RESEARCH ARTICLE

WILEY

The challenges of cloud adoption among South African small to medium enterprises: A thematic analysis

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Abstract

The successful use of Information and Communication Technologies (ICTs) by Small to Medium Enterprises (SMEs) remains a persistent problem within developing economies where they face several technical and skills-related challenges. Although cloud services can mitigate some of these challenges, many SMEs fail to adopt cloud services. Therefore, the main objective of this paper was to develop key recommendations (based on a high-level cloud services adoption framework) which South African SMEs could use to guide them in their adoption of cloud services. To develop our recommendations, we conducted 13 semi-structured interviews with nine South African SMEs within the Eastern Cape province. These were thematically analyzed and the findings used to create a high-level cloud services adoption framework. Our findings indicate that technical expertise (i.e., knowledge) amongst SMEs plays a vital role in the cloud adoption process. Those SMEs who do realize the importance of such technical expertise often use intermediaries to achieve successful adoption of cloud services. We also found evidence to suggest that SMEs generally do not carry out comprehensive cloud adoption preparatory activities, consequently failing in their adoption of cloud services.

KEYWORDS

cloud adoption, cloud adoption recommendations, small to medium enterprises, SMEs, thematic analysis

1 | INTRODUCTION

Many countries around the globe have been facing economic challenges, such as low growth, weak trade, low investment and rising inequality (OECD, 2017). According to the Organisation for Economic Co-operation and Development (OECD, 2017), these challenges can be overcome by creating conditions that enable the benefits of technological progress to be shared across economies and society. Small to medium enterprises play a vital role in local economies (Assante et al., 2016; Rungani & Potgieter, 2018; Senarathna et al., 2018), contributing a large portion (up to 60%) of gross domestic product (OECD, 2017). Additionally, SMEs are an important source of employment, accounting for about 70% of the job market in developed economies. These figures are lower in emerging economies. For example, South African SMEs contribute approximately 42% to South Africa's GDP and account for 60% of total employment (Rungani & Potgieter, 2018).

Unfortunately, SMEs in developing economies (especially rural ones) are faced with a myriad of challenges that negatively influence organic growth in this sector. For example, many rural SMEs operate within the confines of non-formal processes as devised by their owners

(Närvä et al., 2014). Such non-formal approaches also greatly depend on the owner's ambition and attitude toward business within that particular sector. Owners may opt not to employ additional workers despite an expressed ambition to grow their business. Such a disconnect is particularly challenging as owners expect the same number of employees to do more work. The idea of doing more with less also stems from the financial constraints SMEs face. In fact, financial constraints remain a persistent challenge for SMEs within developing economies. Importantly, these financial constraints permeate other (related) aspects that influence their overall success. Such related aspects include: a lack of training, poor management skills, and regulatory issues, to name but a few (Rahman et al., 2016). All are directly influenced by financial constraints. Within the South African context, Smit and Watkins (2012) clearly indicate that the lack of credit constitutes one of the most pressing challenges deterring the growth of SMEs. This is still the case within the context of developing economies (Cea et al., 2021; Faal, 2020). Importantly, this ties into another core challenge faced by SMEs in developing economies namely, management issues. Smaller organizations (like SMEs) often require a significant amount of managerial skills (Maziriri & Mapuranga, 2017). However, SME owners often fail to exhibit these skills, which manifest themselves in the inability to devise a business plan. This, in turn, reduces financial institutions' confidence in providing credit to SMEs. This further exacerbates the aforementioned financial constraints (Rahman et al., 2016).

A lack of awareness with regards to Information and Communication Technologies (ICTs) also plays a role when considering the challenges SMEs face, especially within developing economies (Arefin & Rahman, 2020; Bvuma & Marnewick, 2020). Crucially, and according to recent research, the increased use of ICTs could address some of the challenges SMEs encounter within developing economies (Kyakulumbye & Pather, 2022; Mushtaq et al., 2022; Park, 2022). We therefore argue that SMEs need access to ICTs to increase and facilitate their continued growth (Wamuyu, 2017). This is especially important given the integral role of modern ICTs in the day-to-day operations of most businesses, including SMEs (Wambugu & Ndiege, 2018). To date, such integration has been hampered by ICT-specific challenges (Vidhyalakshmi & Kumar, 2016; Wambugu & Ndiege, 2018; Wamuyu, 2017). These ICT-specific challenges include the costs associated with the purchase, deployment, and maintenance of required ICT resources compounded by the lack of technical expertise within SMEs. For example, most SMEs cannot afford to maintain ICT departments (Collins & Lam, 2014). This impedes, not only organic growth within SMEs, but also their contribution to employment and GDP. In this paper, we argue that cloud services could be used as a means to mitigate these ICT-specific challenges, particularly the technical and expertise-related challenges (Wambugu & Ndiege, 2018). This is especially important, given that cloud services enable SMEs to leverage the technical expertise of cloud providers (Wamuyu, 2017). However, despite these advantages, the rate at which SMEs adopt cloud services remains low (Carcary et al., 2014). This is especially the case in South Africa (Dyubele et al., 2020; Mohlameane & Ruxwana, 2014; Sithole & Ruhode, 2021). Mohlameane and Ruxwana (2014) attribute this to a lack of clear guidelines and insufficient knowledge of cloud adoption. Dyubele et al. (2020), as well as Sithole and Ruhode (2021), argue similarly, calling for additional research as to why South African SMEs (specifically those in rural areas) are not adopting cloud services. As a consequence, few SMEs, especially those in developing countries such as South Africa, gain the benefits that cloud services offer (Adendorff & Smuts, 2019). Given the lack of clear guidance in this regard, the objective of this paper was to develop key recommendations (based on a high-level cloud services adoption framework) tailored specifically for South African SMEs—a practical contribution within this context. Note that, within this context, we define cloud adoption as a (sometimes strategic) move by SMEs to start using cloud services to ameliorate the challenges outlined thus far. The paper is structured as follows. After providing an overview of cloud services and what they entail, we define a series of SME-specific ICT challenges that cloud services could mitigate. This is followed by a brief outline of our theoretical foundation and methodological approach. Next, the findings are discussed, culminating in the formal specification of our recommendations and the associated cloud adoption framework. The paper concludes with sections detailing the limitations and suggestions for future research.

2 | AN OVERVIEW OF CLOUD SERVICES

There has been a lack of consensus in extant literature in terms of how cloud computing should be defined. This has resulted in a plethora of conceptualizations being advanced in several publications (Hassan, 2017; Vidhyalakshmi & Kumar, 2016). As such, and before commencing this overview, we define our understanding of what cloud services are. Within the context of this paper, we view cloud services (also referred to as cloud computing) as:

> "A model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Assante et al., 2016; Mell & Grance, 2011)

Mell and Grance (2011) extend this NIST definition to include the following:

- *Five Key Characteristics*: (1) on-demand self-service, (2) broad network access, (3) resource pooling, (4) rapid elasticity and (5) measured service.
- *Four Deployment Models*: (1) private clouds, (2) community clouds, (3) public clouds and (4) hybrid clouds.

- *Three Service Models*: (1) Software as a service (SaaS), (2) Platform as a service (PaaS) and (3) Infrastructure as a service (IaaS).

It is also crucial to define what we mean by "SMEs." The South African National Small Business Amendment Act of 2003 makes use of three parameters to define SMEs namely: the number of employees, the total turnover, and the total gross value of assets (excluding fixed property). The number of employees and total turnover parameters were used in this paper to delineate SMEs (as seen in Table 1).

