The Influence of Change Management Process on Cloud Transitioning

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ABSTRACT

Technology is a dynamic field with constant changes, improvements, and new discoveries even before anyone is fully comfortable or used to the way it was. Cloud computing has gained momentum with the migration to the cloud growing at an incremental rate each year. However, some organisations migrate prematurely without fully understanding the impact on various factors. This research focuses on the influence of change management processes on cloud transitioning. The study included the feasibility of using COBIT to adequately manage organisational change when migrating to the cloud. The quantitative research methodology used a survey where the concept of cloud computing and applying COBIT in the context of organisational change were explored. A combination of these concepts was necessary as these had not been explored in other studies. A correlation coefficient analysis was performed to determine the relationship between COBIT's change management processes and the success rate of cloud computing. The results of this research suggest that there is a relationship between change management processes and the success rate of cloud computing. Future research could include the creation of a cloud-readiness assessment model to assist businesses to make an informed decisions when migrating to the cloud.

1 INTRODUCTION

For various reasons, organisations are transitioning to cloud computing at an increasing rate each year (Akar & Mardiyan, 2016). Some organisations are transitioning to the cloud for monetary benefits, whilst others are migrating to increase the efficiency and effectiveness of their internal processes (Akar & Mardiyan, 2016; Gimmon & Benjamin, 2014). This transition has presented businesses with a level of unprecedented agility, improving the organisations' ability to implement and deliver fast and effective services (Almishal & Youssef, 2014; Narula et al., 2015). However, cloud transition has also introduced new challenges to organisations' risk, governance and management strategies, as those strategies attempt to protect information

in an environment where they have minimal control (Narula et al., 2015). This results in many organisations resorting to cloud computing to handle such challenges (Singh, 2012). However, some organisations are prematurely moving to the cloud without careful consideration of the effects of this transition.

Change management and IT are inseparable. The implementation of any new IT system or the upgrade of such systems, involves change. Change is associated with (1) the way and manner that people engage with the new system (behavioural) and (2) the introduction of new or enhanced business processes (system). Whether the change is behavioural or system, it should have a positive impact. Change management can be addressed from various angles. Changing behaviour speaks to the culture of the organisation. Various studies have focused on behavioural changes, for instance Kotter's (1995) 8-step change methodology. Jayeola et al. (2022) discussed the role of top management in the adoption of enterprise resource planning (ERP) cloud solutions. Da Veiga (2018) introduced the Prosci's ADKAR (Awareness, Desire, Knowledge, Ability and Reinforcement) change management model to investigate culture change regarding security. Even information systems theories such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) address this phenomenon, ensuring that users adopt and adapt to changes. From a process perspective, Hornstein (2015) highlighted the symbiotic relationship between change management and project management. Change management is also a component of IT service management (Gacenga et al., 2010). Here the focus is on standardised methods and procedures that are used for the efficient and prompt handling of all changes to control IT infrastructure.

Irrespective of the change management perspective, change is governed through corporate governance as well as IT governance. From a corporate governance perspective, the King IV Report on Good Governance stipulates that the oversight should be exercised resulting in "a technology architecture that enables the achievement of strategic and operational objectives" (Institute of Directors Southern Africa, 2016). IT governance forms part of corporate governance and the major approaches include the Control Objectives for Information and Related Technologies (COBIT), the Information Technology Infrastructure Library (ITIL) and International Standards Organisation Standard on IT governance (ISO 38500:2015).

In general, the concerns of cloud computing have become so significant that studies suggest cloud computing may have a distinct governance function, separate from other governance capabilities (Narula et al., 2015; Rebollo et al., 2015). Researchers have gone as far as suggesting that some organisations need a specific executive position that is committed to the oversight of cloud-related issues, such as a Chief Cloud Officer, and a separate subcommittee from the board of directors to guide the position's priorities (Gimmon & Benjamin, 2014).

Organisations' transition to the cloud involves change from a behavioural and a systems perspective. The research question posed by this study is: *whether change management processes have any influence on the success of cloud transitioning.* This will be analysed from the systems perspective. In this study, COBIT was used as the IT governance framework. The choice of COBIT is based on the following: it is a globally recognised framework and it provides measurable and actionable practices through its various control objectives (Erasmus & Marnewick,

2021). Insights were gathered from IT managers and IT executives within the South African banking sector with relevant experience in cloud computing, IT governance and change management.

The outline of this article is as follows: Section 2 focuses on the literature studied in this research i.e., the concept of cloud computing, IT governance and organisational change management within the context of cloud transitioning. Section 3 focuses on the research methodology used in this research – it explores the concept of research and how to determine the appropriate research method to use for this study. Section 4 focuses on the data analysis and discussion – it discusses how the data were collected, analysed, and interpreted. The results of this section provide insights needed to determine if the research goal was met. Section 5 concludes this research study by revisiting the objectives and determining the outcome.

2   LITERATURE REVIEW

'The cloud' is a concept that has been around since the 1990s. Haris and Khan (2018) did an extensive mapping around the paradigm of cloud computing. The origins of cloud computing as we know it today, originated from distributed computing, evolved into cluster computing, and eventually cloud computing. The underlying premise is that cloud simply refers to the internet and its supporting infrastructures (Conway & Curry, 2012; Marston et al., 2011). Cloud computing is a model that enables network access to shared computing resources that can be managed with minimal effort or minimal service provider interaction, from anywhere at any time. Cloud computing is mainly based on internet computing where virtual resources are used on a pay-as-you-use basis (Thobejane & Marnewick, 2020). Cloud computing can also be defined as internet-based computing in which virtual resources are dynamically scaled and provided as infrastructure, platform or service, over the internet (Singh, 2012). In this article, cloud computing is defined as the sharing of virtual resources and dynamically managing them, ubiquitously over the internet.

Figure 1 depicts a high-level summary of cloud computing (Thobejane & Marnewick, 2020). Cloud computing consists of various deployment models, service models and essential characteristics. Cloud computing essentially has five characteristics, namely resource pooling, broad network access, rapid elasticity, measured service and on-demand self-service (Armbrust et al., 2010).

The various deployment models are adopted by different organisations based on business needs and other related factors. There are different types of cloud deployment models. Deploying these cloud models can happen in the following ways, namely private cloud, public cloud, community cloud and hybrid cloud (Subashini & Kavitha, 2011). Selecting a deployment model may be based on a variety of factors, ranging from business objectives to how the business is structured, taking into consideration the benefits and drawbacks of the model adopted:

