asked to determine, using their knowledge of the status quo, if the facility is ready or has the potential of adopting cloud computing, the responses were varied but shared the same substance; with most participant starting their response with 'Yes'.

"*Yes, I think there would be a need to upgrade, most of the computers that we have are old. So we will need that and we also have to improve our cyber security. Umm. Yeah.*" *P2*

"*I do believe that the current computers can be updated without necessarily buying a new computer but updating software or buying a software. Whether it's maybe staggered, it doesn't have to be a whole implementation started in bits and pieces. Get one system, I mean one computer system to be up and running and then add on another one, add on another one." P5*

One participant shared the same sentiment but with a different view:

"No. We don't have enough resources. What we have currently it's just space because we would then need to buy computers, computers will have to get appropriate desks. And, the status of the establishment? I don't know, maybe yes. I mean office can work. And with the Internet, we do have. Which would then need to be improved to work better. But yeah, we do have things that need to be augmented to fit the profile. Let me just say that we do have necessary setup things that can allow us to start from somewhere. But, to get it running, we will need to improve certain areas." P4

The analysis of the responses gives evidence of the level of readiness when it comes to the topic of infrastructure and the operability of the infrastructure. The participants have shown some level of confidence with the current infrastructure at the facility.

4.8 Access of data and security

The participants referred to the fact that the present method of data storage have very poor security and it is cumbersome to retrieve files:

"Security is just a word that is on paper. I believe anyone can just walk in and access. There's literally, I mean, I don't know, if you're a first time person going in there, you wouldn't know where to stand and ask for help. You would literally think everyone just walks in. So there isn't any security. The only thing that secures those file is just the key. Of which the shelves are unlocked in the morning and they are locked in the afternoons. So anyone during the day can have access. So the security? I don't think it's there." P4

They agreed that cloud computing could help with the problem of inadequate data security if specific limited access control mechanisms are implemented. Participant

one further added that because cloud computing can restrict access to only those who are authorised, it is more advantageous:

> *"Because when you design such a system you will always build in security features in the sense that not everybody will have access to everything." P1*

Authorised individuals were defined as administration officers and doctors in the following manner: doctors should have full access to and editing privileges over their own reports, but one doctor should not be able to edit another doctor's report. Administration officers should only be able to view and print the reports that have been made public by doctors.

> *"My view is that anybody is open to corruption, so the only person you can be in control of is yourself. And so for that reason, I think I'm still with the idea that you should be the only one who should be able to edit your own report. And once the PDF form or some type of PDF form, that can't be changed, it should stay as that." P5*

Giving third parties (including investigating officers - police) access to the cloud is severely discouraged by all participants with participant five stating:

> *"With regards to investigating officers having access to the system, I'm weary about that one because now it opens up all sorts of potential for having access to things that may not be necessary" P5*

Participant two also indicated that password protection will make a significant difference. Furthermore, one precaution measure that was mentioned by all participants is for the system to leave a trail or footprint of who accessed the information and when, Participant two stated:

> "*if most of the information is password protected and designed in a way that any person who has access, whenever they open that information can be retrieved as to who opened the document when and how, then yeah, it is safe." P2*

Along with the time saved when searching for files, the simplicity of data access through cloud computing was also highlighted:

> *"it will shorten the time we spend on documents because when accessing a document, all you need to do is, if you have the access code you just open and access that information compared to where there is information that is locked away*

in a certain file where you have to find the key, you have to find someone to open for you and then if you take it out, we have to document that we have taken it out and then you bring it back. It's a lot of time compared to cloud." P2

One participant raised the prospect that there is a potential of the system being hacked and further mentioned that the organisation could learn from how the banks do things in order to prevent that risk:

"But having said that, I think we also need to take on how banks have done it because banks also carry very delicate information about clients. And so if we adopt those methods and find out how they have done it, how they overcome those challenges, I think it would also help." P5

The analysis demonstrates the readiness to adopt cloud computing in order to address the problem of insufficient data security and ease of data access.

4.9 Conclusion of findings

The aim of this chapter was to present the results from the data gathered. The thematic analysis of the data revealed willingness to adopt, training required, human resource capacity, data access and security as well as infrastructure procurement to be the emerging themes.