3 | USE OF CLOUD SERVICES TO AMELIORATE ICT CHALLENGES

Information and communication technologies (ICTs), play a crucial role in helping SMEs to achieve their operational objectives (Bhat, 2013). However, they face several challenges in ICT usage, such as a lack of expertise to harness ICT advantages, uncertain return on ICT investment, cluttered product portfolios, and high existing investments in legacy systems (Barba-Sánchez et al., 2007; González-Varona et al., 2021; Vidhyalakshmi & Kumar, 2016). In this paper, we argue that SMEs stand to benefit substantially from the use of cloud services. To make this case, we enumerate the ICT challenges in the first column of Table 2, mapping these to the potential cloud services that could ameliorate them (second column).

Paradoxically, actual adoption of cloud services by SMEs worldwide has been low, as compared to the way larger companies have embraced them (Senarathna et al., 2018). According to Mohlameane and Ruxwana (2014), South African SMEs are no exception in this regard. Adane (2018), argues that having a clear cloud adoption strategy would help SMEs. However, there are few guidelines (and recommendations) that could assist SMEs when adopting cloud services (Khayer et al., 2020). Specifically those tailored to South African SMEs. Several frameworks (and related guidelines) exist to assist the adoption of cloud services within developing economies (Al-Shboul, 2019; Shetty & Panda, 2020; Ta, 2017), but these are not focused on rural SMEs in developing countries such as South Africa. A cloud adoption framework that can be used by rural South African SMEs is clearly needed.

4 | THEORETICAL FOUNDATION

We make use of the technological, organizational, and environmental context (TOE) framework (Tornatzky & Fleischer, 1990). We deem this appropriate given the intended framework's focus on synthesizing technological and organizational elements within specific contexts (Tornatzky & Fleischer, 1990). This framework identifies three aspects of an enterprise's context that, in turn, influence technological innovation and adoption (Oliveira et al., 2011). Several studies have utilized elements of the TOE framework to explore the adoption of other kinds of technologies, such as websites, Enterprise Resource Planning Systems (ERPs) and e-commerce platforms (Oliveira et al., 2011). Importantly, the TOE framework has also been used to study cloud adoption in contexts such as healthcare and higher education (Hiran & Henten, 2020; Ngongo et al., 2019). Crucially, and to our knowledge, this is the first use of TOE to study SME cloud adoption within the South African context.

TABLE 1 National Small Business Amendment Act of 2003 SME definition

Size	Number of employees	Total turnover	Gross value of assets
Small	1–49	R13 million maximum	R5 million maximum
Medium	51–200	R51 million maximum	R19 million maximum

TABLE 2 Challenges to ICT usage in SMEs

Challenge	Cloud computing ameliorations
Lack of ICT expertise/difficulty attracting skilled labor.	As cloud service providers assume all the responsibilities of maintaining the relevant ICT infrastructure, SMEs would have access to ICT expertise that they would otherwise not have, internally.
High costs of prerequisite hardware and software and/or ICT implementation.	There is no need for upfront investments in hardware and software as cloud service providers assume that responsibility.
Difficulty in innovating and adopting new technologies/insufficient research and development.	Cloud service providers are constantly researching new technologies and developing their products enabling SMEs to remain abreast with the latest technologies.
Incompatibility of some ICTs with the environments that define most developing economies.	Cloud services can be readily customized to suit any user's needs regardless of geographical location.

TABLE 3 Chosen TOE constructs

Context	Construct	Definition
Technological	Relative advantage	The degree to which an innovation is seen as being better than the one it supersedes by its adopters (Rogers et al., 2019).
	Complexity	The degree to which adopters of an innovation perceive it as being relatively difficult to understand and use.
	Compatibility	The degree to which adopters perceive an innovation as being consistent with their existing values, past experiences and needs (Rogers, 2003).
	Trialability	The degree to which adopters can experiment with an innovation on a limited basis (Rogers, 2003).
	Uncertainty	The degree to which the result of using an innovation is insecure (Ostlund, 1974).
	Infrastructural support	The existence of required IT infrastructure and resources.
Organizational	Size	The size of the business.
	Top management support	Devoting time to the innovation adoption project in proportion to its cost and potential, reviewing plans, following up on results, and facilitating management problems associated with integrating computing systems with management processes of the business (Young & Jordan, 2008).
	Prior technology experience	The extent of a user's past experience with similar technologies (Heide & Weiss, 1995).
	Innovativeness	The extent to which a user is relatively earlier in adopting new ideas and/or innovations than other members of the same social context (Rogers, 2003).
Environmental	Competitive pressure	The degree of pressure experienced by a business from competitors within the industry (Oliveira et al., 2011).
	Industry	The sector in which a business operates in (Yap, 1990).
	Supplier support	Activities by the supplier that have a significant effect on a business' probability of adopting an innovation (Frambach et al., 1998).

To operationalize this framework, several constructs were chosen and utilized as a means to theorize the adoption of cloud services by SMEs in South Africa. See Table 3 for a complete outline of the chosen TOE constructs and their associated definitions. Note that we do not argue each construct individually, but rather their synthesis as grouped under the three components of the TOE framework.

These constructs were instrumental in developing our understanding of what SMEs need to consider when adopting cloud services.

5 | METHODOLOGICAL APPROACH

For the purposes of this research, it was anticipated that the considerations that South African SMEs within the rural Eastern Cape need to consider when adopting cloud services would emerge from both theory and the collected data. As such, a combination of deductive and inductive approaches was used. The research design followed a three-stage process, using the TOE constructs as a theoretical lens (Figure 1):

1. Establish, from extant literature, best practices for SME cloud service adoption (deductive approach).
2. Establish what considerations informs cloud adoption by rural South African SMEs (inductive approach).
3. Create a high-level framework to inform the adoption of cloud services by rural South African SMEs.

As Klein and Myers (1999) highlight, interpretive research can be utilized to understand human thought and action in social and organizational contexts. As such, the study adopted an interpretive approach because of its focus on the perspectives and opinions of South African SMEs (Myers & Klein, 2011).

5.1 | Data collection

According to Mack (2005), qualitative research is effective when one needs to obtain culturally specific knowledge about values, opinions, behaviors and social contexts of a certain population. To that end, several pilot interviews were conducted and qualitative data was collected from 13 participants across nine SMEs using both face-to-face and telephonic semi-structured interviews. This multi-case (i.e., interview) strategy assisted in determining whether the findings that emerged in one case would apply in other cases,
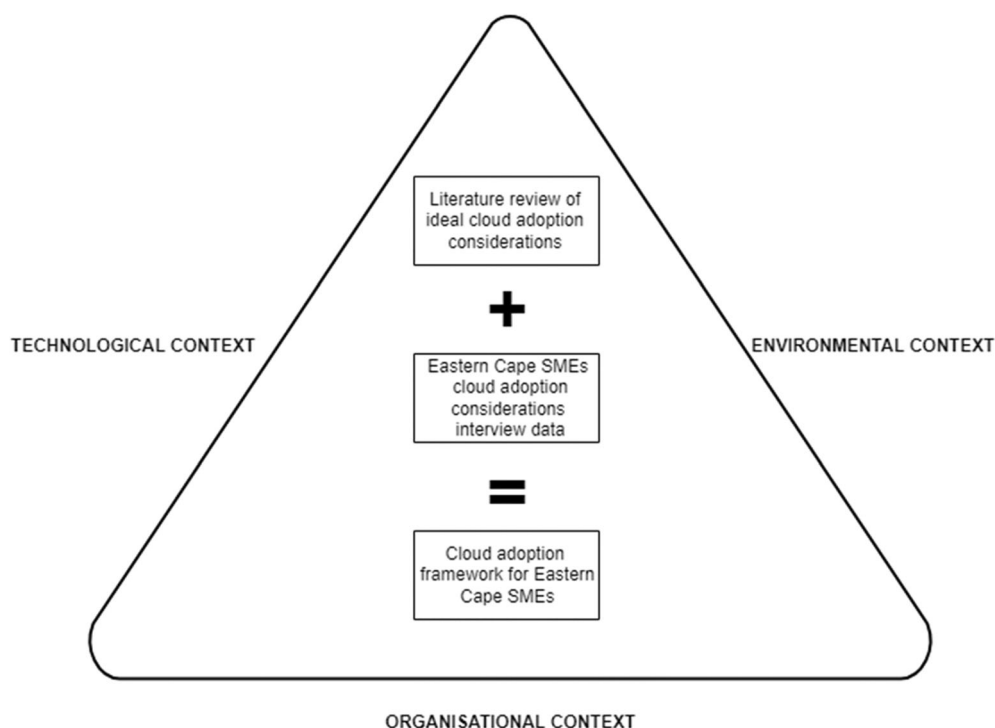
FIGURE 1 Research design

