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# Adoption of cloud-based enterprise resource planning payroll system state-owned enterprises in South Africa

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**Background:** Cloud computing simplifies the access of applications and data from any location worldwide using Internet connected devices. Whilst adoption of cloud computing seems to be attractive, most companies are still using the on-premise enterprise resource planning (ERP) systems. Cloud computing provides organizations with scalable computer resources; nevertheless, state-owned corporations in South Africa have a poor adoption rate for integrating ERP and, in particular, payroll into the cloud (SOEs).

**Objectives:** The goal of the study was to investigate factors affecting the adoption of ERP payroll cloud solutions in SOEs and basing on these factors develop an ERP payroll cloud solution adoption model.

**Method:** In this study, a qualitative research approach was employed. Data were collected through observation, interviews and document reviews, and were analysed using thematic analysis method.

**Results:** The *a priori* themes for this study: policy, security, cost, compliance and privacy were confirmed, whilst Protection of Personal Information Act, data centre location and top management emerged and were found to have a substantial influence in cloud ERP Payroll adoption process in SOEs.

**Conclusion:** To move from on-premise to cloud ERP solution, SOEs managers need clarity on: Protection of Personal Information Act (POPI) act adherence, data centre location, top management support, privacy assurance, security guarantee, cost effectiveness, compliance controls and policy formulation adoption and implementation. The studied SOEs were not yet ready to migrate from on-premise solution to a cloud solution because of these factors. Addressing the above-mentioned concerns may enable SOEs' managers to gain confidence in adopting cloud services.

**Keywords:** cloud computing; ERP payroll; adoption; cloud ERP; state-owned enterprises.

## Introduction

Cloud computing denotes storing and accessing data and programmes over the Internet instead of the computer's hard drive (Rashid & Chaturvedi 2019). Many companies are still using on-premise enterprise resource planning (ERP) systems. An ERP system is described as software solution that integrates the range of business processes that enables companies to gain a holistic view of the business enterprise (Al-Shboul 2018). The ERP uses one data repository to coordinate different organisational processes in different organisational units by means of software modules. The ERP systems are inclusive of a human capital management (HCM) module, which is an important function within human resources (HR) and it consists of sub-modules such as the payroll module. The payroll module has been designed for the purpose of maintaining details of various allowances and deductions that need to be compensated to the employees of an organisation (Madavarapu 2014). The payroll module uses software to generate pay checks and administer benefits payments that makes it easier for an organisation to gather all the information necessary for payroll calculations. There is an integration of other HR areas into the payroll and its significance varies with organisations as a result of governance and regulatory differences. The payroll systems are quite complex because they deal not only with time and attendance but also with a plethora of potential deductions (Benaissa & Benabdelhafid 2005).

The conventional approach of utilising on-premise ERPs presents numerous disadvantages to organisations such as exorbitant costs (Mangiuc 2011). The ERP has been revolutionised through

the development of cloud-based ERP systems (Al-Shbou 2018). These systems enable corporations to use third-party hosting information technology (IT) applications and resources virtually rather than physically. The implementation and execution of ERP systems over the cloud offers great advantages through the collection, recording, integration, management and conveyance of accurate data. Cloud computing enables companies to reap the benefits of computing resources, such as storage and applications utilities, which frees the customers from building and maintaining infrastructure in-house and running applications on the premise. According to Garrison, Wakefield and Kim (2015), adoption of cloud computing is likely to be either as on-premise, public cloud or private cloud services, or the hybrid of the two. For broader transformation, it is important to understand the predictors of cloud computing adoption in order to design and promote effective policies (Vu, Hartley & Kankanhalli 2020).

This study focused on factors that may impede the adoption of cloud computing services by state-owned enterprises (SOEs). In addition, this study investigated the SOEs level of readiness to adopt cloud computing in view of the Fourth Industrial Revolution (4IR). The 4IRhas created innovative capabilities for people and machines using technologies such as cyber-physical systems, the internet of things (IOTs) and the internet of systems (IOSs) (Gatouillat et al. 2018).

As a result of 4IR's revolutionary impact, organisations will need to think critically about their policies and priorities, as well as be aware of this requirement and begin to undertake efforts to prepare to embrace these changes. Citizens will be able to connect with one another, trade with one another and access services that are currently unavailable, thanks to the 4IR technology. Schwab (2016) observed that in its scale, scope and complexity, the transformation will be unlike anything humankind has ever experienced before.

## Problem statement

With the payroll in the cloud, no additional hardware investment would be required to host a successful payroll. Organisations do not have to worry about data security as this is handled by the service provider.