The findings have revealed a great level of willingness to adopt cloud computing from the participants mostly because of the challenges that the organisation faces with manual storage and access of files that cloud computing could mitigate. It further revealed that there may be some level of hesitance from the old aged officers mostly because they are intimidated by technology and set in their ways of doing things. However, with good change management, it is believed they may be encouraged to use the technology. Human resource capacity appeared to have varying views from the participants' responses. Some show some level of uncertainty mentioning that in order to be completely certain if whether there is enough workforce to carry cloud computing through, a pilot study will be necessary. Others were confident that cloud computing will complement the current staff that is short, and it will not pose threat to people's jobs.

Finances have been seen to be concerning to the participants after understanding that the common belief is procurement of the service and post adoption maintenance. The participants shared the ideology that government processes are intricate and time consuming. There is also a view that forensic pathology is not often seen as a priority service and therefore, a lot of lobbying and convincing is often necessary when it comes to government investing in its innovation. They have outlined that there is basic infrastructure to resume but it will need upgrading/updating and increment in the long run.

Another aspect that was highlighted was the idea of ownership, where the participants mentioned the significant amount of risk with in-house control and suggesting that outsourced service will ensure effectiveness. To ensure that the workforce won't experience problems with cloud, all of the participants stressed the importance of basic training and orientation required. The nature of the work being carried out requires very high levels of confidentiality and integrity which seemed to be an awareness the participants had. Access to the data/information and security of it has been numerously explained to be of paramount importance while others mentioned that different roles will require different access privileges. The participants made reference to the high levels of security that will be required.

The themes can be described as interconnected, meaning, some themes could be related to more than one study objectives. Table 4-1. Below demonstrates how each theme was related to the objectives and established foundation for following chapter.

Objective	Theme	Theme factor relating to the objective
1. Exploring the feasibility and readiness of cloud-computing	Infrastructure procurement	Internet connectivity Technology hardware equipment
	Human Resource Capacity	Varying opinions
	Training required	Skill shortage
2. Participant perception with regard to cloud computing	Willingness to adopt	Perceived ease of use
		Perceived benefits
3. Exploring factors influencing the adoption of cloud computing	Willingness to adopt	Older staff members hesitancy
	Finance and ownership	Leadership support and provision of resources Need for outsourcing
	Access and data security	Privacy features & ease of data access

Table 4-1 - Linking of the themes and objectives

5 DISCUSSION

5.1 Introduction

The purpose of this chapter is to render an interpretation of the findings, point out the relevance of the findings to the research questions and provide a comparison with existing literature. The objectives will be re-visited and related to the findings of this study and previous work.

5.2 Discussion of findings in relation to objective one: Exploring the feasibility and readiness of cloud computing

The study has identified three factors that indicates feasibility and readiness namely; internet connectivity, human resource capacity and training, and infrastructure. These findings are consistent with the findings from other researchers (Maurice, et al., 2012; Lam, 2011; Niazi & Mahmood, 2011).

5.2.1 Internet connectivity

The findings demonstrate that there is connectivity to the facility. However, the connectivity is reportedly poor and requires improvements to be well equipped for cloud computing adoption. This corroborates the viewpoint of ITU (2012), that adoption of cloud computing requires a reliable internet connection. In addition, one of the difficulties the South African government faces when implementing technological innovation is the necessity for a reliable internet connection (Mutula & Mostert, 2010).

5.2.2 Human resource capacity and training

The human resource aspect showed varying opinions amongst the participants. Some described it to be sufficient to some extent while raising the possibility of more being employed in future and others displayed uncertainty. Mutula and Mostert (2010), on their study of challenges of e-government in South Africa, it was highlighted that the South African government has not yet succeeded in building human resource capacities at the local level, most efforts are focused more on provincial and national level. The need for a skillset was also highlighted in their study, further pointing out to

the lack of effective measures to retain and attract desired skills to the country. Xi and Mitrovic (2014), expressed a similar viewpoint, referencing the necessity of skills development in the pursuit for cloud computing within South African government institutions.

5.2.3 Infrastructure

The findings show that there is infrastructure to initiate the adoption, however, the present fixed and movable technological resources are reportedly aged and will need to be upgraded as well as the building where this technological equipment are being housed. This finding is supported by those of other researchers (Almarabeh, Majdalawi, & Mohammad, 2016; Bollineni & Kumar, 2011; Kundra, 2011). For example, South Africa has challenges in maintenance of government infrastructure (Nengwekhulu, 2009).