TABLE 4 SME clusters

Cluster A	Cluster B
Size: Small	Size: Medium
Industry: ICT services	Industry: ICT services
Sample size: 6 SMEs	Sample size: 1 SME
Cluster C	**Cluster D**
Size: Small	Size: Medium
Industry: Information and Media	Industry: Information and Media
Sample size: 1 SME	Sample size: 1 SME

thus reducing data bias (Saunders et al., 2009). The SMEs were organized into clusters to facilitate a contextual understanding of the participants (see Table 4 below). Due to the limited number of suitable SMEs for the purposes of this study, some clusters consisted of only one SME. However, categorizing the SMEs in this way was important within the context of the data analysis phase as each cluster had unique contextual characteristics that had a likely influence on how the SMEs behaved during the cloud adoption process.

Because we deemed it essential to collect data only from SMEs with experience of cloud service adoption, we utilized both snowball and purposive sampling. As part of this sampling approach, we selected SMEs that fulfilled one of the following criteria:

- The SME has adopted, or is in the process of adopting, one or more cloud services, or
- The SME has attempted to adopt one or more cloud services, but failed.

Within each SME, we interviewed participants who worked within the relevant ICT departments or were otherwise instrumental in determining the overall ICT direction of that SME. More specifically, participants occupying any of the following roles were targeted as primary data sources:

- Owners/managers of the SMEs,
- IT directors,
- Systems managers,
- IT managers, and
- System administrators.

To collect data from these participants, an interview guide (see Table 5) was used until saturation was reached (i.e., no new information could be identified). According to DiCicco-Bloom and Crabtree (2006), questions that lead the research participants toward a particular response often produce misleading answers. As such, care was taken to ensure that no leading questions were usedt. In addition, care was taken in ensuring that the questions were not driven by the deductive nature of the research process. This reduced bias in the collected data.

5.2 | Data analysis

The interview data was thematically analyzed allowing for the identification and reporting of patterns (i.e., themes) within the data (Braun & Clarke, 2006). As part of this process, a rigorous six phase approach was employed, as prescribed by Braun and Clarke (2006). Thematic maps were developed at each phase given their usefulness at improving the analysis and interpretation of the data (Attride-Stirling, 2001; Braun & Clarke, 2006). The process of thematic analysis was operationalized by following a structured approach as outlined below.

5.2.1 | Phase 1: Initial familiarization with the data

As suggested by Braun and Clarke (2006), audio recordings of all the interviews were transcribed by the first author to enhance data familiarity.

TABLE 5 Interview guide

Interview question	Purpose
Tell me more about your organization. What does your organization do?	Whilst not directly related to any particular research objective, the purpose of this question was to probe the organization to reveal some details pertaining to its operational context.
The most popular cloud service model offerings are SaaS, PaaS and IaaS. Are you familiar with any of these terms and in your opinion, do you think your organization utilizes any of them?	The purpose of this question was to gauge how much the SMEs knew about cloud computing. This included, determining if the SMEs had adopted, are in the process of adopting, or have attempted but did not succeed in adopting cloud services.
Literature suggests that in order to successfully adopt cloud services SMEs have to perform certain tasks/activities at various stages of the cloud adoption process. These include identifying suitable services to migrate, ensuring availability of IT infrastructure, defining expected values, evaluating risks, establishing a strategic focus, engaging all stakeholders, understanding the influence of the organizational structure, managing the external environment, adopting systems incrementally and testing deployed systems. In your opinion, how essential do you think are these considerations when adopting cloud services and has your organization done any of them during the adoption process?	The purpose of this question was to try and understand how SMEs perceive the technological, organizational and environmental considerations prescribed by literature as relevant within their particular context when adopting cloud services.
If you were to implement a new cloud solution in your organization today, what else do you believe needs to be considered in addition to what we have already discussed?	The purpose of this question was to inductively probe the SMEs further to reveal other considerations they perceived as key in adopting cloud computing services. It was believed that each SME's context would influence their beliefs about what considerations need to be taken into account when adopting cloud services. Kotelnikov posits that SMEs adopt ICTs at varying levels of complexity. The inductive nature of this question thus sought to bring out context specific data relating to cloud adoption by SMEs in South Africa.

5.2.2 | Phase 2: Generating initial codes

The second phase entailed systematically generating a list of codes relating to the study's objective (SME cloud services adoption) and associating them with relevant data extracts (i.e., snippets of transcribed text). This was done across the entire data corpus by making use of Atlas.ti—a qualitative data analysis software package. Upon completion, one hundred and fifty-three (153) codes were generated (see Figure 2).

5.2.3 | Phase 3: Theme searching

Phase 3 commenced with a review of what was coded in phase 2. The intention was to organize the codes based on their common conceptual content (defined as code groups in Figure 3).

However, even though the codes were organized into conceptually similar groups, they still exhibited low frequencies. The codes themselves therefore needed to be reconceptualized. According to Attride-Stirling (2001), codes need to be discrete so as to avoid redundancy, while being broad enough to be meaningful. As such, the code groups were reviewed and redundant codes were merged to better fit the code groups they formed part of. The result of this is illustrated in Figure 4.

After the codes had been organized as above, the next step involved identifying candidate themes. This involved reading through each of the data extracts associated with each code in each code group. Themes were identified, based on the objective of this study and organized (as candidate themes) using Microsoft Excel (see Figure 5).

The codes associated with these candidate themes were also recorded in Excel to make it easier to re-read and collect all the data extracts that comprised those candidate themes (see Figure 6). At the end of this process fourteen (14) candidate themes had been identified.

Once completed, the initial thematic maps could be developed.

5.2.4 | Phase 4: Reviewing candidate themes

This phase entailed refining the candidate themes that emerged in phase 3. First, the data extracts associated with each candidate theme had to be re-read to verify if they were consistent within each theme. Any data extracts that did not fit into the candidate themes were moved to another (more suitable) candidate theme. This process also involved a simultaneous evaluation of the candidate themes. Second, we evaluated the candidate themes in relation to the data corpus as a whole. This process involved re-reading all the transcripts to ascertain if the defined candidate themes (now represented as thematic maps) accurately and adequately reflected participant views (see Figure 7).