- Private cloud refers to computing resources that are used, controlled and owned by an
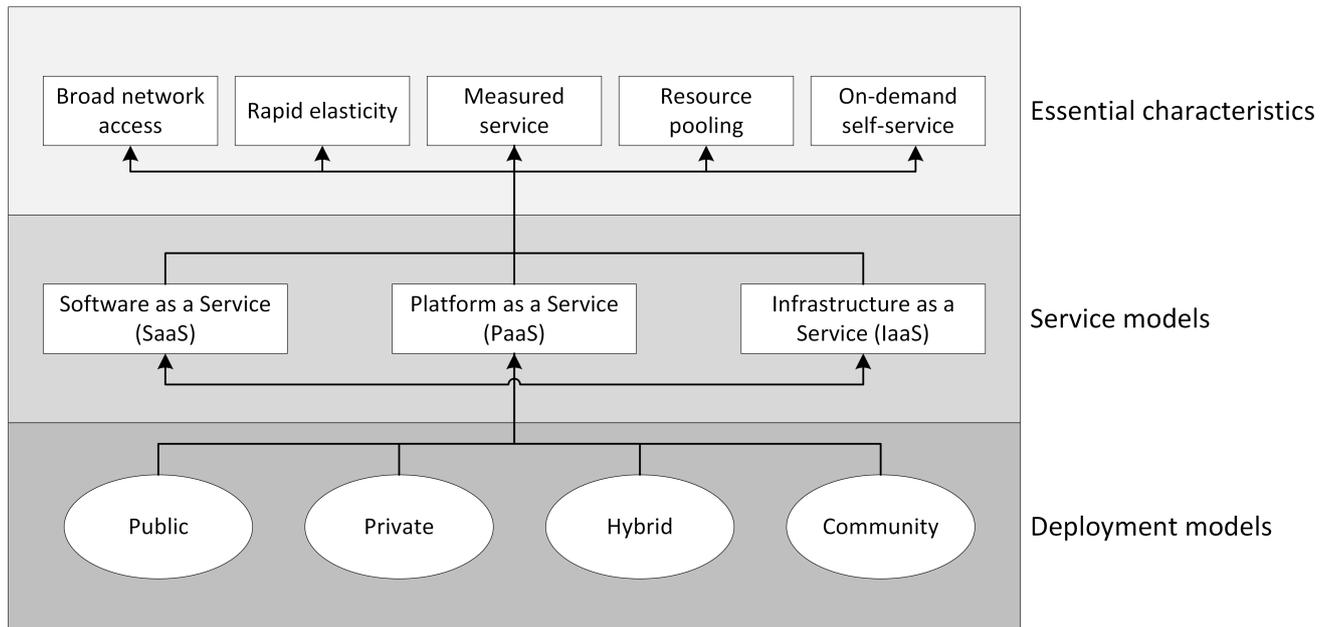
Figure 1: Summary of cloud computing[a]

[a](Thobejane & Marnewick, 2020)

organisation (Leavitt, 2009). Hosting can either be internal, within the organisation, or external, through a third party or a cloud service provider (CSP).

- Public cloud refers to computing resources that are owned and managed by third parties or cloud providers (Mell & Grance, 2011). The resources are dynamically provisioned over the internet. There is the ability to scale resources up or down as needed by the organisation.

- Community cloud refers to organisations in a group with common interests alongside their concerns and share computing resources. The infrastructure is arranged and maintained by third-parties or CSPs, and the organisations involved (Mell & Grance, 2011).

- Hybrid cloud refers to when an organisation has a desire to provide cloud services but would still like to secure its internal workings. Hybrid cloud hosting could be from within or outside the organisation, based on the objectives of opting to use a hybrid cloud.

In summary, the various deployment models can be compared as per Table 1.

Once an organisation has decided which deployment model to adopt, they then need to consider the service model that they will use i.e., infrastructure as a service (IaaS), platform as a service (PaaS) and/or software as a service (SaaS). These sometimes build on one another but can also be independent from each other. Figure 2 gives an overview of the cloud service mod-

Table 1: Summary of cloud deployment models[a][b][c]

Deployment model	Reason for adoption	Cloud setup	Benefits	Drawbacks
Private Cloud	- Privacy and legal reasons - Smooth running of private data centres - Availability of computational resources	- Hosting can either be internal or external, based on usage - Infrastructure is owned and controlled by an organisation	- Exposure is better managed, thus more reliable and secure	- Purchase and maintenance of infrastructure might be costly
Public Cloud	- Requires variable resources - Inability to purchase and maintain infrastructure - Collaborative development projects - Variety of resource services available at low costs based on usage	- Infrastructure is setup by a cloud service provider	- Pay as you use, thus low cost - Resources are dynamically provisioned over the internet - Scalable and transitioning between performance immediately and with ease	- Risk of exposure is high, thus security concerns - The higher the scalability, the higher the cost
Commmunity Cloud	- Organisations grouped together with common interests and concerns	- Infrastructure is setup and maintained by 3rd parties, or organisations involved	- Collaboration and sharing with other organisation - Lower cost of investment	- Very slow adoption rate, this is only beneficial once more organisations are involved
Hybrid Cloud	- Organisation with the desire to provide cloud services, but also wants to safeguard its internal workings	- Cloud hosting may be from within or outside based on the usage requirement	- Enable organisations to enjoy the benefits of being scalable with minimal costs of public cloud, whilst still reducing exposure of critical applications to third party vulnerabilities	- Not easy to maintain - Infrastructure is dependent on one another and the merging of many cloud platforms

[a]Mell and Grance (2011)
[b]Hentschel et al. (2021)
[c]Rastogi and Sushil (2015)

els, depicting how the models build on each other. It also indicates where the responsibility lies i.e., who manages the cloud.
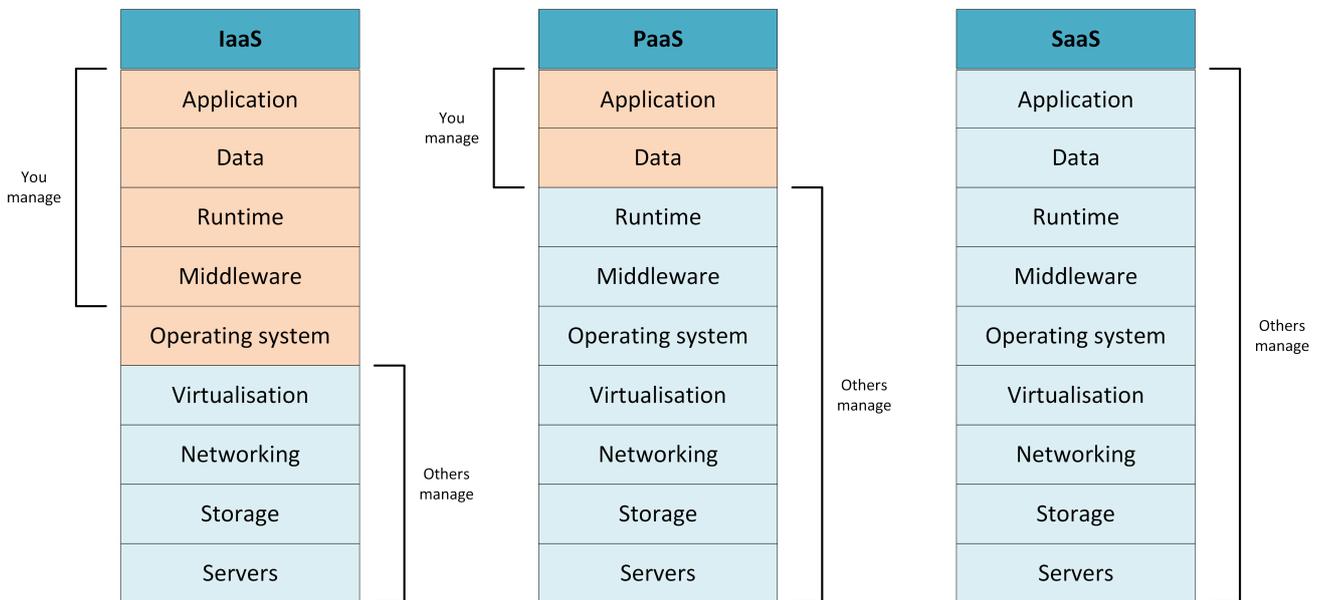
Figure 2: Cloud service models[a][b]

[a]Marston et al. (2011)
[b]Thobejane and Marnewick (2020)

Over the years, cloud computing has gained momentum, and has been growing incrementally ever since its inception. There have been three major role players, namely Amazon with its Amazon Web Services, Microsoft with its Microsoft Azure, and Google with its Google Cloud Platform (GCP) (Almishal & Youssef, 2014; Conway & Curry, 2012). These three players have most of the global cloud market. The three role players in cloud computing have penetrated the market over the years and occupy specific segments. They have continued to grow at an incremental rate and gain market-share across the world (Gimmon & Benjamin, 2014).