Some of the benefits offered by cloud computing are mobility, scalability, cost saving, agility, efficiency, environment, flexible security and data access anytime anywhere (Armbrust et al. 2009). Whereas the on-premise payroll is more customised and not easy to maintain or update, cloud solution offers stability and continuous updates from the vendor because of less customisation, which leads to organisations working directly with cloud providers during system updates. According to EPI-USE (2017) as an independent SAP HCM specialist in designing, building and implementing SAP systems for customers, implementation process for cloud ERP Payroll is shorter and more cost-effective – monthly payroll processes are simplified and automated and the organisation only need to deal with one external provider. Regardless of these cloud benefits, organisations are still using on-premise ERP payroll especially during these times where organisations are encouraging their employees to work from home because of the COVID-19 pandemic. Therefore, it is necessary to fathom the factors that may influence the adoption of ERP payroll into the cloud solution.

## Aim of the study

The aim of this study was to investigate factors affecting the adoption of cloud ERP payroll solution and use these factors to develop a proposed ERP Payroll Cloud Adoption Framework.

The objectives of this study are to:

- Identify critical factors affecting adoption of a cloud ERP Payroll solution.
- Identity which of these factors are the most important.
- Use the identified factors to develop framework for the adoption of a cloud ERP payroll.

## Literature review

A study by Tan and Lin (2012), revealed that the Singapore government has recently implemented a pro-innovative scheme that allows firms adopting cloud computing to get a 400% tax deduction, and this has thrusted Singapore to be the third most ready country for cloud computing in the Asia Pacific region. The study has examined the status of organisational adoption of cloud computing in Singapore and the factors affecting their adoption to understand its adoption in the wide range of business organisations. The study surveyed a total of 52 executives on adoption of cloud computing in their companies. The findings of the study showed that factors such as organisational technology-sensing capability, perceived relative advantage and perceived industry pressure rank high on cloud adoption decisions.

A quantitative study by Shah, Vadiya and Jhaverui (2016), analysed 122 articles on cloud computing security research issues and found that cloud computing is in high demand because of the advantages it offers to a company such as high computing power, less cost of services, high performance, scalability, reliability, accessibility and 24/7 availability. One of the study's findings was that the research in cloud computing has received more attention over the past few years.

Varghese and Buyya (2018), showed that the cloud computing space has been crowded not only by more providers and services but also by a variety of cloud infrastructures options. They further explored the layers of abstraction in the cloud stack that need to accommodate changes brought about by the evolving infrastructures.

Noor et al. (2018), studied the challenges and future research directions in mobile cloud computing. The study showed that there are still challenges that must be addressed in order to enable the ubiquitous deployment and adoption of mobile cloud computing. The study revealed that security, privacy and trust, bandwidth and data transfer, data management and synchronisation, energy efficiency and heterogeneity are some of these challenges.

# Conceptual framework

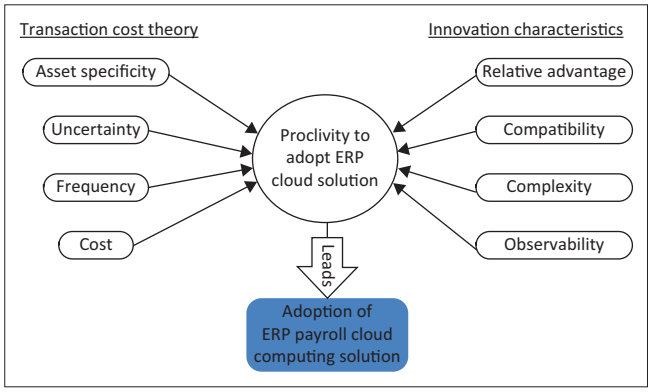
The transactional cost theory (TCT) constructs, namely asset specificity, uncertainty, frequency, and cost, were used in this study, together with diffusion of innovation (DOI) constructs, namely relative advantage, complexity, compatibility and observability. As indicated by Shahab and Allam (2020), transaction costs are associated with the time and effort to search, negotiate, contract and maintain a relationship with vendors or customers. Avilés (2020) indicated that the DOI is the process by which an innovation is communicated through certain channels over time amongst the members of a social system. Figure 1 shows the research model for cloud computing adoption.

# Transaction cost theory

The TCT, founded by Williamson (1981), is one of the key theoretical foundations used by researchers to facilitate the outsourcing decision (Aubert et al. 1996; Bahli & Rivard 2003). Essentially, this theory illustrates the make-versus-buy decision for companies.

## Asset specificity

The investments of asset specificity are based on both the customer and the third-party provider that have value outside the relationship. It is imperative that the legal system at the vendor's location is compatible with that of the client so that it meets local regulatory requirements (Marston et al. 2011). Data lock-in on the customer's end, is a cause of concern because of the challenges faced during migrating to a different provider, which may happen because of the lack of agreement between diverse cloud providers. According to Rodríguez, Chun-Lai and Gil-Padilla (2017), there are other important concepts of asset specificity, which refers to the degree to which an asset can be redeployed to alternative users and by alternative users without sacrificing the productive value. Asset specificity is a sustainable investment made in support of specific transactions, where the opportunity cost is much lower (Williamson 1985).