	Name	Grounded	Density	Groups
○	ease of use of cloud based system upgraded fro...~		7	0
○	ease of use of software~		1	0
○	easier access to latest technology~		2	0
○	easier adoption with own internal IT department~		5	0
○	easier to go with a provider you already have a rel...~		10	0
○	easier to have one provider for all needed services~		1	0
○	emails mostly hosted on cloud~		3	0
○	extra fee charged for data backups~		1	0
○	fear of internet downtime~		3	0
○	fear of losing data control~		1	0
○	fear of negative consequences stemming from cl...~		7	0
○	goal of intermediaries is to make money~		1	0
○	handful of employees~		2	0
○	hybrid cloud solution common~		8	0
○	hybrid parallel implementation~		5	0

Search Codes

FIGURE 2 Initial coding across the entire data corpus as part of phase 2
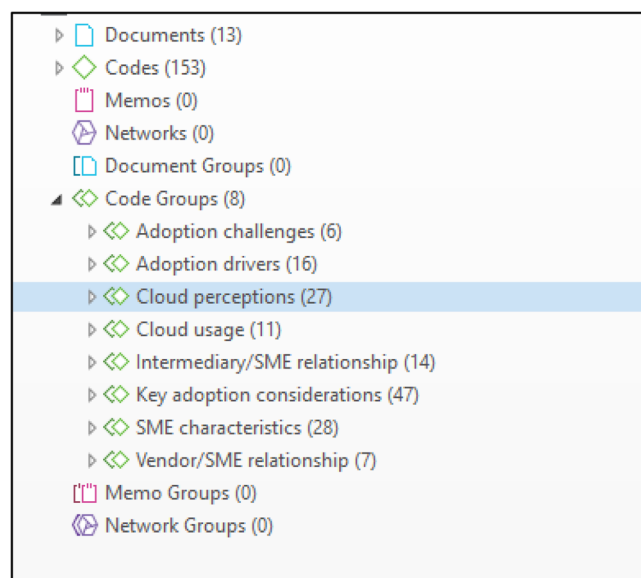
FIGURE 3 Codes organized around common conceptual content as part of phase 3
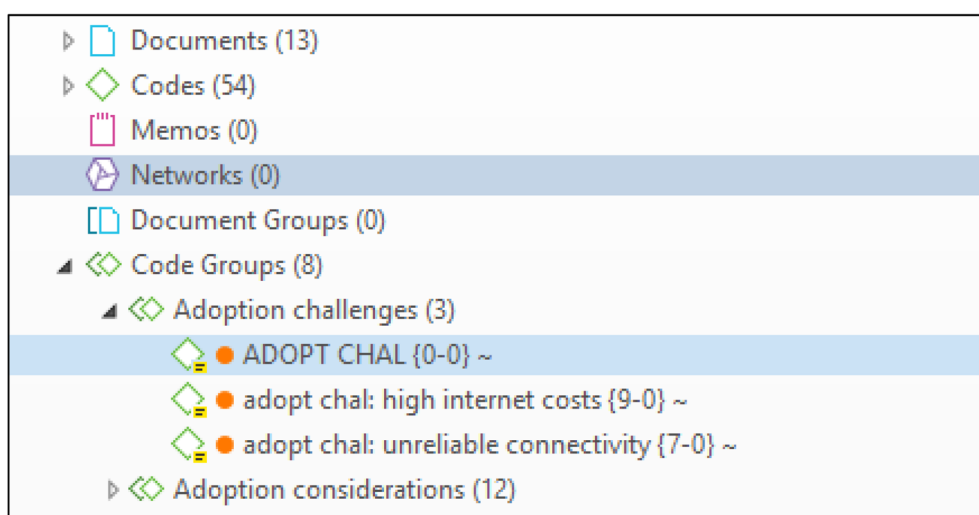
FIGURE 4 Initial codes reviewed and re-conceptualized as part of phase 3

5.2.5 | Phase 5: Defining and naming themes

At this stage an evaluation of the naming scheme of the themes (and their sub-themes) was carried out culminated in the development of the final thematic map (see Figures 8 and 9 below). Importantly, we used this final thematic map to guide our interpretation of the data extracts, as detailed in phase 6.

5.2.6 | Phase 6: Interpretive narrative

The data analysis process concluded with an interpretive narrative based on the data extracts associated with the final thematic maps. The narrative specifically addressed:

- The prevalence of the identified themes,
- The contextual influences and their relationships with the data extracts, and
- Provided support for the claims of the study.

	A	B	
1	Category	Code	Themes
2	Adoption challenges		
3		High Internets costs	affordable, reliable internet is a cloud require
4		Unreliable connectvity	
5			
6	Adoption Considerations		
7		Cloud Viability	affordable, reliable internet is a cloud require
8		Contingency planning	there is a general fear of losing data and cloud
9		financial feasibility	affordable, reliable internet is a cloud require
10		implementation procedure	it is best to trial and test software to see how
11		internal organisational capabilities	support from top management essential to im
12		organisational IT maturity	prior working knowledge with a system that h
13		security (removed)	
14		service level agreements (SLAs)	need to agree on uptime and disaster recover
15		service provider choice	Ongoing process to find the right vendor/clou
16		software usability	Very little change management if upgrading fr
17		supporting infrastructure	Important to upgrade internet connectivity pr

FIGURE 5 List of codes and their associated candidate themes

	A	B	
1	Theme	Organising Theme	code
2			
3	Adoption challenges		
4	affordable, reliable internet is a clou	cloud as high-speed-internet-centric	High Internets co
5	lack of trust in local internet connect	cloud as high-speed-internet-centric	Unreliable conne
6			
7	Adoption considerations		
8			
9	there should be a cloud fit/need asse	pre-cloud-fit assessment	Cloud Viability
10	affordable, reliable internet is a clou	cloud as high-speed-internet-centric	Cloud Viability
11	there is a general fear of losing data	secure data management	Contingency pla
12	affordable, reliable internet is a clou	cloud as high-speed-internet-centric	financial feasibil
13	incremental implementation ensure	cloud-induced work disruption avoidanc	implementation
14	it is best to trial and test software to	cloud-induced work disruption avoidanc	implementation
15	Ability to manage change during clou	human resources support	internal organisa
16	support from top management esser	human resources support	internal organisa

FIGURE 6 Candidate themes organized by conceptual similarity as part of phase 3

6 | FINDINGS

In the following subsections we discuss our findings within the context of the two themes we identified during the analysis of the semi-structured interviews.

