USERS' PERCEPTION TOWARDS CLOUD COMPUTING: A CASE OF DEPARTMENT STATISTIC SOUTH AFRICA

Mosima Naphtaline Phasha[1] and Alfred Thaga Kgopa[2]

[1]Department of Informatics, Tshwane University of Technology, South Africa
[2]Department of End-User Computing, Tshwane University of Technology, South Africa

ABSTRACT

This study was initiated as a result of the researcher's concerns regarding computing infrastructure at the Department of statistic South Africa (Stats-SA). The concerns arise from issues observed on the physical infrastructure platform currently deployed within the organisation. It is therefore proposed to investigate the attitude and perceptions of users working in Stats-SA on cloud computing and their willingness to migrate from physical infrastructure to cloud. The issue of user behavior during the transition from traditional IT services to cloud services has been addressed in a lot of studies, but the perceptions of employees at Stats-SA have never been investigated. The study expounds on the technology acceptance model by incorporating factors such as availability, accessibility, security and reliability by investigating the perception of end-users. The investigation took the mixed research approach. A questionnaire was developed using three technology acceptance instruments: perceived ease of use, usefulness and attitude to measure the end-user's intention to move to the cloud.

KEYWORDS

Cloud computing, cloud storage, infrastructure, network security

1. INTRODUCTIONS

This section gives an introduction to the study and the areas that have been investigations. It also discusses the background to the study to show the importance of the research. The section introduces the concept of cloud computing and technology acceptance model. Furthermore, it explains the research problem from which the research questions are derived. In addition to these downsides, capacity is inadequate, and as can be anticipated in any data intensive organisation, storage capacity is also low on the network drives and yet money spent on software licensing is very high. Most users at Stats-SA are not satisfied about the unavailability of the services which hampers their service delivery and needs to be addressed. Cloud computing provides increased standardisation of information technology infrastructure. Since the Department of Statistic South Africa (Stats-SA) is not using cloud computing, the researcher is doing the study for purposes of understanding the end-user's attitude.

Stats-SA has a vision to be "Your leading partner in quality statistics". The goal of Stats-SA is "To lead and partner in statistical production systems for evidence- based decisions". It is accountable for the gathering, production and distribution of authorised and other statistics, counting and piloting of a census of the population, and for organisation between producers of statistics. Also, it must establish a statistics council, define its responsibilities, repeal relevant laws, and take care of other associated issues [1].
Stats-SA's information technology infrastructure is not stable. The network is often unavailable, emails servers are unreliable, storage capacity is low on the network drives, huge amounts of

money are spent on software licensing and applications that are not well maintained and also a huge amount is spent on acquiring on ICT. Seventy percent of users in Department statistic SA (Stats-SA) have reported their dissatisfaction with the unavailability and unreliability of information technology services, services that are slow and claimed this also hampers their productivity. Hence the need for cloud computing as it can provide stable and dependable services with the best systems that are in a good condition and providing good quality to the users [2].

The aim of this study was to establish the perceptions and attitudes of State enterprise's (Stats-SA) users regarding adopting cloud computing services. During literature review a gap was identified in terms of locally-relevant research on users' knowledge and perceptions regarding migrating from common IT infrastructure to cloud services. Due to the fact that the majority of previous studies were conducted in other countries with particular circumstances, they may not be entirely applicable to the situation in South African organisations. The study employed the technology acceptance model (TAM) to analyse user attitudes on the adoption of cloud services. Before offering suggestions on whether an organisation should implement cloud computing or not, this study first looked into the users' perspectives and attitudes concerning the adoption of cloud computing services. The study research questions: What are the perceptions and attitudes of users in the organisation towards cloud computing adoption? The secondary research questions are: 1. What are the user perception and attitude towards existing information technologies in the organisation ? 2. What are the challenges of the existing information technologies in the organisation? 3. What opportunities does cloud computing provide to the organisation? 4. What cloud computing service and deployment model may be appropriate for the organisation if any?

2. LITERATURE REVIEWS

This section reviews the literature and related research models, discusses the concepts, evolution, history and the importance of cloud computing and the related framework as well. The indication of providing computing as a service through networks ages back from the 1960's when the establishment of computing utilities turned into a powerful strength behind the key growth of the internet [2]. Allocating information technology infrastructure and connecting it via a network occurred during the 1980's with Application Service Provision (ASP) for example email services like Hotmail that emerged in the 1990s as a means to outsource applications as a service [3].