Various benefits and challenges are associated with cloud computing. The benefits of cloud computing can be grouped into non-functional, economic and technology benefits. Non-functional benefits include simplicity, elasticity/scalability, mobility, and availability. Economic benefits include the reduction of cost, pay-per-usage, and a green environment (sustainability). Technological benefits include virtualisation, multi-tenancy, security, and data management. Saini et al. (2019) added the following benefits: backup and recovery, speed of setup and growth in business. Marston et al. (2011) mentioned that lowering IT barriers to innovation is also a benefit of cloud computing. Table 2 classifies the benefits of cloud computing.

The two major benefits of cloud computing are the scalability associated with cloud computing and the reduction of cost.

Table 2: Benefits of cloud computing

Classification	Benefit	References
Non-functional	Simplicity	Haris and Khan (2018)
	Elasticity/scalability	Akar and Mardiyan (2016), Singh (2012), Haris and Khan (2018), Marston et al. (2011), Leavitt (2009), Saini et al. (2019)
	Mobility	Haris and Khan (2018), Marston et al. (2011)
	Availability	Haris and Khan (2018), Marston et al. (2011)
Economic	Cost reduction	Singh (2012), Haris and Khan (2018), Marston et al. (2011), Saini et al. (2019)
	Pay-per-usage	Haris and Khan (2018)
	Green environment (sustainability)	Singh (2012), Haris and Khan (2018), Youssef (2014)
Technological	Virtualisation	Haris and Khan (2018), Saini et al. (2019)
	Multi-tenancy	Singh (2012), Haris and Khan (2018)
	Security	Singh (2012), Haris and Khan (2018), Saini et al. (2019)
	Data management	Haris and Khan (2018), Saini et al. (2019)
	Backup & recovery	Saini et al. (2019)
	Speed of setup	Marston et al. (2011), Saini et al. (2019)
	Business growth	Saini et al. (2019)
	Innovation	Marston et al. (2011)

The benefits of adopting cloud computing out-weighs the disadvantages associated with cloud computing. Disadvantages of cloud computing include load balancing performance interoperability energy consumption (Haris & Khan, 2018) security staffing or resource reduction (Saini et al., 2019; Stein et al., 2020).

Cloud computing brings various changes about within an organisation. These changes relate to infrastructure, processes, project management, roles and responsibilities of people, governance and legislation (Borgman et al., 2013; Li et al., 2010; Rizescu & Tileaga, 2016). These changes can be classified as either behavioural or system. In addition, these changes need to be managed effectively to ensure the introduction of cloud computing adds value within an organisation (Gimmon & Benjamin, 2014).

2.1   Organisational change as a result of cloud computing

The transition to cloud computing introduces change. From an IT perspective, the ability to effectively manage change has emerged as a pivotal skill in navigating the complexities of today's dynamic business environment. Change management can be defined as a structured approach to transitioning individuals, teams, and entire organisations from a current state to a desired future state, minimising resistance and maximising the likelihood of success.

Numerous theories and models have been developed to provide frameworks for understanding and implementing change within organisations. One of the most widely known models is Lewin's Change Management Model (Ratana et al., 2020), which suggests that change involves

three stages: unfreezing the current state, transitioning to the desired state, and refreezing to stabilise the new state. This model underscores the importance of preparing employees for change, managing the transition, and reinforcing new behaviours. Another influential framework is Kotter's (1995) 8-Step Change Model, which emphasises creating a sense of urgency, forming a guiding coalition, developing a vision, communicating the vision, empowering action, generating short-term wins, consolidating gains, and anchoring new approaches in the culture. This model places a strong focus on leadership's role in driving change and ensuring its sustainability. This model is aimed at the strategic level of the change management process (Tang, 2019). The ADKAR model is mainly intended to be a coaching and change management tool to assist subordinates through the change process within organisations (Tang, 2019). The ADKAR model describes how change can be successful at an individual level. Da Veiga's (2018) study investigated the role of an individual's behaviour on information security. These change management theories focus on the culture and behavioural changes within the organisation. In this study, the focus is on the governance of changes associated with the transition to the cloud. The focus is not on the individual or organisation per se.

From an IT perspective, change management holds particular significance. Rapid technological advancements and digital transformations are common in the IT landscape, making effective change management essential to ensure the success of projects and minimise disruptions. ITIL is a widely adopted framework that provides best practices for IT service management, including change management (Marrone & Kolbe, 2011). ITIL emphasises the importance of rigorously planning and controlling changes to IT services, evaluating risks, and involving relevant stakeholders throughout the process.

Agile and DevOps methodologies introduced new approaches to change management in IT (Marnewick & Langerman, 2021). These methodologies promote iterative development, continuous integration, and frequent releases, necessitating a more flexible and adaptable change management strategy. This shift from traditional waterfall approaches to more dynamic methods aligns change management with the pace of technological innovation (Tshabalala & Marnewick, 2021).

Change is inherent to the world of technology, with organisations constantly adopting new systems, software, and processes to remain competitive and efficient. COBIT, within its governance structure, plays a pivotal role in change management by providing a structured framework for evaluating, approving, and implementing changes to an organisation's IT environment. COBIT ensures that changes are in line with the organisation's strategic objectives and are implemented in a controlled and risk-aware manner. By setting up change governance processes and defining the roles and responsibilities of stakeholders, COBIT establishes a framework for assessing the impact of changes on business outcomes and IT systems. By incorporating change management principles that align with COBIT's guidelines, organisations can drive innovation, enhance operational efficiency, and minimise risks associated with technology transformations.

Organisational change comes with various benefits when businesses decide to move to the cloud. These benefits ensure that these organisations remain relevant in the long term and can

sustain their businesses. When organisations change because of cloud computing, the benefits can be summarised as follows (Gimmon & Benjamin, 2014; Li et al., 2010):

Increased return on investment An organisation embarking on an organisational change, usually invests many resources to ensure the implementation of an effective change. In the case of cloud computing, organisations can share their resources with others to save costs and pay only for what they use.

Improved productivity Organisational change could be a result of automating mundane business processes. In the case of cloud computing, organisations do not need staff working on upgrading the infrastructure and manually updating software in their data centres; all these can be automated, and the staff can focus on other fulfilling tasks.

Greater efficiency Organisational change could be due to decommissioning legacy systems that require repetitive, tedious processes to conduct business. In the context of cloud computing, the performance of the systems and availability of services is determined by the SLA between the organisation and their CSP, thus better efficiency can be achieved by subscribing to the correct package.

Reduced costs Organisational change could be from improving processes to reduce organisational costs. In the context of cloud computing, not having a data centre that requires maintenance within the organisation could save costs

New opportunities Any change comes with new opportunities. In the context of cloud computing, an organisation having the ability to store more data about their clients and gain some insights about their behavioural patterns could result in opportunities that they never knew existed.