6.1 | Cloud adoption is personal

Using the thematic maps provided in Figure 9, the personal nature of the cloud adoption process was explored. A distinction could be made between pre-implementation activities and actual implementation activities. Discussions revolved around the various elements that were at play within the SMEs' socio-environmental context that influenced their adoption behavior; thereby bringing to the fore their individuality within the
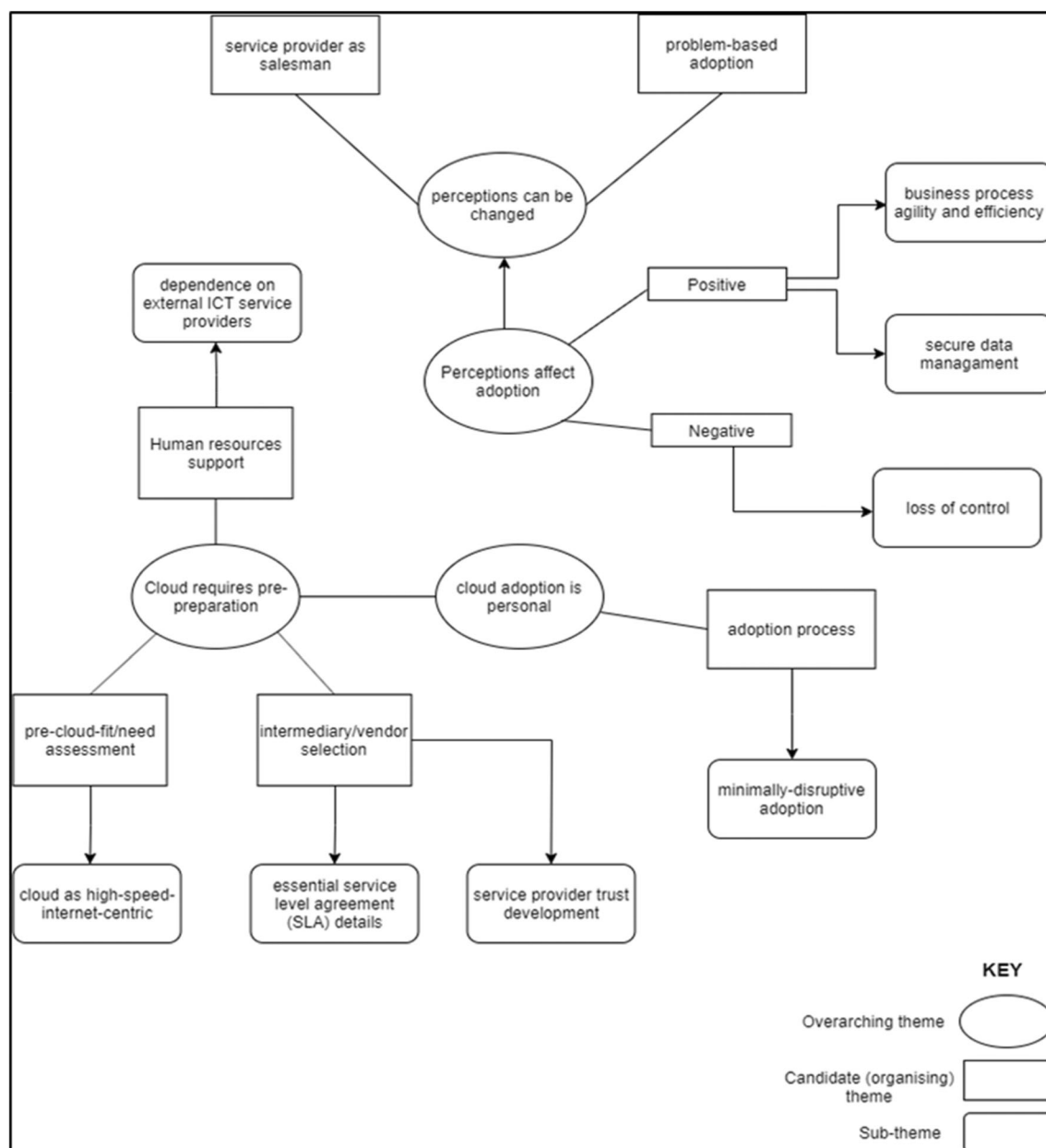
FIGURE 7 Initial thematic maps as the final output of phase 3

adoption process. Cloud adoption was thus not just a one size fits all solution, but a complex and individual deliberation that was tailor-made for each SME.

Pre-implementation activities were identified as service provider selection, feasibility assessment and ensuring that there was access to ample technical support. The concept of user trust was central to the discussions on service provider selection. Its role as a tool in determining the right service provider was quite apparent throughout the discussions with the research participants. However, service provider selection also appeared to be carried out by utilizing long-standing relationships with software vendors that had begun to offer cloud services. Discussions on cloud feasibility revolved around the availability of high-speed internet in South Africa. Internet connectivity was generally perceived to be poor, and insufficient to allow them to benefit from cloud services. This seemed to impact not only the decision to adopt cloud services, but also the choice of which cloud services to adopt and how. Access to technical support was viewed as an essential element in the cloud adoption process by most SMEs in the South Africa. This was not surprising as extant literature indicates that most SMEs, particularly in developing countries, were not proficient in the use of ICTs. However, a basic aptitude and interest in ICTs, in addition to that, was seen to be a catalyst in SMEs' adoption and utilization of new technologies such as cloud services. During the adoption of cloud services, the need for control of data and systems was viewed as an essential requirement. The participants' cloud service adoption activities reflected this.
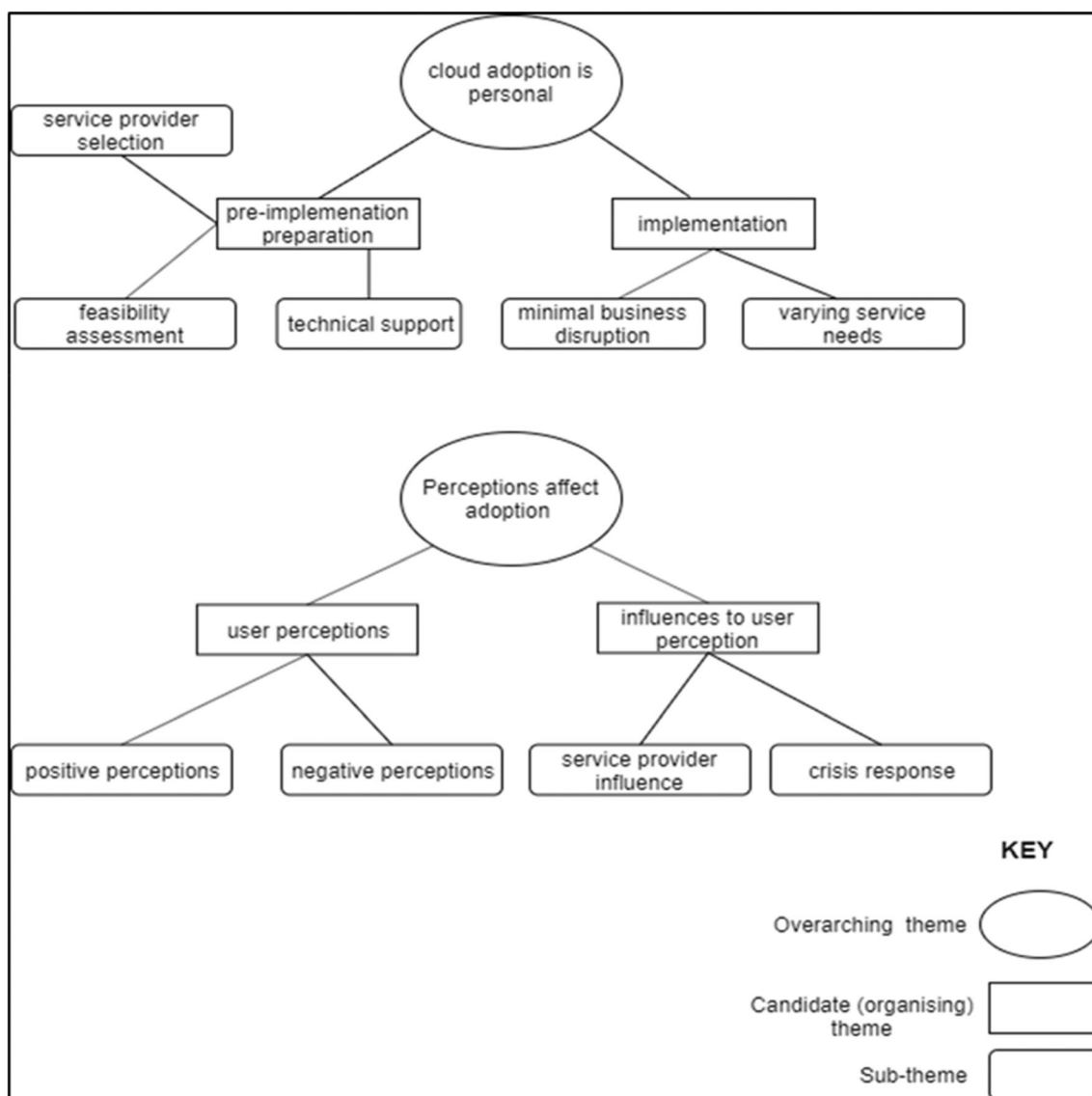
FIGURE 8 The refined thematic maps

SMEs also performed various activities at varying stages of the cloud adoption process. These included a cloud preparation phase, followed by a cloud implementation phase and finally, a cloud maintenance phase (Khan & Al-Yasiri, 2015; Workineh et al., 2018). This paper was only concerned with the first two (2) phases of the cloud adoption process (cloud preparation and cloud implementation). It was, however, apparent that the activities performed by the SMEs at each phase (both the cloud preparation and cloud implementation phases) were not standard across the various SMEs. Instead, the adoption process for each SME, was highly personalized; depending on a set of characteristics that were unique for each SME. In particular, the location and size of the SME.