ERP, Enterprise resource planning.

**FIGURE 1:** The research model.

## Uncertainty

Environmental uncertainty refers to unanticipated changes in environments surrounding an exchange. But when operationalised in empirical studies, amongst all the transaction cost analysis construct, environmental uncertainty seems to be the most problematic from a measurement standpoint (Rindfleisch 2019). In cases of high uncertainty, Rogers (1995) proposed either trying to create an elaborate contract to handle possible uncertainties or to insource. To deal with cloud adoption uncertainties related to major changes in requirements, an elaborate contract may be required to handle provisions which may not be a part of the current provider's offering. Williamson (1985), distinguished between two types of uncertainties, namely primary uncertainty and behavioural uncertainty. Primary uncertainty covers exogenous sources of uncertainty such as natural occurrences, consumer preferences, technology and regulations; secondly behavioral uncertainty, as the strategic misrepresentation of information by economic agents (Sutcliffe & Zaheer 1998).

## Frequency

Through frequency, organisations can be in a position to understand the focus in order to deal with the issue of time amongst transactions. Occasional practice of transactions mostly leads to unjustified costs of alternative governance, reason-driven by the fact that, more frequency of transactions, nevertheless, will give rise to validations regarding alternative governance. According to Man et al. (2017), the volume, number, and/or temporal spread of transactions must be considered because, given the previous assumptions even if they are infrequent, alternative governance structures may not be necessary or feasible and as alluded by Williamson (1985), 'The degree of frequency ranges from occasional to recurrent'. The variation of contracts and governance structures is 'mainly explained by underlying differences in the attributes of transactions' (Williamson 1985).

## Cost

When adopting new technology, the cost and availability of financial resources are prioritised to cater for the new technology acquisition. The cost of an innovation is always directly linked to the skills and expertise necessary to adopt the innovation (Hall & Khan 2003). A study conducted by Columbus (2012), illustrated that the perceived lower total cost of ownership (TCO) offered by cloud computing solutions continues to be the dominant reason why organisations consider adopting cloud computing. Other great benefits of cloud computing include increased revenues and reduced costs. The ROI and TCO are important in order

to examine the viability of a new technology as favourable for adoption. The cost benefits analysis of the new technology to be adopted is also a significant consideration in the adoption decision (Li et al. 2005).

#### Innovation characteristics

The DOIs theory was also considered in this study in order to identify the constructs that define organisations' use of an innovation.

### Relative advantage

The DOI relative advantage attribute is considered to be the same as technology acceptance model's perceived usefulness construct, which is defined as 'the degree to which a person believes that using a particular system will enhance his or her job performance' (Mokwena 2011). Relative advantage is the progression to which an innovation to a group of operators appears better than the idea it replaces based on what is important for those operators. The more an innovation's perceived relative advantage increases, the higher the acceptance rate is likely to be. Users measure an innovation in terms of what matters most to them, which could be economic advantage, social prestige, satisfaction or convenience (Robinson 2009).

### Compatibility

The complexity of an innovation or the perceived lack of ease of use can present a stumbling block to the adoption of an innovation (Hester 2010). An idea that is regarded incompatible with consumers' values, norms or practices will not be adopted as rapidly as an innovation that is compatible. When an innovation is more compatible with the existing values, past experiences and needs of potential adopters, uncertainty will decrease. If an innovation is compatible with an individual's needs, then uncertainty will decrease and the rate of adoption of the innovation will increase (Sahin 2006). When a technology is considered incompatible and the organisation does not see it as meeting its standard, it may not be adopted.

### Complexity

This is the extent to which an innovation is perceived as difficult to understand and use. New ideas are implemented more rapidly than technologies that allow the adopter to develop new skills and understandings. Cloud computing complexity can be comparable to the degree to which it is difficult to use. The complexity of an innovation is not positively related to the rate of adoption (Valente & Rogers 1995). Sometimes it is not easy for users to understand the complex systems, which means the implementation of the system might take long and the customisations in all probability may go wrong or disturb standard functions. Therefore, the difficulty of an invention can act as a barrier if the innovation, such as cloud ERP Payroll, is considered as complicated to use and not user friendly (Rogers 1983).

Complexity of the system may cause confusions during implementation and delay the implementation process.