5.3 Discussion of findings in relation to objective two: Examine participants' perception with regard to cloud computing

The general perception towards cloud computing by the managers of JFPS is that it is useful and easy to use. This corroborates the studies done by (Anjomshoaa & Tjoa, 2011; Lam, 2011; Wyld, 2010).

5.3.1 Perceived usefulness

The perceived usefulness can be assessed by the relative advantages brought by a technological solution (Gangwar, Date, & Ramaswamy, 2014). There is a generalized perceived usefulness due to realisation of advantages that cloud computing could bring to the operations at JFPS. The eagerness and perceived excitement in the expressions of the participants suggests that the perception of the technology is of a positive nature. The participants have largely responded positively to the intended benefits of the technology. Mutula and Mostert (2010), demonstrated that the technological solution is found advantageous in that it improves level of flexibility and mobility, lower the total cost of ownership, and reduce energy consumption amongst other things. Their observations are supported by the findings of this study. In their

study of issues and challenges of cloud computing in developing nations, Mudawi et al. (2020) expressed a similar viewpoint, explicitly mentioning the benefits that cloud computing could provide to developing countries.

5.3.2 Perceived ease of use

The findings demonstrate a common focus put on the perceived ease of use, the observation made points to the perception that cloud computing can be relatively easy to use in the working environment which can be largely attributed to the personal experiences of the use of the technology. The finding of perceived ease of use is consistent with other studies (Abubakar, Bass, & Allison, 2014; Almarabeh, Majdalawi, & Mohammad, 2016; Wyld, 2010). These other studies further emphasise the importance of negative impact that the technology could have if the users perceive it to be complex.

5.4 Discussion of findings in relation to objective three: Explore factors influencing the adoption of cloud computing

The third objective aims to explore the factors that will either favor or hinder the adoption of cloud computing at JFPS. In this regard, the influencing factors that emerged from the themes includes: leadership, ownership, staff member age, access of data and security.

5.4.1 Leadership –

The participants showed poor confidence in the leadership supporting the adoption of cloud computing. In most cases, they demonstrated that there will be a need to motivate the top leadership of the government unit. They hold the view that the leadership could be a barrier, particularly when it comes to allocating funds to support the adoption of cloud computing. This finding supports that of Xi and Mitrovic (2014) where it was stipulated that the top-management in government has no clear strategies when it comes to the adoption of cloud computing. Almini et al. (2014) in their study, they stressed the importance of top management as an influential factor in

the adoption of cloud computing. Moreover, their study indicated that once the leadership see the benefit, they will positively influence the employees to adopt cloud computing by allocating resources and influencing them to the direction of change (Amini, Bakri, Safavi, Javadinia, & Tolooie, 2014).

5.4.2 Outsourcing –

In order for the implementation to proceed smoothly, there is a shared common believe among the participants that the services of cloud computing should be holistically outsourced. A remark was made that though the government has the capacity and ability to drive cloud computing, in the long run, there is no confidence that the government will be able to maintain it. For that reason, outsourcing services appear to be a positive influence to the adoption of cloud computing. Although outsourcing was not specifically mentioned as a factor that directly influenced adoption, this finding is consistent with studies conducted by other researchers. For instance, it has been demonstrated in the study done by Chandran and KempeGowda (2012) that outsourcing services provide benefits such as low capital expenditure costs and operational costs. A notable advantage is that, there won't be a requirement for personnel to support the infrastructure (Chandran & KempeGowda, 2012).

5.4.3 The age of employees –

The findings show a believe that employees with older age will be resistant to accept the technological solution. In this instance, older age was not specified. Strong change management initiatives will be necessary, nevertheless, in order to convince them of the advantages of cloud computing. The finding is consistent with that of Xi and Mitrovic (2014), who emphasised the issue of employee’s age as a factor influencing the adoption of cloud computing in government organisations. It was noted that older individuals at government institution have a tendency and culture to prefer doing things their own way (Xi & Mitrovic, 2014).