Controlling the on-demand delivery of massively scalable computing resources was accompanied by advancements in networking, as demonstrated by developments in grid computing, utility computing, and virtualisation on commodity hardware [4]. Exceedingly outsized data centres of commodity hardware initiated to be established by companies such as Google, Amazon, and Microsoft. This development of information technology infrastructure and the allocation of computing activity from separate individual computers and private data centres to big external public data centres accessible over the internet became well-known as cloud computing. This shift to the cloud is possibly extra precisely defined as a change to computing being provided by enormous pools of automated scalable computing resources and related applications [2].

The cloud computing term it might be new to the public, but it is slowly gaining attractiveness and acceptance gradually, it shapes to the Internet-based growth and use of technology where the cloud simplifies or signify the Internet [4]. It encompasses considerable technical infrastructure that users do not need to know or understand in any level of detail, they just connect to it and access the resources [5]. In principle, the cloud enables computer software and hardware resources to gain access to over the internet without the essential for any comprehensive, precise

knowledge of the infrastructure used to supply the resources, like a utility model. A utility model is connected to cloud computing, and it incorporates Web 2.0 and many other technology models that rely on the Internet to access services [6]. The services are available anywhere in the world, with the cloud serving as a single point of access for all user computing necessities [5]. Several modern technologies, including Grid computing, utility computing, and distributed computing resources, are used in cloud computing. Grid computing is the ancestor of cloud computing, and it serves as the foundation and infrastructural support for cloud computing. The evolution has been the outcome of a change in focus from an infrastructure that distributes storage and compute resources [6]. Evolution of cloud computing took a number years to fully unfold, the three technologies that will enable its virtualisation that hides the physical character of computing platform, multi-tenancy which is a single instance of application software serves multiple clients, web services that support interoperable machine to machine interaction over the network [7].

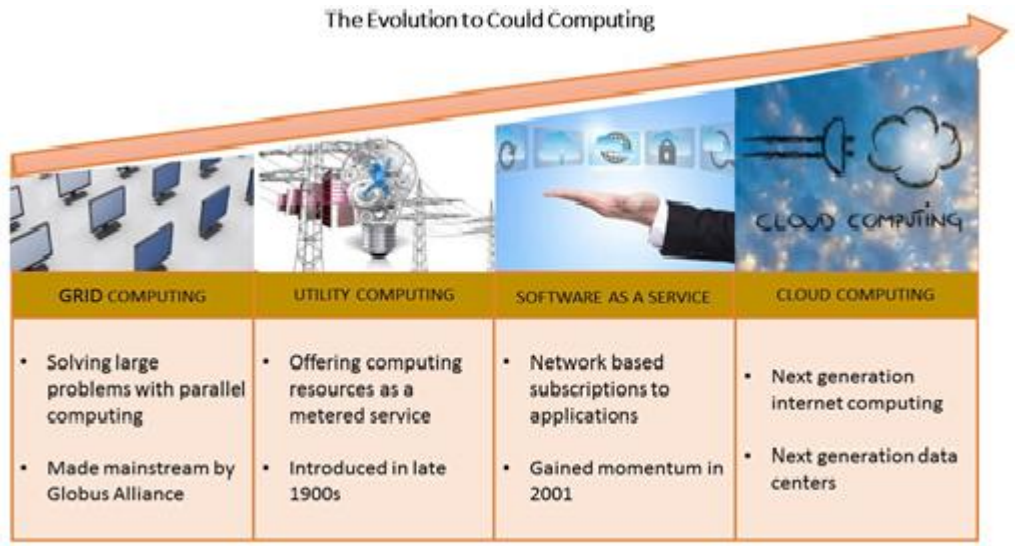

Figure 1: The Evolution of cloud computing [8].

The introduction of cloud computing represents an important change in the way information technology services are developed, deployed, scaled, updated, retained, and paid for. It is an improvement of parallel computing, infrastructure-as-a-service, platform-as-a-service, and software-as-a-service. Cloud computing promises to offer all the capabilities of existing information technology services while lowering the initial costs of computing [7]. It's an information technology service model where computing services are delivered on demand to customers over the network in a self-service fashion, independent of device and location.