However, just like any other concept, organisational change as a result of cloud computing comes with challenges as well (Akar & Mardiyan, 2016; Rizescu & Tileaga, 2016):

Conflict As many as there are people who embrace change, there are just as many who are reluctant to change. In the context of cloud computing, conflict could arise from some maintenance staff members being retrenched as a result of not needing an in-house data centre.

Distinguishing the necessity of different objectives For a change to occur, there needs to be a vision that drives this change. However, if the vision is not communicated effectively, it could result in stakeholders misunderstanding the need for the change. In the context of cloud computing, some stakeholders might think the reason for moving to the cloud is to restructure and retrench some staff members, which could lead to disgruntled employees who do not fully understand the vision.

Maintaining records of the acceptance of change Organisational change needs to be tracked and constantly monitored. With cloud computing, if the organisation successfully migrates to the cloud, but migration hinders business processes that support daily operations, then there must be a way to measure this and be able to resolve it timeously.

Planning Organisational change requires intensive planning, constant monitoring and updating of the plan, based on different challenges that could possibly arise. In cloud computing, if the organisation plans on using a CSP based on what was discussed and agreed on, only to find that this does not really have all the services that the organisation needs, one should reconsider and look at alternative options offered by other CSPs.

Cloud computing brings about change in an organisation. These changes include the infrastructure, processes, project management, roles and responsibilities of people, governance and legislation (Borgman et al., 2013; Li et al., 2010; Rizescu & Tileaga, 2016). However, these changes come with their benefits and drawbacks, and need to be governed to have a smooth transition to the cloud.

2.2   IT governance with a focus on change management

IT governance is a subset of corporate governance (Marnewick & Labuschagne, 2011), which is a combination of mechanisms, processes and practices that direct and control an organisation (Cheng & Gong, 2012; IT Governance Institute, 2019b). IT governance ensures that the organisation's IT aligns, sustains and extends the corporate strategies (Marnewick & Labuschagne, 2011).

The implementation of IT governance to oversee changes due to cloud computing comes with various benefits (Gheorghe, 2011; Selig, 2018). IT governance ensures there are controls in place that address identified risks. These controls are usually based on different industry standards and implemented within the organisation. An IT governance framework ensures that policies and procedures are as a form of guidance to standardise IT processes. IT governance also ensures that there is an adherence to legal and regulatory requirements. Governance frameworks like ITIL and COBIT make it easier to determine the operating effectiveness of different systems implemented within an organisation.

Implementing IT governance to govern changes such as cloud computing transitioning, comes with its own set of challenges (Cheng & Gong, 2012; Selig, 2018). Implementing IT governance processes can be very costly; thus, it is crucial to ensure the correct size is applied. Implementing IT governance processes does not necessarily result in tangible end products, so getting stakeholders to buy into the idea of implementing this could be tricky. Project sponsors and process owners could have different expectations when implementing IT governance, thus it could result in failure. Integrating the existing standard could be a challenge if the organisation wants to optimise the adopted governance framework. An organisation should have a mature information management plan to implement successful IT governance.

Within COBIT's Build, Acquire and Implement (BAI) domain, management objective BAI05 focuses explicitly on managing organisational change. The purpose of this management objective is to maximise the likelihood of successfully implementing sustainable enterprise-wide organisational change quickly and with reduced risk (IT Governance Institute, 2019a). This management objective covers the entire life cycle of the change and all affected stakeholders in the organisation as well as IT. There are seven management practices that support the change management objective (Abu-Musa, 2009; IT Governance Institute, 2019b):

1. **Establish the desire to change** This is to fully comprehend the extent and possible consequences of the desired change. Prior to a change being implemented, organisations must have a desire to transition to the cloud. For an organisation to transition to the cloud, all involved stakeholders must be keen and ready to change. However, to be successfully implemented, there must be some form of drive to influence stakeholders to participate in the transition to the cloud.

2. **Form an effective implementation team** Create an implementation team with appropriate team members – this will ensure there are measurable common goals that enable a smooth transition to the cloud.

3. **Communicate the desired vision** Effectively communicate the desired vision to transition to the cloud in a manner that will be understood by everyone involved.

4. **Empower role players and identify short-term wins** Ensure that accountability is enabled for those with roles in the transition to cloud computing. Crucial short-term wins that enable cloud transitioning should be communicated.

5. **Enable operation and use** Establish technical, operational and usage aspects of cloud computing to enable all parties to exercise their responsibilities.

6. **Embed new approaches** Instil a new outlook by monitoring the cloud transition and determining the adequacy of the use and operation plan, and ensuring there is continuous awareness.

7. **Sustain changes** Encourage and endure cloud transitions by ensuring staff members are trained, continuous communication is maintained, top leadership is committed, and adoption is tracked and monitored.

Furthermore, the BAI05 management objective addresses aspects of managing changes in an organisation, within the context of introducing new technologies, which in this case, would be referring to cloud computing. The change management objective within COBIT, ensures that changes are effectively implemented whilst managing all the risks that could arise (IT Governance Institute, 2019b). It also ensures that all the involved parties, including individuals in business and IT, are fully supportive of the vision and understand the risks associated with the change (IT Governance Institute, 2019b).

3   RESEARCH METHODOLOGY

To determine the appropriate research methodology, firstly, an appropriate research paradigm had to be determined. After careful consideration, a quantitative research approach was found to be appropriate (Balnaves & Caputi, 2001). Secondly, an appropriate research strategy had to be determined. The survey research strategy was found to be appropriate, as it gave a holistic view of the phenomenon, and is associated with quantitative research. This research made use of a closed-ended questionnaire to obtain a meaningful number of responses in a cost-effective manner. The questionnaire consisted of three parts. The first part focused on biographical information. The second part focused on cloud computing – on the benefits of cloud computing as well as the deployment models. The third part focused on the IT governance change management processes. Although there are drawbacks to using a questionnaire, the benefits outweigh the drawbacks in this research, and some of these benefits include: (i) data is collected directly from the respondent, (ii) data can be collected in a quantitative or qualitative form, (iii) it provides a holistic view, thus can be generalised and (iv) data can be collected within a short period at a low cost.

Furthermore, an appropriate timeframe had to be determined. After careful consideration, the study needed to be conducted at a single point in time using various individuals, thus, the cross-sectional research time frame was selected. In addition, an appropriate sampling technique had to be determined. A population of IT managers and IT executives within the South African banking sector was identified for this research. Using a stratified sampling technique provides insight to the different groups within the population and ensured accountability of the subgroups (Saunders et al., 2016). However, not all IT managers and executives had adequate insight and knowledge of cloud computing or IT change management to obtain sufficient insights required on these subjects. Therefore, subgroups of IT managers and executives with experience in cloud computing, change management and IT governance were identified. This provided a potential 16 candidates per bank, who could complete the questionnaire to provide insightful data. This resulted in a total of 64 potential candidates from the four banks. A sample size of 56 is sufficient to conduct a successful study (Krejcie & Morgan, 1970).

Lastly, an appropriate method to collect and analyse the collected data had to be determined. A data analysis framework was established, which consisted of five phases: data collection, data preparation, data analysis, interpretation and discussion (Miles et al., 2019; Pesämaa et al., 2021).

Data collection and preparation process were meticulously and systematically performed, ensuring that there was no erroneous capturing of data or introduction of bias in the gathered data. The survey was created using Google Forms. A link was shared with the participants via email and LinkedIn. The research aimed to reach a total of 56 participants, as per the sampling approach. However, the target was exceeded with a total of 59 respondents who opted to participate in the research survey. This enabled the researchers to set up the data collection process in a way that ensured the participants: (i) did not submit blank responses by making sure that all the required fields were completed before they could move to the

next question and (ii) data types were collected as needed i.e., numbers, texts and Boolean variables. Data from Google Forms were exported into SPSS for data interpretation. Results and analysis were also exported from SPSS to Excel. The applications' internal export function was utilised to avoid the manual manipulation of data.