5.4.4 **Access of data and security** –

The security features of cloud computing as well as the ability to access data with ease are factors which brought positive influence to adoption of cloud computing. However, with security some level of skepticism was displayed, further recommending that the government should learn from private institutions such as banks in order to master the issue of information protection. This finding adversely corresponds to that of Xi & Mitrovic (2014). In their study, participants showed concern on trustworthiness when it comes to the security of data stored on cloud, making them skeptical about the government information being kept safe, however they believed that though this issue is of concern, it should not stop the adoption of cloud computing.

5.5 Discussion of findings in relation to the technology adoption models

The literature point out that the intendent purpose of TOE is to identify factors relating to technology, organisation and environment that have influence to technology adoption (Tornatzky & Fleischer, 1990). The TOE framework allowed for the collection of technological, organizational and environmental adoption elements in this study. This is consistent with other findings from previous work (Legris, Ingham, & Collerette, 2003; Riyadh, Akter, & Islam, 2009; Al-Hujran, Al-Lozi, Al-Debei, & Maqableh, 2018).

TAM aims to determine whether the study subjects will accept the technological entity (Davis, 1989). The application of TAM's ease of use and perceived usefulness constructs in this study made it possible to demonstrate that there is willingness to adopt. In addition, the presentation of the benefits of cloud computing by participants further indicated potential usefulness of cloud computing at JFPS. Therefore, it became possible to explore the cloud computing acceptance. This findings are consistent with that by Gangwar et al., (2014) in their study of understanding determinants of cloud computing adoption.

UTAUT intends to assess the user's continuity of using the technology after it had been adopted. It does so by assessing the user's behavioural intention (Venkatesh et al., 2003). It is evident that the UTAUT model achieves its intended goals after being applied in this study. For instance, through the constructs from UTAUT, the discovery that cloud computing services will need to be outsourced at JFPS with the aim to

ensure continued use and maintenance of the technology, was made. This supposition is consistent with that of Lia (2017).

The three technology adoption models mentioned above were utilised in this research study, and it can be reasoned that each one is distinct and only addresses the factors that pertain to it, leaving out those that were covered by other models. This supports the argument that the technology adoption models have to be used in conjunction in order to reduce inefficiencies (Wang & Wu, 2015). For instance, TOE only covered the technological, organisational and environmental aspects of cloud computing adoption. Beyond these factors, it became evident that how the users perceive cloud computing also plays a critical role to their willingness to adopt. Therefore, the willingness to adopt was recognized by incorporating TAM in this study. Furthermore, on predicting the possibility that cloud computing would continue to be used after adoption, UTAUT added a distinctive perspective.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter concludes the research study by re-visiting the objectives in chapter one and addressing them based on the findings and discussions in previous chapters. Moreover, recommendations for cloud computing adoption for this case study are given. The chapter further reports on the study limitations and provides recommendations for future research.

6.2 Conclusions

6.2.1 Conclusion in relation to research objective one: Exploring the feasibility and readiness of cloud computing

It is conclusive that there is partial readiness when it comes to the question of the readiness of JFPS to adopt cloud computing. This is because the following indicators: internet connectivity, human resource capacity and skills, and infrastructure have not been fully met to the level that readiness can be entirely justified.

6.2.2 Conclusion in relation to research objective two: Examine participants' perception with regard to cloud computing

The managers of JFPS perceive cloud computing to be useful and easy to use. The perceived ease of use is attributed to their shared experiences of using the technology at personal basis. Whereas the perceived usefulness was due to the advantages and benefits that cloud computing has and that will simplify and improve workflow processes.

6.2.3 Conclusion in relation to research objective three: Explore factors influencing the adoption of cloud computing

This study explored factors that influence cloud computing at this particular organisation. The finding indicated that the top leadership, outsourcing of services, employees age, and access of data and security are all factors found to have influence to cloud computing adoption. One other striking finding gathered from this study is

that cloud computing will not pose a threat to the employees jobs or result in other roles being redundant at this particular institution.

6.2.4 Conclusion in relation to technology adoption models

The technology adoption models played a critical role in relating the readiness test to the actual operating entity. They have guided the study into contextualising the specifications of the adoption of cloud computing. TOE, for instance, evaluated internal and external aspects relating to the organisation and has identified the elements that can influence the adoption, TAM focused mostly on the attitude of the users and UTAUT put some focus on behavioural expectations covering a wider spectrum of readiness assessment. Upon the reflection of those outcomes from the adoption models, decisions could be made with regard to readiness. The adoption models have allowed the study to assume the readiness of the facility towards partial readiness.