During the cloud preparation phase, most of the SMEs only made decisions regarding what services should be migrated to the cloud, whether the installed infrastructure was sufficient to support a cloud move, the choice of the right cloud service provider as well as negotiating the right service level agreements (SLAs). Cluster C SMEs, however, mostly relied on the services of either Clusters A or B type SMEs (intermediaries) to make decisions pertaining to the choice of cloud provider, the type of cloud services to utilize and/or the right supporting ICT infrastructure.

On the other hand, the larger SMEs (Cluster D) could rely on their internal ICT departments to make such decisions. Furthermore, most of the Cluster C SMEs were located in City A, which had limited Internet bandwidth to support bandwidth intensive cloud services. This appeared to affect their choice of cloud services. As such, only low bandwidth cloud applications such as data storage and/or data backup services were utilized by these types of SMEs.

Further preparatory steps such as evaluating risks, establishing a strategic focus, evaluating the influence of the organizational structure, engaging all stakeholders as well as defining the expected value were *not* carried out by the majority of Cluster C SMEs. This could be attributed
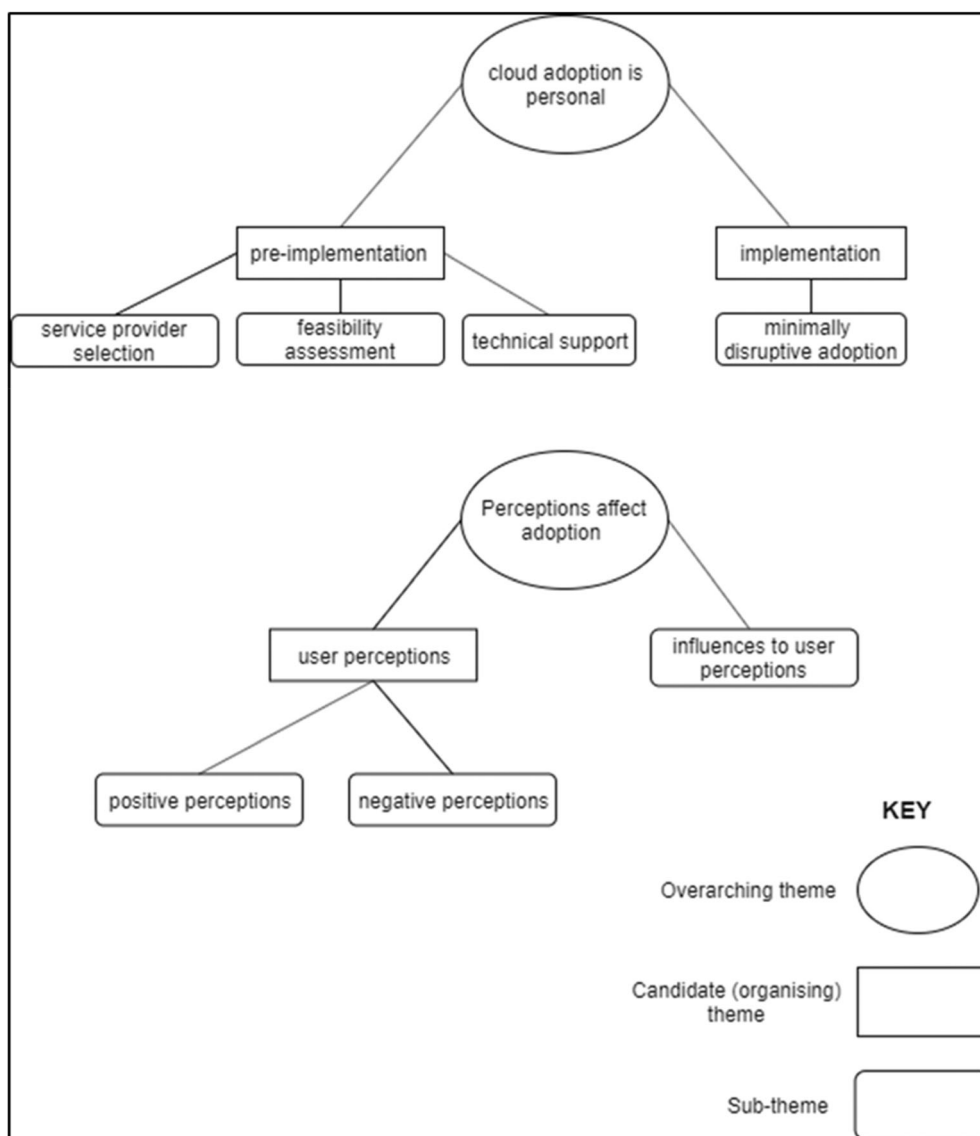
FIGURE 9 Final thematic maps

to their small size, and their desire for more agility and less formal processes. All of which are characteristics consistent with that of similar SME-centric research (Gupta et al., 2013; Senarathna et al., 2018). The larger SMEs (Clusters B and D), on the other hand, appeared to carry out these activities - albeit less formally.

The activities that were recommended in the literature for the implementation phase were consistent with SMEs in Clusters B and D. These SMEs had much more sophisticated ICT requirements and the services they needed to move to the cloud often required integration with their inhouse systems. Emphasis was placed on reducing business disruption as much as possible during the implementation phase. As such, these SMEs migrated their systems incrementally whilst conducting tests to ensure that everything was working correctly before fully implementing the requisite cloud services. Cluster C SMEs on the other hand, had less sophisticated ICT requirements and their usage of cloud services were mostly limited to basic low bandwidth cloud applications. As such, the majority of these SMEs did not need to implement any cloud solutions incrementally, as they could do so fairly quickly without disrupting their business operations.

6.2 | Perceptions affecting adoption strategies

By using the thematic map illustrated in Figure 9, user perceptions, and how they affected the adoption of cloud services, were explored. More specifically, the various positive and negative perceptions participants had, and how these affected their adoption of cloud services.

Cloud services were mostly viewed as the go to solution to a plethora of business problems affecting SMEs. For Cluster C SMEs, cloud adoption was more reactive than predictive, as they seemed to only require cloud services when a particular problem arose. Larger SMEs (from Clusters B and D), however, were more deliberate in their adoption of cloud; viewing cloud as a way to streamline their business services.

Notably, a significant number of Cluster C SMEs, seemed to view cloud services as being synonymous with losing control of their personal data and systems. There were also some concerns around the subscription model on which most cloud services are based. Subscription was mostly viewed as a debt and a number of the SMEs appeared unwilling to accept it. For these SMEs, subscription represented a loss of financial control, as they were not confident that they would always be able to meet these monthly costs. This however, appeared to be more prevalent amongst SMEs with older owners, as they seemed to be more risk averse than their younger counterparts.

It was apparent, however, that perceptions could be changed by a variety of change agents, thereby influencing the cloud adoption decisions of the SMEs. Specifically those SMEs from Cluster C. Intermediaries were particularly important as they appeared to market cloud services to Cluster C SMEs in an effort to convince them to adopt cloud services; something they were unlikely to do in the absence of the push from the intermediaries. The loss of data also appeared to force SMEs to view cloud services differently. This was most apparent after encountering a problem.