4 DATA ANALYSIS AND DISCUSSION

The goal of this section, in line with the objective of this research, was to analyse, interpret and discuss the data collected for the purposes of assessing the feasibility of using COBIT to adequately manage organisational change when moving to the cloud.

A Cronbach's alpha reliability test was performed using the Statistical Package for the Social Sciences (SPSS) built-in scale functionality. The Cronbach's alpha reliability results for this research were 0.876, and based on the results, this is good, and the data was reliable (Field, 2018). Furthermore, the analysis of the data was performed using Microsoft Excel and its related formulae and analysis tools to gain insights from the gathered data. Lastly, correlation analyses were performed to determine any possible relationship between the different variables.

4.1 Biographical information

The biographical information that was gathered, focused on the participants' level and type of experience in IT governance, the participants' level and type of experience in cloud computing and lastly, the participants' level of experience in the banking industry. The results are depicted in Figure 3, Figure 4 and Figure 5.
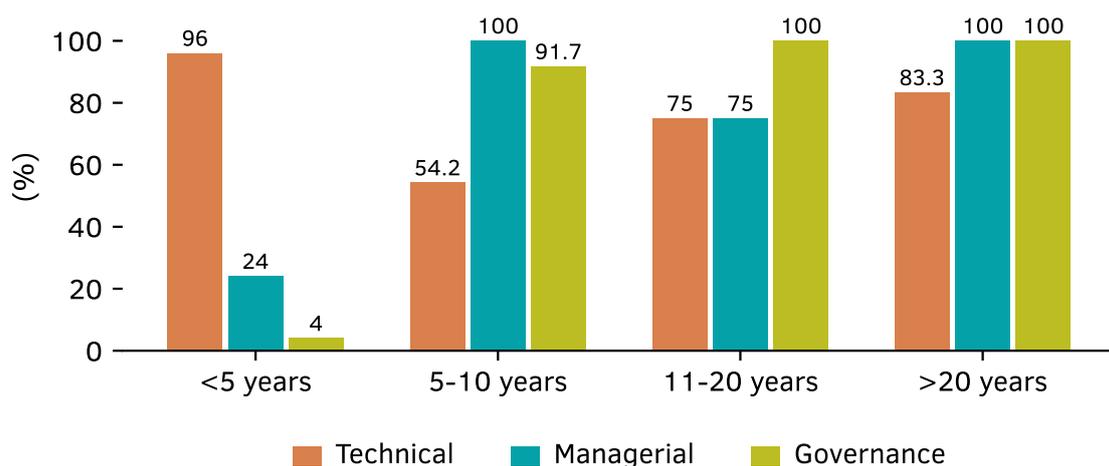
Figure 3: Relationship between the IT governance focus areas and the participants' years of experience.

Figure 3 shows that the participants with less than five years of experience have more technical experience in IT governance than the other two focus areas. Participants with more than five years of experience have more managerial and governance experience in IT governance, than the technical experience focus area. This could imply that the more years of experience the participants have, there is a better chance of them being exposed to more managerial and governance responsibilities. This tends to be the average number years by when most employees become managers or executives.

Figure 4 shows that the participants with less than five years of experience have more technical experience in cloud computing than the other two focus areas. Participants with five to ten years of experience in cloud computing have more managerial and governance experience than the technical experience focus area. This could imply that the more years of experience the participants have, the better chance of them being exposed to managerial and governance responsibilities in cloud computing.
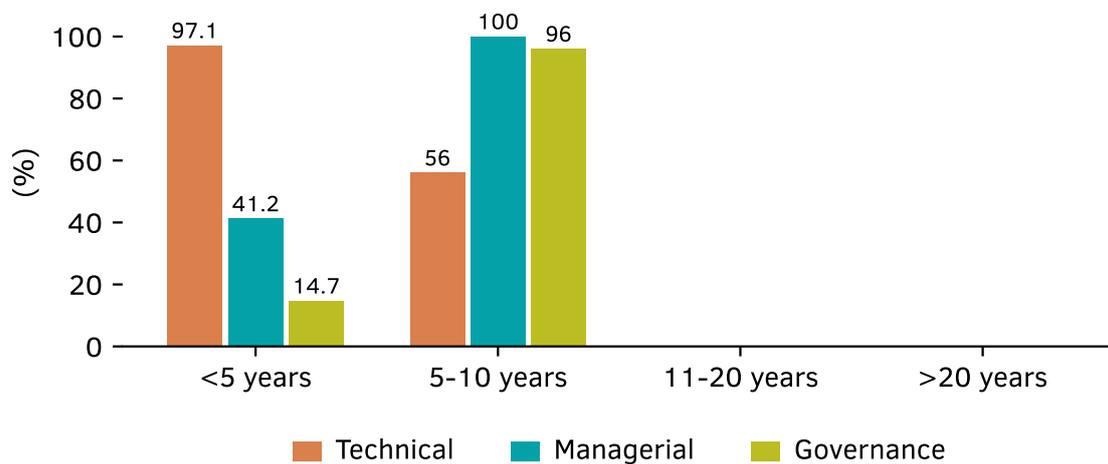
Figure 4: Relationship between the cloud computing focus areas and the participants' years of experience.

Figure 5 shows that out of the 59 participants with experience in the banking industry, 39% (23) have five to 10 years of experience, 35.6% (21) have 11 to 20 years, 15.3% (9) have more than 20 years and 10.2% (6) have less than five years. It also shows that the minority of the participants have less than five years of experience in the banking industry. This reason could be that a manager in a bank needs to have a good understanding of the banking business prior to being considered for this role. Furthermore, this research targeted individuals who were IT managers and IT executives.

10.2	39.0	35.6	15.3

0   20   40   60   80   100

🟥 < 5 years   🟨 5-10 years   ⬜ 11-20 years   🟦 > 20 years
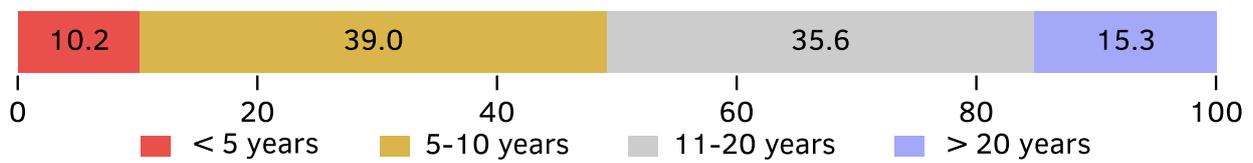
Figure 5: Participants' years of experience in the banking sector.

4.2 Cloud computing

The cloud computing information that was gathered focused on the participants' level of involvement, as well as the success rate of the cloud computing projects and the different cloud project phases in which the participants were involved, the impact of introducing cloud computing in the environment of the participants' organisations, the key drivers to move to the cloud, the cloud service providers and the services the participants' organisations opted to use, and the benefits and drawbacks of moving to the cloud.

The results in Figure 6 showed that all the participants were involved in cloud computing projects. As a result, their input would be in alignment with the objectives of this research. Most (62.7%) were *Often* involved and 25.4% were *always* involved in cloud computing projects.