6.3 Recommendations and implications

For JFPS to be successful in cloud computing adoption, we recommend that a determination of the amount of technical assistance the organisation will require to advance their understanding of cloud computing be assessed. The knowledge attained will enable them to be at a well-informed position to be able to deploy the cloud computing model that is suitable for their services in order for it to add value.

It has become apparent that top leadership influence could be a hindrance. Regarding this, the study recommends that the benefits of cloud computing be communicated to the leadership in order for them to be aware of the advantages that cloud computing could bring to the services of JFPS. Leadership involvement will enable a seamless adoption by providing necessary resources such as infrastructure, human capacity, and finance. These factors all exhibited some degree of deficiency and appeared to be poorly influencing cloud computing adoption.

Additionally, a further recommendation is on change management programs that will ensure that all necessary measures are addressed to ensure full onboarding of all future users, including officers with older age. Effective and measurable strategies

should be implemented and followed holistically together with policies that support the adoption of cloud computing and its implementation.

The safety and security of information stored and shared on the cloud is paramount. As part of getting ready for cloud computing adoption, we recommend that the organisation consult with private institutions such as banks in order to learn how they are successfully able to protect their client's properties from cyber-crime and implement similar systems as part of their strategies, as suggested by a participant in this study.

Furthermore, the study recommends that an outsourced company holistically run the service to ensure sustainability as it has been demonstrated from the findings that government tends to be incompetent in some areas.

6.4 Limitations

The following limitations are acknowledged:

- The study focused only on middle and senior managers. ICT personnel were excluded, this implies that the findings of this research can only be used to assess the non-technological readiness of cloud computing and not the technical aspects of cloud computing.
- The focus was only on one government institution, therefore the findings can not be generalised to other government institutions.
- The research did not explore the computer literacy of the participants.

However, the integrity of this study is not thought to have been compromised by these limitations.

6.5 Suggestions for further studies

Future research directions have been suggested as follows:

- Similar future studies should involve ICT personnel because they are thought to have a broader and specialised perspective about the technical aspects of cloud computing.

- Assess computer literacy level amongst the users by employing appropriate computer literacy indicators.

The study should be replicated in other government and forensic pathology service institutions.

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ANNEXURE 1

INTERVIEW GUIDE

Model	Constructs/ Focus area	Interview questions	References
1. TAM	Perceived usefulness	What opinion do you have regarding the adoption of cloud computing? In your own words, describe how you think the adoption will bring a change in the operations.	(Gangwar, Date, & Ramaswamy, 2014)
	Perceived ease of use	How do you perceive the usability of cloud computing? What is your opinion on users' abilities in using the technology?	(Gangwar, Date, & Ramaswamy, 2014)
2. TOE	Technology context	What is the current state of mobility? (flexibility of being able to carry out work anywhere) In your own words, how you describe the state of data storage? Elaborate. Point out areas that could benefit from technological solutions?	(Schillewaert, Ahearne, Frambach, & Moenaert, 2005)
	Organisation context	How can the existing resources (financial, human, etc.) be used to seamlessly adopt cloud computing? How would the current skills be useful for cloud computing, any roles that may be redundant or obsolete? Describe how the resources can improve the cloud computing adoption. How would you describe the willingness for the adoption of cloud computing?	(Tan, Tyla, & Manica, 2007)
	Environment context	Would you say you have enough resources to go ahead with the adoption? Elaborate. What operational logic would you use to promote the decision to acceptance of the technology? Describe if there is a capacity (Financial, skills, technical, time) to adopt cloud computing as part of the operations.	(Low, Chen, & Wu, 2011)
3. UTAUT	Attitude towards cloud computing	Why should the adoption of cloud computing be given focus? How would you recommend the adoption be done? Which parts of the organisation require what cloud computing can offer?	(Lai, 2017)
	Behavior towards cloud computing	Have you used technology such as google drive, one drive, icloud, etc.? How do you feel about something of that nature being used in the organisation? Why?	(Venkatesh, Morris, Davis, & Davis, 2003)