Literature does not seem to acknowledge the influence of user perceptions on the cloud adoption process. However, discussions with SMEs revealed how essential user perceptions were, in driving the adoption process. Positive perceptions about the use of cloud services were generally associated with a greater propensity to adopt cloud services, whereas negative perceptions were a significant deterrent to their adoption.

According to the literature, organizations that had more mature technological capabilities were more likely to readily adopt cloud services. We found that the SMEs within Clusters A, B and D generally viewed cloud services in a positive light and were thus more willing to adopt them. These types of SMEs were either in the ICT services sector and/or had their own internal ICT departments that took care of all their ICT related needs. Their technological maturity level was, therefore, higher than that of Cluster C SMEs and their attitude and behavior toward cloud services adoption appeared to be consistent with what was suggested by the literature.

A significant number of negative perceptions appeared to emanate from Cluster C SMEs. These SMEs generally had low levels of technological maturity and relied on the services of ICT service providers (intermediaries). As such, these SMEs were less likely to adopt cloud services than SMEs in the other clusters. We found this to be consistent with the literature's assertions about the adoption behavior of SMEs with low levels of technical maturity (Guo et al., 2019). This could potentially be linked to their negative perceptions about the use of cloud services.

However, Cluster C SMEs' negative perceptions about the use of cloud services could also be changed by a variety of change agents. Intermediaries could market cloud services to Cluster C SMEs, thereby changing their perceptions about them and influencing them to adopt the services. Tragic events such as the loss of data also appeared to force Cluster C SMEs to re-evaluate their negative perceptions about cloud services and thus also influenced them to adopt these services. As such, positive perceptions about the use of cloud services, appeared to be an essential pre-requisite for the successful adoption of cloud services.

7 | DISCUSSION

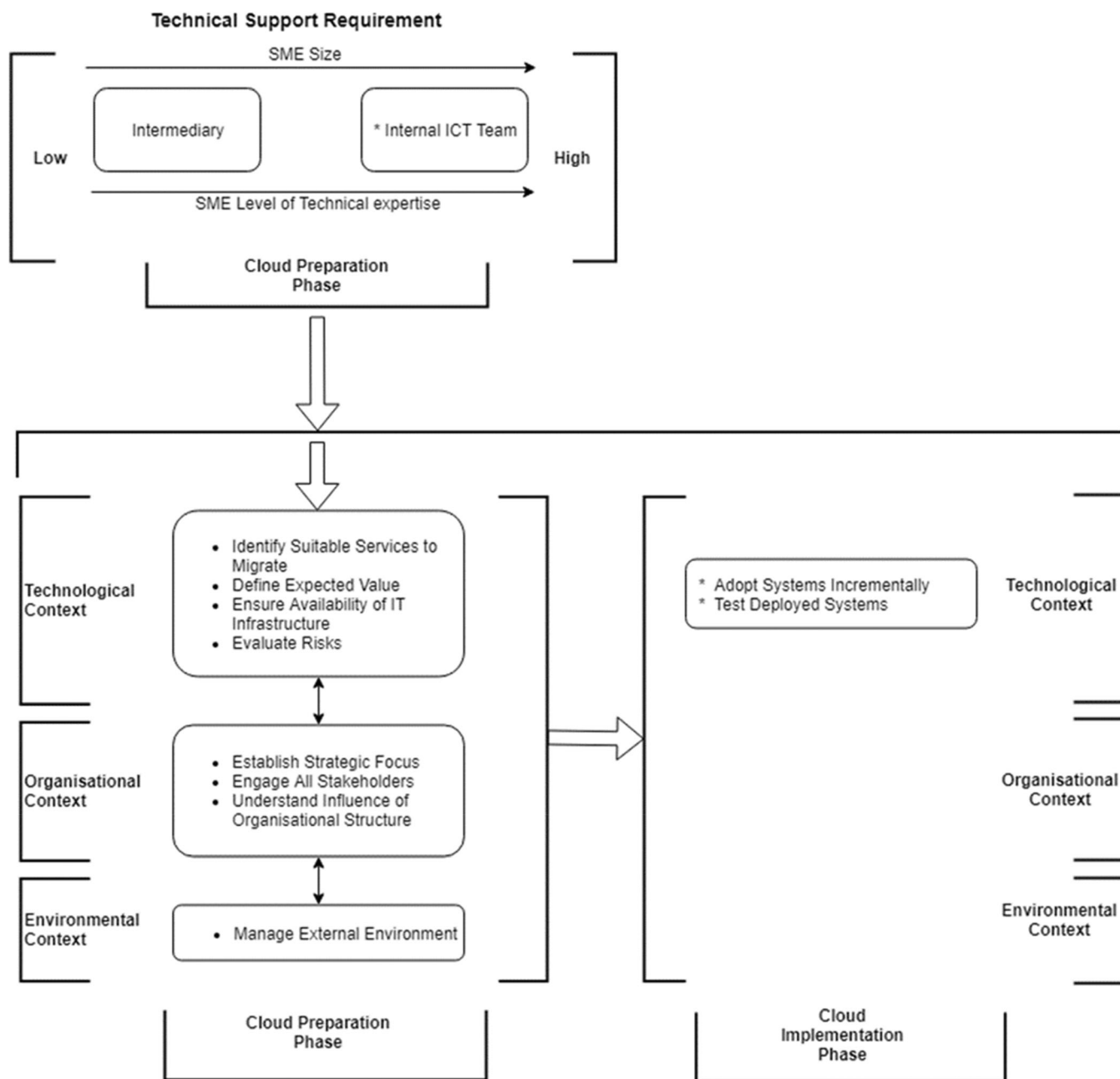## 7.1 | High-level SME cloud services adoption framework

Figure 10 illustrates the proposed framework for the adoption of cloud services by South African SMEs. Together with the related recommendations, this serves as the main contribution. Technical expertise was identified as the cornerstone of the entire cloud adoption process. As such, the proposed framework, encourages SMEs to first assess the level of technical support they may require. SMEs who possess less technical expertise are encouraged to seek support from a reliable intermediary who likely has the knowledge to complete the *Cloud Preparation Phase* (and complete an associated readiness assessment).

All the activities associated with the *Cloud Preparation Phase* should be completed prior to moving on to the activities associated with the *Cloud Implementation Phase*. The implementation phase activities should be carried out only when the possibility of business operations disruption is low—hence their optional nature. Our interview data suggests that this depends on the complexity of the SMEs legacy ICT infrastructure, if any, and on how easily legacy systems could be integrated with the required cloud services to be adopted.

The framework (see Figure 10) recommends carrying out all the pre-implementation activities outlined in the framework and, if necessary, the implementation activities. However, it should be noted that this deviates from both the literature and what was observed in practice (i.e., from the interview data). Most SMEs only carried out a subset of the outlined activities. This could be due to their inclination for less formal processes, the need for greater agility in decision making, and the lack of resources to dedicate to research and development.

7.2 | Recommendations and research implications

For SMEs that have started, are planning to start, or have already completed the process of moving some services to the cloud (e.g., email storage and management, document storage, financial processing), the following key recommendations are proposed and discussed below.