1.7 10.2	62.7	25.4

0   20   40   60   80   100

🟥 Never   🟨 Occasionally   ⬜ Sometimes   🟦 Often   🟦 Always

Figure 6: Participants involvement in cloud computing projects (as %).

Based on the participants' involvement in cloud computing projects Figure 7, 54.2% of the respondents said they either agree or strongly agree that the projects were successful. Disturbingly, 44.1% of the respondents provided a neutral response implying that the projects could be perceived as either failures or successes.

1.7	44.1	49.1	5.1

0   20   40   60   80   100

🟥 Strongly disagree   🟨 Disagree   ⬜ Neutral   🟦 Agree   🟦 Strongly agree
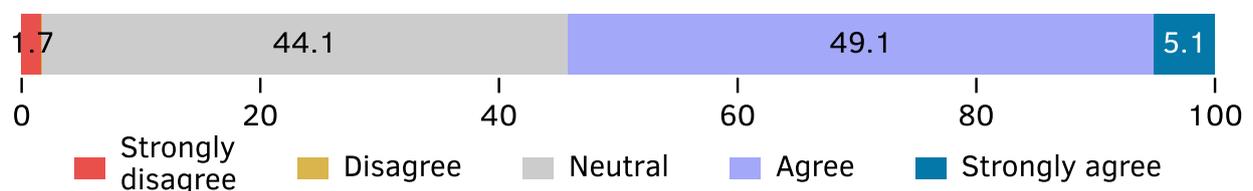
Figure 7: Cloud computing project success rate (participant %).

There is definitely still room for improvement to have successful cloud computing projects.

Furthermore, most participants were involved in the planning, execution, monitoring and reporting phases as seen in Figure 8.
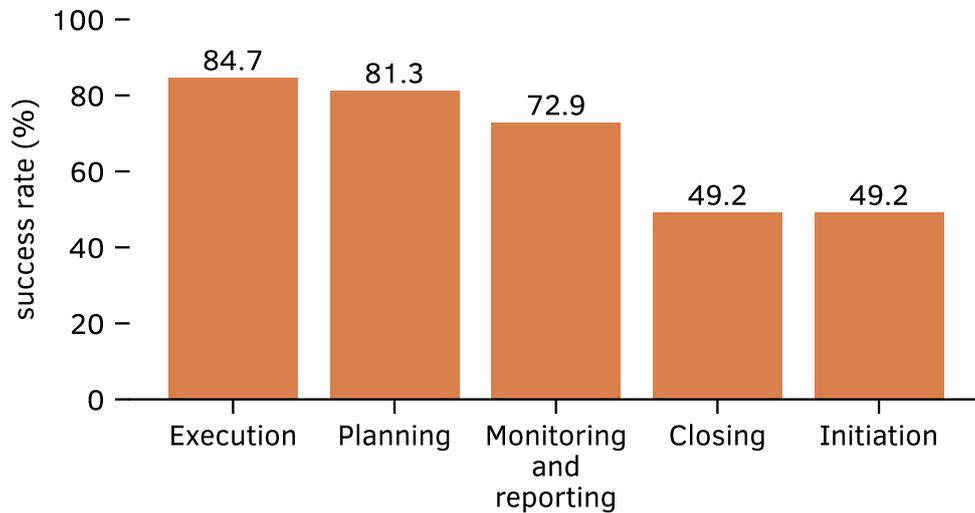
Figure 8: Relationship between the success rates of the phases of cloud computing projects and the participants' views of these.

The results in Figure 9 show that the introduction of cloud computing in the participants' organisations has had a high to severe impact on all the business areas. The biggest impact is on the infrastructure area. This is quite expected as cloud computing does first have an impact on the IT infrastructure. The second most affected area relates to the change associated with the roles and responsibilities when it comes to transitioning to the cloud. The least impacted area is project management.
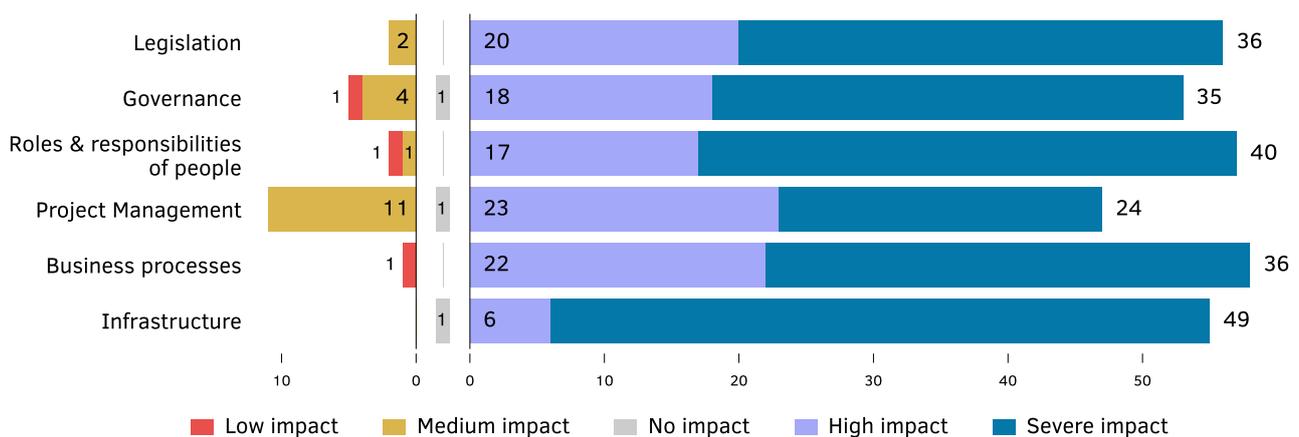
Figure 9: Impact on different areas when transitioning to the cloud.

Transitioning to the cloud is motivated by various reasons. The participants were mainly driven by technological innovation, competition, and growth to move to the cloud as depicted in Figure 10. Respondents could select multiple drivers for transitioning to the cloud.
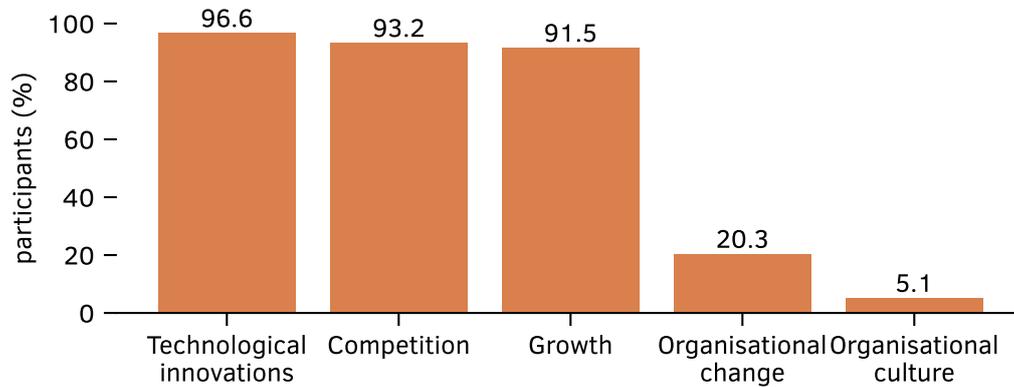
Figure 10: Drivers of the desire to move to the cloud.