### Observability

Visible results lower uncertainty and stimulate constructive discussion of a new idea (as friends and neighbours of an adopter often request information about it). Observability is relative to the visibility of successful cases and practices. Innovation that is known by many stimulates discussions amongst the users and increases the chances of it being adopted. According to Taherdoost (2018), role modelling (or peer observation) is the key motivational factor in the adoption and diffusion of technology. If the advantages are not easily observable, then the innovation could face a slower rate of adoption (Rogers 1995). When potential adopters can easily see the relative advantage of an innovation, they may adopt it as early as possible.

## Research methods

This is a qualitative study aimed at investigating factors that may influence the adoption of cloud ERP payroll within SOEs in South Africa. The aim of this qualitative research is to provide the researcher the perspective of the target audience members by immersing himself in a culture or situation and by directly engaging with participants (Weinreich 2009). Purposive sampling also known as judgement sampling (Tongco 2007) was used as a sampling method for data collection from SOEs and private sector consultants working with SOEs. According to Mastaglia, Toye and Kristjanson (2003), the advantage of using purposive sampling is that individuals who have experienced the phenomenon of interest are invited to participate, contributing a wide range of domain descriptors and construct dimensions.

## Data collection instruments

### Document review and observation

Related documentation was reviewed on the topic of 'Adoption of Cloud-based ERP Payroll system from South African SOEs'. A variety of data were gathered and studied, which included sources from published studies such as white papers, reports and documents (policies, Protection of Personal Information Act [POPIA], and procedures) and Internet-based documents. In addition to this documentation, an extensive literature was reviewed (such as books, journals and articles).

A common finding from the studied SOEs was that they are not yet ready to move into cloud ERP payroll based on the procedures, policies and cloud-first strategy in place and this was clearly observed in the organisational documentation during the data gathering for this study; and in some instances throughout the researcher's employment as a

consultant implementing and supporting on-premise ERP payroll for some of these organisations.

### Interviews

A total of 13 questions approved by the University Ethics Committee were used during interviews with the participants, namely SAP Payroll Consultants, IT Specialists, IT managers, Chief Information Officers and SAP HR Managers. A total of 18 emails/WhatsApp messages were sent out to the participants, but only 12 participants responded indicating that they were interested to be a part of the research study, while 6 research participants did not respond to the emails. The study, therefore, used the data collected from the 12 participants for the analysis (see Table 1 for the interviews discussion request rate summary).

An interview schedule was applied with the purpose of investigating factors influencing SOEs in adopting cloud computing and allowed participants to share their experiences. Face-to-face and telephonic interviews were used to collect responses from the study participants based on the questions designed for the purpose. Emails and WhatsApp messages were sent to the research participants to politely ask for the 30 min of their time for an interview engagement.

Personal visits and telephonic conversations with the participants were undertaken to have a discussion based on the questions approved by the University Ethics Committee.

**TABLE 1:** Interview discussion request rate summary.

| Description | Interview requests | Percentage |
|---|---|---|
| Total number of interviews requested | 18 | 100 |
| Total number without responses | 6 | 33.33 |
| Total number who agreed to participate in the interviews | 12 | 66.67 |

The support was positive, and all the questions were discussed and interviews were completed.

## Data analysis

This study adopted thematic analysis as an approach to data analysis, which is a form of analysis that heavily relies on recurrent themes and necessitates a specific definition of what constitutes a theme. The use of quotes in thematic analysis contributes to the emphasis on transcription accuracy. Table 2 shows example of data extracts that have been coded multiple times.

## Background of the participants

All the interviewees held positions in three SOEs and two consulting firms doing business with SOEs. To ensure confidentiality of the participants, each interviewee was allocated a specific code.

Table 3, shows a breakdown of the participants according to their positions held in the organisations.

**TABLE 3:** Breakdown of participants contributed in the study.

| Participants' code | Department | Position |
|---|---|---|
| P1 | SAP Support Centre | SAP Payroll Consultant |
| P2 | SAP Support Centre | SAP Payroll Consultant |
| P3 | SAP Support Centre | SAP Payroll Associate Consultant |
| P4 | SAP Support Centre | SAP Payroll Consultant |
| P5 | HR Systems | SAP Payroll Specialist |
| P6 | Group HR Remuneration | Manager: HR Enablement |
| P7 | ICT Services | IT Specialist |
| P8 | ICT Services | IT Specialist |
| P9 | ICT Services | IT Project Specialist |
| P10 | Group ICT Services | IT Project Manager |
| P11 | Group ICT Services | IT Project Manager |
| P12 | ICT Services | Chief Information Officer |