Technical Support Requirement

FIGURE 10   SME cloud adoption framework (Key: * = optional)

SMEs should assess the level of technical support they may require by improving their knowledge (and overall awareness) of cloud services. It is imperative for SMEs to assess this as it directly influences overall success when adopting cloud services. They should, therefore, understand (in quite some detail) what they will be required to do as part of the cloud adoption process. We illustrate this process in the upper left of our framework (see Figure 10). Importantly, it forms part of the larger _Cloud Preparation Phase_ which informs the _Technological Context_. Understandably the knowledge attained enables SMEs to not only gain a better understanding of the benefits that cloud services have to offer, but also to select suitable services that would maximize these benefits (referred to as _Identify Suitable Services..._). Importantly, the identified benefits associated with the selected (and thus suitable) cloud services should add value beyond the risks identified (_Evaluate Risks_ in the framework). Once some initial knowledge (and awareness) has been gained it could further inform decisions related to the involvement of an intermediary. For example, if during the process of knowledge acquisition, they realize there is a lack of requisite technical skills to successfully adopt the identified cloud services, they could make use of intermediaries to assist in this regard. This emerged as a prominent challenge within the context of our study, as many SMEs fail to perform this thoroughly as part of the cloud preparation phases illustrated in Figure 10. Complying with this recommendation does, however, engender several practical implications that would likely affect SMEs to varying degrees. First, it requires SMEs to set aside money

and resources to improve their knowledge of cloud services. For example, they may not be able to select suitable services requiring the use of intermediaries even at this early stage of the adoption process. Given that many SMEs are already resource constraint, complying with this recommendation could prove to be problematic—a persistent problem with recent support in this regard (Beliaeva et al., 2020; Putra et al., 2021). Second, such skill and technical constraints are not only monetary in nature, but also infrastructural. If SMEs do not have adequate access to cloud infrastructure very little (if any) knowledge acquisition can take place. This forms yet another common challenge faced by SMEs in developing economies (Chundu, 2022; Supriyadi et al., 2018). Third, the same holds for any knowledge gained through the process is testing cloud services during the adoption process (Fitriasari, 2020; Vijayan & Mork, 2020). Having said this, our interview data indicates that this mostly affects processes within the *Cloud Implementation Phase*, as part of testing those systems that deliver the cloud services (illustrated as *Test Deployed Systems* in Figure 10).

In addition to improving their knowledge of cloud services, *SMEs who do manage to successfully adopt cloud services, should share the knowledge that enabled them to achieve such success*. For example, from our interview data it is clear that even though some of the SMEs achieved success in terms of adopting cloud services, the knowledge and experience gained remained within many of these SMEs. Having said this, the inability (or unwillingness) to share such knowledge mostly affected smaller SMEs. Even more so if they used intermediaries. Those SMEs who possess internal ICT teams were uniquely positioned to not only learn from the adoption process, but also gained experience as to how these services should be maintained as that is their purpose within the respective SMEs. Given that these cloud services are off-premise, we illustrate this as *Manage External Environment* within Figure 10. From a practical perspective, not sharing such information implies that, in principle, smaller SMEs who do not possess the requisite resources (to use intermediaries, for example) will likely continue to fail adopting cloud services. We do, however, concede that there are more pressing challenges that affect SMEs in developing economies. These challenges include their inability to assimilate innovations, lack of market intelligence, the inability to effectively manage their business (amongst others) (Prasanna et al., 2019). Having said this, we also argue that cloud services may (indirectly) assist in addressing some of these challenges. For example, several studies have found the adoption of web-based information and communication technologies (ICTs) to boost organic growth in the form of a reduction in operating costs, improved market intelligence and improved service delivery (Quayle & Christiansen, 2004). Crucially, these ICTs are portrayed as cloud based. Collectively, the recommendations we have provided thus far are somewhat incongruent with the abilities of a typical SME within a developing economy. On the one hand, literature provides evidence to suggest that cloud services could ameliorate many challenges that SMEs in developing economies face. On the other hand, our thematic analyses indicate that the adoption (and long-term strategic use) of these cloud services requires certain resources to be available as part of the cloud preparation phase. Given that SMEs within developing economies are, as argued, resource constraint complying with these recommendations is difficult to say the least. Even more so considering that sharing (or learning) new knowledge, as recommended, does not also address the other challenges (see Table 2). For example, improved knowledge about the cloud services does not provide SMEs with more time or money. Neither does it, provide them with enhanced infrastructure.

To address the above, and to enhance the effectiveness of the knowledge gained by following the recommendations provided, SMEs should perform a cloud readiness assessment. *In particular, we recommend that as part of the readiness assessment, SMEs should first identify those cloud services that strike a balance between required and available resources*. In other words, those cloud services that are likely to deliver the most value considering the current technological, organizational and environmental contexts. Such a readiness assessment need not be completed in isolation from the preparatory phases (as illustrated in Figure 10), but should in the least inform these preparatory phases. For example, SMEs should ideally only prepare for cloud services that would add value considering their current resource constraints (e.g., lack of funds). This is a key recommendation that works hand-in-hand with those discussed above. If, for example, an SME has very little (if any) funds to allocate to cloud services, then a thorough readiness assessment should steer them toward preparing for cloud services which are provided at low cost (some may even be provided free of charge as is the case with cloud-based emailing and collaboration). More importantly, once an SME has deemed themselves to be "ready" in principle for a cloud service, they could start focusing on specifics whilst preparing. This need not be performed in a unidirectional manner, as additional preparation may indicate that a candidate cloud service is actually not viable. At this point the SME would have to cycle back and perform readiness assessments on other cloud services. This is why our framework separates the TOE contexts within the main *Cloud Preparation Phase* in a bidirectional manner. In this regard, recent literature provides some evidence to suggest that a thorough and well-informed cloud readiness assessment positively influences the adoption of cloud services (Ali et al., 2018; Al-rawahna et al., 2018).

8 | LIMITATIONS AND FUTURE RESEARCH

We wish to acknowledge several limitations. First, this paper only interviewed a select number of SMEs within a single province of South Africa. The views expressed are therefore not necessarily representative of SMEs in the rest of the country. We do, however, argue that our findings would apply to similar rural contexts. Second, we did not operationalize all the constructs within the TOE framework during the development of our interview guide. For example, we did not probe technological readiness. Instead, we opted for this to emerge as part of the interview process where we probed SMEs on their level of technical expertise. Third, our cloud adoption framework is developed at a high level of abstraction and should thus be read in combination with the provided recommendations to gain an understanding of the findings' theoretical and practical implications.

To address some of the above our thematic analysis points to interesting research opportunities. First, we found that intermediaries significantly influenced how SMEs went about adopting cloud services. Whilst this paper revealed intermediaries' influence, we advocate future research to adopt a more in-depth approach in this regard. Moreover, instead of only focusing on SMEs within a single province of South Africa, future research could interview SMEs from other provinces—possibly even neighboring countries. This will allow for a more representative analysis, but also provide more details as to the influence of varied contexts. Finally, SMEs seemingly place a lot of trust in intermediaries when considering adopting cloud services. Thus, it is believed that the concept should be explored further to try and establish its role in SME cloud adoption. It would also be interesting to investigate how SMEs establish and maintain trust in intermediaries.

9 | CONCLUSION

This paper explored how the technological, organizational and environmental contexts that define South African SMEs influence the adoption of cloud services. Specifically, those SMEs who operate within a single province of South Africa, namely the Eastern Cape. To this end, 13 semi-structured interviews were carried out within the context of an adapted version of the TOE framework. During our thematic analyses, we developed several key recommendations (based on our high-level cloud services adoption framework) that South African SMEs can use to adopt cloud services successfully. Findings from our thematic analyses indicate that smaller SMEs make extensive use of intermediaries when adopting cloud services—mostly because of low levels of technical skills and expertise. The findings also suggest a general lack of cloud preparatory activities, which often results in failed attempts at adopting cloud services.

CONFLICT OF INTEREST
The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT
Research data are not shared.

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