The results further showed that although AWS and Microsoft Azure are the leading service provider, SAP and Salesforce are also present in the participants' organisations, as seen in Figure 11, while Google Cloud is not very dominant in the banking sector as would have been expected.
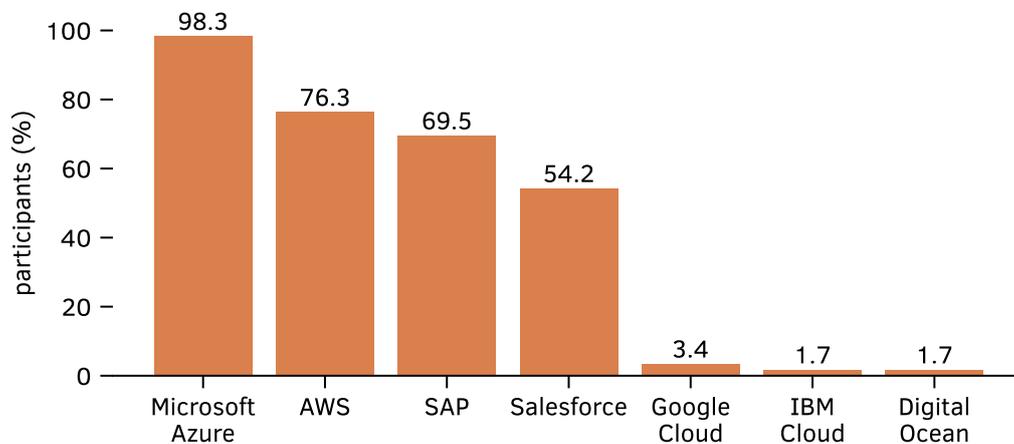
Figure 11: Service providers used by the participants' organisations.

There is also a high use of the private cloud deployment model in the banking sector as seen in Figure 12, which could be due to the sensitivity of the data gathered and used in banks.
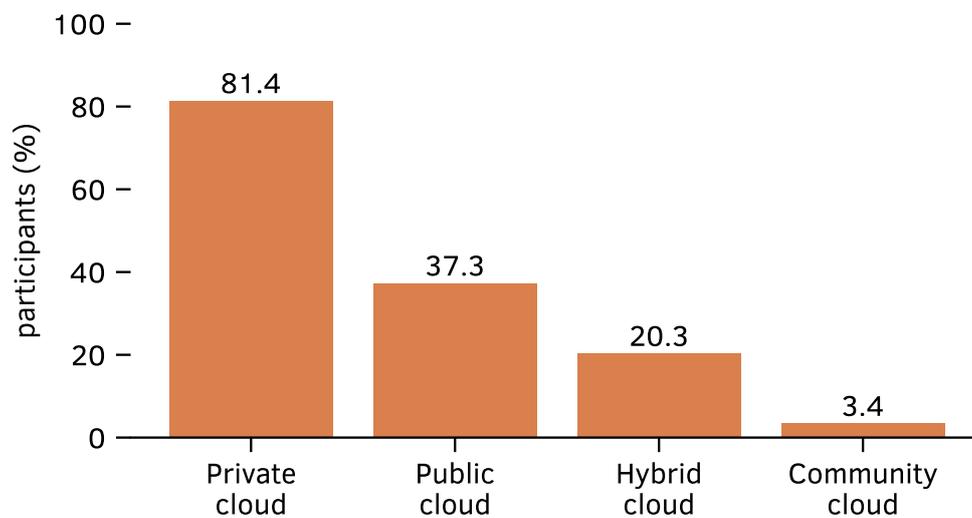
Figure 12: Cloud deployment models used by the banking sector.

4.3   IT governance with a focus on change management

There are management practices that support the change management objective, as per the COBIT framework. Figure 13 shows the participants' responses to the key COBIT framework statements to gather data in relation to their organisations' cloud transitioning. The objective of this gathered data was to determine if this framework would be sufficient to manage cloud transitioning in an organisation. The results in Figure 13 show that the framework would be sufficient. The governance activity that is perceived as the most influential is the establishment of a desire to move to the cloud. This was followed by the establishment of an implementation team. The two least influential activities are the identification of short-term wins and the empowerment of key role players.

Furthermore, the results indicated that there is some correlation between the success of the project and the different COBIT framework activities. A summary of this relationship is depicted in Figure 14.

The correlations strongly suggest that three activities contribute to successful cloud transitioning. The remaining activities do have an impact, but it is not as evident to what extent it contributes to the successful transitioning to the cloud.

Strong correlations

Project success and a desire to change and migrate to the cloud was established This implies that there is a strong correlation between the two variables, meaning that to increase the likelihood of a successful project, a desire to change and migrate to the cloud needs to be established. This means that if there is no desire to change and migrate to the cloud, there is a higher chance that the project will not be successful.
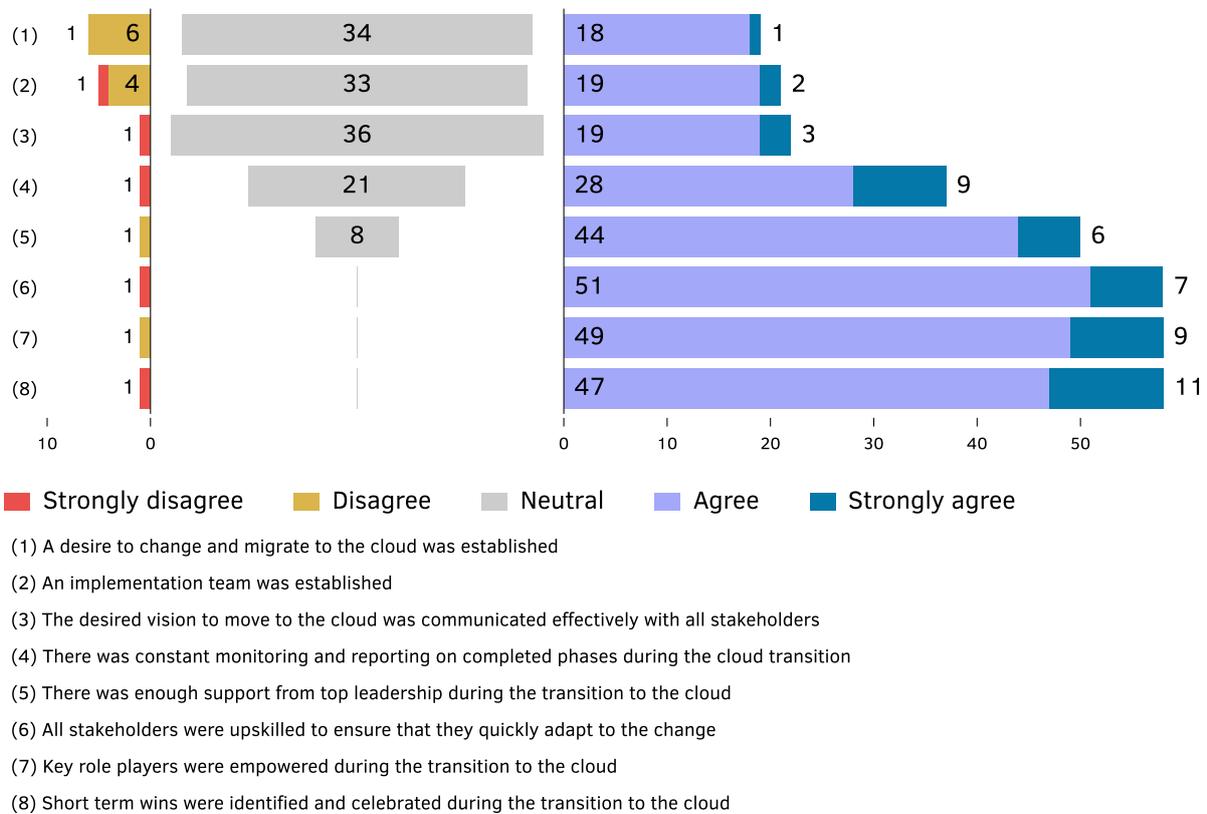
Figure 13: COBIT framework change management activities assisting organisations' move to the cloud.