**TABLE 2:** Data extract that have been coded several times.

| Data extract | Code |
|---|---|
| We are in support of cloud computing and there are policies in place. We consider the hybrid model, and this is carried out in gradual manner. Top management is supportive of the adoption of cloud computing. There are still questions that need clarity about cloud computing. Knowledge of the differences between on-premise and cloud computing enterprise in place. | • Support of policies for cloud computing<br>• Top management support is essential<br>• Understanding on-premise and cloud computing enterprise<br>• Hybrid model a consideration |
| The cost might have an impact on cloud adoption. Concern is about network connectivity, data security and data privacy because there is less control as data owners and data security is delegated to service providers and the fact that data is hosted outside organisation's premises is a problem. No company has come forth to attest that they are on ERP Payroll cloud and protection of personal information is ensured. Change management is also important because there are industry principles. Tools to monitor and verify data integrity must be guaranteed and cloud providers should provide proper backups. We expect state-of-the-art security and compliance with all laws and regulations and as a consumer to ensure that you set up the correct security protocols for the environment. | • Concerned about cost<br>• Concerned about network connectivity, data security and privacy<br>• Change management is crucial |
| Data will not be compromised because it is a risk that your data are exposed but there are mitigators to the risk. Cloud service provider must be open to mention what are the breaches, pros and cons putting in mind that a proven track record of uncompromised data is important. Resources have skills and are also taken to forums and trainings. Skill is available, but remains unutilised. Organisations offer knowledge and invite service providers to do internal training. Employees conduct their own research and upskill themselves. | • Lack of understanding mitigations to cloud risk which cloud providers should disclose<br>• Concerned about governance and laws<br>• Concerned about lack of exercising in-house skills |
| Top management support is the biggest riddle every company has to go face. In the top management some don't understand the concept of cloud computing. Their worry is that, what if data stored on cloud disappears. Yes, the organisation is in support of strategy for cloud computing. There is a cloud first policy in place. | • Top management's influence<br>• Policy availability |
| On-premise means you have physical data centre that might be managed by your organisation. It is owned and supported by your organisation. With the cloud, the service provider is providing you with the service such as the hardware. You are renting the hardware and not owning it. It is about the data centres and company can traditionally outsource data centre within their network and they are in control of it. With cloud computing you are opting for multi data centre approach of which you are going into public data centre of which you are not the only tenant. For the security of our information, we have the POPI act and other legislations, as the sensitivity and security of the data becomes important. My expectations in terms of the security because we are dealing with the payroll data is that there is no room for such attacks where anybody is able to access the information from the space we are in and there is no possibility of anybody stealing the data or intercepting it over the air in terms of malware and hacker attacks, which is the security that needs to be dealt with because we are dealing with POPI act policies. | • Data centre location<br>• POPI Act |

ERP, Enterprise resource planning; POPI, protection of personal information.

It is clearly evident from Table 3 that all the participants held a relevant position in the selected SOEs and private sector, therefore, qualified to contribute in the process of data collection. All the participants had more than 2 years of experience in their positions and this reflected the experience they had gained in the organisation, which was necessary for this study.

The discussions that the researcher had with the participants from various SOEs allowed the researcher to gain an understanding of what is hindering the adoption of cloud computing from different perspectives. In this regard, the data gathered are considered to be comprehensive. The benefits of the information obtained generated value for the organisations and contributed towards the cloud ERP Payroll computing adoption and could enhance cloud computing adoption for SOEs.

## Ethical considerations

Participants of the research were given the details and intention of the study and were assured about the confidentiality of their information in the study. Information of the participants was kept anonymous and is not be published for the public. All the data collected for the study from the participants was securely saved, to assure the safety of participant's information. Faculty of Information and Communication Technology at Tshwane University of Technology granted Ethics Approval Ref#: FCRE/ICT/2017/11/014(2).

# Results

In the process of analysis of the illustrated themes, number of related concepts occurred. Using this, the researcher decided to create a new conceptual framework through means of the combinations, which guided the interpretation process. Two emerged and six *a priori* themes were formulated for this study during the investigation of cloud ERP Payroll adoption. The findings of this study show that the intention of cloud ERP Payroll adoption can be predicted by emerged themes.

## Emerged Theme 1

The POPI Act emerged during the interviews and influenced SOEs adoption of cloud ERP Payroll. This is emphasised by the fact that, despite the word 'POPI Act' not expressly mentioned in any of the interview questions, it emerged as a common theme in the interpreted data. Hence, it has been illustrated as one of the emerging themes (see Figure 1).

### Interpretation of findings

To make sure that the transition from on-premise to cloud computing adoption is taken into consideration, cloud service providers' strategy, change management and customer awareness is needed to address the adoption of cloud computing in SOEs. The practical findings showed that there is uncertainty in terms of trust in the studied SOEs. Furthermore, it was found that there was no surety in place on how personal information will be protected for the SOEs. It is recommended that strategies, change management and employee awareness be established to give clarity on SOEs uncertainty.

### Implications of the emerged theme 1

Participants were of the view that SOEs should lawfully provide personal information of its employees to be processed by any service provider only after obtaining the employee's consent, unless the processing of such information falls within the purview of the exclusions provided by section 6 of the Protection of Personal Information Act, 2013 (Act No. 4 of 2013) ('the POPI Act'). Furthermore, according to participants strict compliance must be ensured with the provisions of the POPI Act thereof by SOEs.

## Emerged theme 2

Location of the data centre emerged as a factor in theme 2, and this also influenced the adoption of cloud ERP Payroll by SOEs. This theme emerged during the interviews and was not part of the questions asked. This clearly showed that there are other factors of cloud computing that influence the adoption.

### Interpretation of findings

This study has revealed that there are some challenges with regard to the location of data centres. This is because of the apprehensions of the participants regarding the standards and laws, including the fear of data access by other companies and fear of political interference in countries where government can access the data at any given time. Since there are no data centres in South Africa that are regulated by the laws of the country, it becomes evident that this concern hinders the adoption of cloud computing in the studied SOEs.

## Emerged theme 3

Top management, as alluded by other researchers and supported by this study, has a positive impact on cloud ERP Payroll adoption. In response to a question raised by the researcher about top management support to cloud computing adoption, Participant 4 who is a male and working as a SAP consultant stated that:

> 'Top management support is the biggest riddle every company has to go through. In the top management some of them don't understand the concept of cloud. Their worry is that, what if cloud disappears.'

### Interpretation of findings

When introducing a new technology, such as cloud computing, top management support is important because upper levels executives in all probability are the ones who facilitate the adoption of new technologies. The support by top management in the studied SOEs is essential as it drives the focus on crucial areas such as change management,

training of resources, building a technology friendly culture, creating and updating Information Technology (IT) policies that are relevant for technology change and adoption and adequately enforcing those policies. Hence, encouraging and maintaining a high-level motivation is important to successfully adopt cloud computing solution.

#### Implication of the emerged theme 3

Top management plays an important role in cloud computing implementation because it may involve integration of resources and re-engineering of processes (Low & Chen 2011). Top management support is critical for creating a supportive climate and for providing adequate resources for the adoption of new technologies (Li et al. 2005; Wang et al. 2007). Without top management support, it may take users a long time to understand and implement the new technology, even convincing signatories might be a problem for approving the use of the new technology.

As the complexity and sophistication of technologies increase, top management can provide a vision and commitment to create a positive environment for innovation (Lee 2002; Pyke 2009).

## A priori Theme 1

Policy has a positive impact on the adoption of cloud ERP Payroll by SOEs. During interviews it was alluded to by Participant 6 who is a male, working as SAP Consultant that: 'There is a cloud first policy in place'. This was when the researcher asked a question 'What are the challenges of cloud solution your organisation experiences?'

#### Interpretation of findings

Policy assists organisations in subjective decision-making, and senior management decisions must be based on the relative merits of several factors. Participants alluded that cloud first policy is in existence, however others stated that it still needs to be reviewed, and if it is not utilised it will not be useful. An organisation that strives to construct an effective cloud first policy needs to have a well-defined objective concerning cloud computing. Most importantly, studied SOEs should keep in mind that if proper training of policies is in place, it can lead to a well advanced efficient working environment. Consequently, the policy should be addressed at the appropriate time for adopting cloud computing.

#### Implication of a priori theme 1

Whilst there is little doubt that cloud computing can be beneficial in the areas of office computing and work group collaboration (Schubert 2011), it is interesting to examine different operating forms of a complex business software system (such as an ERP system) in a cloud environment. Drafting of an appropriate policy will assist in analysing and improving the adoption of cloud ERP Payroll.

According to Pyke (2009), to enhance competitive advantage, developing cloud computing capability is an important undertaking because it is not only rapidly changing the way that enterprises buy, sell and deal with customers but it is also becoming a more integral part of enterprises' business tactics.

## A priori theme 2

Security has a positive impact on the adoption and use of cloud ERP Payroll. The researcher asked this question 'What do you expect security wise from a cloud solution?' in the interview looking at how the participants feel about all of the main information security issues in relation to cloud computing risks, as well as any knowledge gaps that the researcher might be unaware of.

#### Interpretation of findings

Studied SOEs showed that security is a major concern and a developing factor that hinders the adoption of cloud computing. It is evident that the level of security measures in place to protect organisation's information and unauthorised access to the system without anyone's consent is a crucial factor. Cloud service providers must be transparent and provide sufficient evidence regarding security to the studied SOEs because, currently, cloud computing services are less attractive to them. Subsequently, this security issue and surety to data protection must be addressed appropriately as these will minimise doubts about the security.