Project success and an implementation team was established This implies that there is a strong correlation between the two variables, meaning that to increase the likelihood of a successful project, an implementation team needs to be established. This means that if there is no implementation team, there is a high chance that the project will not be successful.

Project success and the desired vision to move to the cloud was communicated effectively with all stakeholders This implies that there is a strong correlation between the two variables, meaning that to increase the likelihood of a successful project, there has to be a desired vision to move to the cloud that is effectively communicated to all stakeholders. If the desired vision is effectively communicated with all stakeholders, they would support this, which ultimately increases the chances of a project being successful.

Moderate correlations

Project success and key role players were empowered during the transition to the cloud This implies that there is a moderate correlation between the two variables, meaning that to
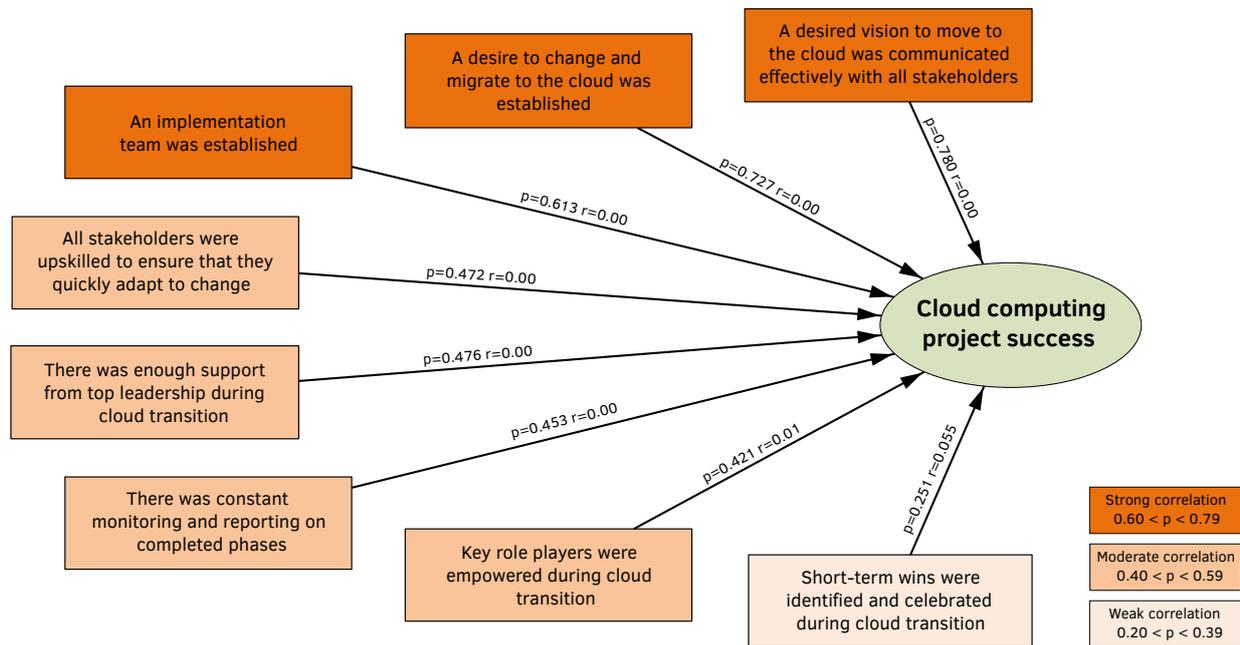
Figure 14: Correlations between cloud computing project success and the different COBIT framework activities.

increase the likelihood of a successful project, the key role players need to be empowered during the transition to the cloud. This could mean that if the key role players are empowered, it could increase team morale, and therefore, result in a successful project.

Project success and all stakeholders were upskilled to ensure that they quickly adapt to the change This implies that there is a moderate correlation between the two variables, suggesting that to increase the likelihood of a successful project, all stakeholders need to be upskilled to ensure that they can quickly adapt to change. This could be due to the acquired knowledge resulting in insightful perspectives from different stakeholders, which could increase the likelihood of a successful project.

Project success and constant monitoring and reporting on completed phases during the cloud transition This implies that there is a moderate correlation between the two variables, meaning that to increase the likelihood of a successful project, there must be constant monitoring and reporting on the completed phases during the cloud transition. This could be due to learnings from previous deliverables resulting in better outcomes of those in future projects.

Project success and enough support from top leadership during the transition to the cloud This implies that there is a moderate correlation between the two variables, meaning that to increase the likelihood of a successful project, there needs to be enough support from

top leadership during the transition to the cloud. This could be due to minimal pushbacks from different stakeholders since the directive comes from top leadership.

5 CONCLUSION

The purpose of this paper was to determine whether change management processes have any influence on the success of cloud transitioning. This was done from the perspective of IT governance and specifically COBIT. The study was conducted in four of the major banks in South Africa.

The results clearly indicate that 50% of the respondents do not believe that their cloud computing transitions were successful. The results indicate that three of the change management practices have a strong positive impact on the success of cloud computing transition. The study did not investigate the presence of these practices. This might be included in future research. Four of the practices have a moderate positive impact on the success of cloud computing transition. The implication is that the change management practices as defined by COBIT, can be used to successfully transition to cloud computing.

The cloud computing transition impacted the infrastructure area the most. This might be because infrastructure is typically what gets moved from on-premises to the cloud. This also has an impact on the roles and responsibilities of the people involved in this transition. What is surprising, is that project management is the least affected area.

The main reasons for moving to the cloud are technological innovations, competition, and growth. This confirms results from literature (Haris & Khan, 2018; Marston et al., 2011; Saini et al., 2019; Singh, 2012).

Although this research study discovered and validated different theories within the broader field of governing cloud transition, there were inherent limitations either known or unknown at the start of the research or revealed while the research was being conducted.

The results presented in this research, as well as the limitations encountered, present opportunities for future research. Some of these future research opportunities include:

(i) Conducting research that will be valid externally to the South African banking sector.

(ii) Considering all stakeholders impacted by cloud transitions and across multiple sectors.

Future research should also investigate the actual importance of the change management practices as well as the application thereof. Another avenue for research is the impact of cloud computing on the organisation and the employees. This is important since the roles and responsibilities were highlighted as an area of concern.

FINAL WORDS

Human beings change as they grow older and in the process of evolving and adapting to new environments, comes learning. To learn something new, one needs to be curious and ask

questions. The curiosity could be due to wanting to test what you already know, wanting to understand the other side of a problem, wanting to establish a reliable guide, wanting to expand your knowledge on a specific concept, wanting to predict, explain and interpret a specific behaviour, and wanting to provide a solution to a problem.

In this research, the identified problem had potential solutions, but with the potential to be improved. Change management processes have some influence on the success of cloud transitioning as identified in the literature and this was empirically validated and confirmed in the data analysis section. There are no shortcuts in conducting research, although through the process, challenges and limitations may be encountered. This does not necessarily mean that the research is lacking, but rather an opportunity for future research.

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