#### Implication of a priori theme 2

Security is a major concern and a developing factor that creates doubts and fear in consumers who intend to adopt cloud computing. The adoption of cloud computing will depend on the level of security measures in place to protect consumer information and prohibit unauthorised access to the system without one's consent. As mentioned by Benlian and Hess (2011), 'Lack of security is one of the biggest doubts for many organisations that intend to adopt the cloud'. According to the survey conducted by IDC in 2008, the major challenges that prevent cloud computing from being adopted are recognised by organisations and this includes security.

Lastly, cloud ERP providers offer a different plan for backup and disaster recovery, which increases the safety of the cloud ERP database and providers intended to perform most of the administration tasks whilst the cloud ERP clients lose the control of this administration and control tasks (Zhang et al. 2002).

## A priori theme 3

Cost influences the adoption of cloud ERP Payroll adoption in SOEs. As some of the participants said that they were supposed to have implemented their cloud solution by now, the scholar suggested that has this not happened till now is because of the cost of Internet access. The question 'Are you familiar with the difference between cloud solution and on-

premise solution including cost impact?' was asked to understand if participants understood the difference between the two models.

#### Interpretation of findings

The cost of adopting new technology and the availability of financial resources is always considered when planning to adopt new technology. According to Khan et al. (2002), the cost of an innovation is always directly linked to the skills and expertise necessary to successfully adopt an invention. A research by Columbus (2012) on what accelerates Software as a Service (SaaS) adoption showed that the perceived lower TCO offered by SaaS solutions continues to be the dominant reason why organisations consider its adoption.

The lower TCO and ROI will always encourage adoption of technology. The ROI and TCO are important in order to examine the viability of a new technology as favourable for adoption; the cost benefits of the new technology to be adopted forms the basis for considering adoption (Li et al. 2005). Mohlameane and Ruxwana (2013), identified the cost of software adoption as one of the three major factors that contribute to South Africa's low cloud services adoption. Le Roux and Evans (2011) supported Mohlameane and Ruxwana (2013) by saying that the substantial savings in cost in terms of IT support, hardware and software expenses is one of the most compelling reasons for the adoption of cloud services, especially SaaS.

#### Implication of a priori theme 3

Participants showed that it is easier to adopt cloud computing if it is cost effective. The lower the cost, the easier it becomes to adopt the technology, as long as it benefits the organisations in the long term.

### *A priori* theme 4

Compliance, as mentioned by other researchers and supported by this study, influences SOEs to adopt a cloud ERP Payroll adoption. On being asked 'What kind of proof would satisfy your doubts about cloud solution?' Participants 2 who is a male and an IT Specialist alluded:

> 'In terms of governance regarding cloud computing, it is a requirement from service providers to be compliant with all data security at all times.'

#### Interpretation of findings

Participants mentioned that compliance is an important factor in adopting cloud solution. Cloud service providers should show confidence and comply with the rules and regulations of the organisations regarding ERP Payroll cloud solution. This is associated with trust in cloud service provider and cloud solution itself. If the advantages are not easily observable, then the innovation could face a slower rate of adoption (Rogers 1995).

#### Implication of a priori theme 4

The provider should guarantee organisations with a structure that is comprehensive and well organised, a strategy that is secured with proper checks and balances. According to various participants it is the organisation's responsibility to ensure that cloud service providers deliver accordingly. Organisations should ensure that they audit cloud service providers to safeguard compliance and also use relevant bodies to do these audits.

Lastly, Low and Chen (2011) supported this study's observation that compliance is important, as in their study they mentioned that firms that would like to adopt cloud computing can start with gradual implantation, slowly increasing the number of processes by developing more internet infrastructure or portable electronic equipment.

### A priori theme 5

Privacy also influences SOEs how they perceive cloud ERP Payroll adoption.

#### Interpretation of findings

Participants disclosed that privacy is another aspect that organisations look at, and it is important to ensure the confidentiality of data, whereby only users with authorisation to the system can have access. Furthermore, interviewees showed that because the full control of the information stored in the cloud is controlled by the cloud providers, it is justifiable for organisations to worry. As a result, SOEs must establish standards that cloud providers must adhere to.

#### Implication of priori theme 5

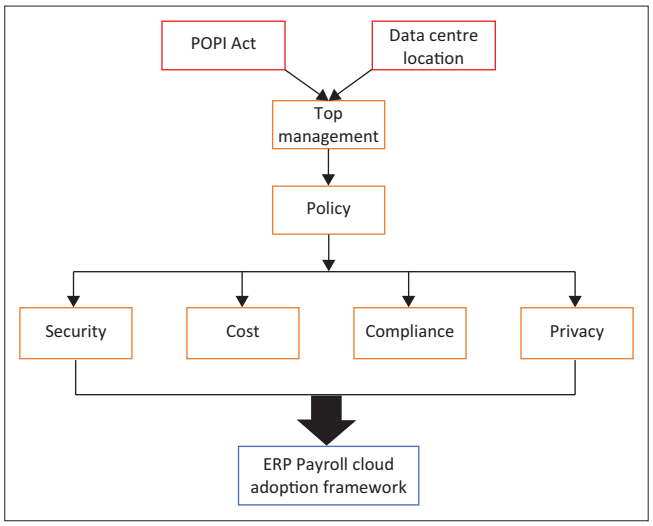
Cloud service providers should make sure that integrity and confidentiality of the services and the data storage is well clarified to the organisations. Participants mentioned that no other companies should have access to their data stored in the cloud. It was also stated that cloud service providers should also not be able to access the data.

Organisations should work hand in hand with cloud service providers to strengthen privacy of their data. IT risk and compliance team should liaise with cloud providers to ensure privacy of organisation's information. Users measure an innovation in terms of what matters the most to them, which could be economic advantage, social prestige, satisfaction or convenience (Robinson 2009).

The results further indicate that other *a priori* themes have an impact on the adoption of cloud ERP Payroll. Figure 2, explains the proposed model for cloud ERP Payroll adoption.

## Research objectives revisited

The aim of this study was to investigate factors affecting the adoption of cloud computing ERP payroll solution and use these factors to develop a proposed ERP Payroll Cloud




ERP, Enterprise resource planning; POPI, protection of personal information.

**FIGURE 2:** Proposed enterprise resource planning payroll cloud adoption framework.

Adoption Framework. The main purpose of this study was to accomplish the following specific objectives:

- *To identify critical factors affecting adoption of ERP Payroll into the cloud solution*: From the findings on this objective, it was evident that the studied SOEs were not yet ready to migrate from on-premise enterprise to cloud computing solution and for the introduction of the ERP cloud computing services because of concern about certain factors.
- *To identity which of these factors is most important:* This specific objective was reached in a way of checking which factors were emphasised as the most important prior to migrating to cloud computing. This produced a list of factors which were then used to achieve the following specific objective.
- *To use the identified factors to develop cloud ERP payroll adoption model:* After attaining this objective, the model was established to show factors affecting the adoption of cloud ERP Payroll solution.

## Recommendations for further research

It is recommended that future research be performed to examine cloud service providers by investigating their capabilities in ensuring that SOEs doubts about cloud computing are taken into consideration and addressed. This is more important as there is no successful adoption of cloud ERP payroll without surety from external providers about compliance, security and privacy. It is relevant to explore the cloud ERP Payroll adoption framework presented in this study. Bearing this in mind, more study still needs to be carried out, in order to explore successful cloud computing adoption and deployment within the studied SOEs and / or other public-sector organisations.

It is also recommended to replicate this study in other South African SOEs and public sector organisations, in order to increase the generalisation of the findings of this study, and furthermore to increase the reliability of the readiness indicators.

## Conclusion

This dissertation reports on a study intended to investigate factors affecting adoption of ERP payroll into the cloud computing. The non-pragmatic data retrieved from the literature, together with the pragmatic findings, demonstrated that there are a number of factors that impact cloud-computing adoption in the studied SOEs as summarised here:

- POPI Act *as introduced in the National Assembly (proposed section 75); explanatory summary of Bill published in Government Gazette No. 32495 of 14 August 2009* influences SOEs adoption of cloud ERP Payroll.
- Data centre location influences SOEs adoption of cloud ERP Payroll.
- Top management has a positive impact on cloud ERP Payroll adoption.
- Policy has a positive impact on cloud ERP Payroll adoption by SOEs.
- Security has a positive impact on adoption and use of cloud ERP Payroll.
- Cost influences the adoption of cloud ERP Payroll adoption in SOEs.
- Compliance influences SOEs to adopt cloud ERP Payroll adoption.
- Privacy also influences SOEs to perceive cloud ERP Payroll adoption.

Regardless of all the benefits of cloud computing technologies, it is recommended that SOEs decision-makers should take into consideration the factors of TCT and deficiency of innovation.

The guidelines needed for cloud computing adoption has been provided in this study. Cloud service providers, SOEs and the academic world will benefit as this research is open to amendment or expansion by other researchers.

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### Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

### Authors' contributions

L.N. was the main author of this article and conducted the research as part of his Master of Computing at Tshwane

University of Technology, whilst S.M. and M.M were the co-authors performing mostly the supervisory role.

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## Data availability

Data supporting the results of this study are available from the corresponding author, L.N., on request. The information is not openly available as it contains information that could compromise the privacy of participants in the research.

## Disclaimer

The interpretations and thoughts shared in this study are those of the authors and do not generally represent the official policy or position of any related organisation of the authors, and the Publisher/s.

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