Cloud computing is a hyped phenomenon in the information technology and business worlds that is expected to deliver benefits. Research by Mohlameane and Ruxwana [9] as an attempt to model the return on investment in using cloud computing in organisations revealed that cloud computing is a real technology option that is flexible, will help to respond to fast market conditions, and will assist in increasing focus on the primary business. Cloud computing is a specialised distributed computing paradigm that is hugely scalable. It is determined by cost-cutting, in which a collection of abstracted, virtualised, scalable, accomplished computing power, storage, platforms, and facilities are provided on request to outside customers over the internet. Three main drivers, including the emergence of multi-core design and contemporary supercomputers with multiple core processors, are currently driving the development and interest

in cloud computing [6]. These factors include the rapid decrease in hardware cost and rise in computing power.

2.1. Types of cloud computing development models

The delivery model to be used, which is the horizontal dimension of the framework, is the most important factor to take into account while designing a cloud strategy. According to Wyld, [8] there is diverse adoption strategy for cloud computing and the different models and definitions are described. Deployment models provide a cloud drive and how cloud is positioned. There are four diverse deployment models; public, private, hybrid and community cloud [10]. These models help to express how infrastructure will be deployed. Many cloud computing models depend on the financial pressures within an organisation, the nature and size of business that is acquiring cloud services. Much as cloud computing models may range from simple to more sophisticated ones, all models are built with resource brokering reason that proceeds into justification of the cost of resources, network connectivity, performance necessities, user geography, and flexibility [11].

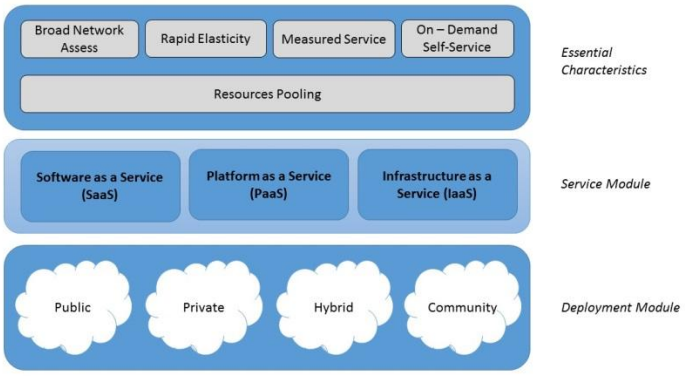

Figure 2: NIST Cloud computing model [12]

2.1.1. A private cloud

The cloud infrastructure in private cloud functions only for the organisation; it can be accomplished by the organisation itself or a third party. The private cloud can be present on premises or off premises. It is a set of hardware, networking, storage, services, applications and interface maintained and operated by an organisation for the use of its employees, partners and customers [13]. This is a model where the infrastructure is devoted to one organisation and is not shared with other organisations. The organisation itself or a rented location hosts the data center. Infrastructure is owned and completely within the organisation's control. Advantages of private clouds include improved cost and energy efficiency, increased control, stronger security, and increased privacy. Limitated scalability as a result of scarce resources, rigid pricing, and regional exclusivity of private clouds are drawbacks [12]. Private cloud is constructed on information technology assets owned by the organisation using the end output. The assets are contained in the organisation‘s own data centre, or housed in an external organisation‘s data centre facility. It is also known as co-location and the information technology continues with the property of the owning organisation, though the complete facility is made, operated and maintained by an external company. The same business that offers and uses cloud services is where the ownership of the cloud assets resides [11].

2.1.2. A public Cloud

The cloud infrastructure is reserved by the cloud service provider and happens in the premises of cloud provider. It is a set of hardware, networking, storage, applications and interface maintained by the third party. The cloud services are available to the general public or a sizable industry group on a pay-per-use basis. On-demand resources are assigned to users in the cloud, and resources are delivered dynamically over the internet. Small and medium enterprises benefit to great extent from using public clouds[14]. Location independence, cost-effectiveness, dependability, flexibility, utility-style pricing, and great scalability are advantages of public clouds. Disadvantages include low security and limited customisation. [3]. A public cloud is where the data centre facility, along with the application or the functionality provided, is all owned by external parties. This may be a compound arrangement. For example, a cloud provider may own the assets that are placed in another organisation's data centre facility. Though, any contractual agreement was amongst the end user organisation and the cloud service provider. Services in the public cloud can range from the freely available through to commercial offerings. The service provider retains ownership of the assets used to deliver cloud services [12].

2.1.3. A Hybrid Cloud

A hybrid cloud's cloud infrastructure is made up of two or more clouds (public, private, or community). Each of them lasts as a unique entity but they are related together by standardised or proprietary technology. This technology allows data and application compactness. Benefits of Hybrid cloud are scalability, flexibility, cost efficiency and security. Shortcomings are networking issues and security compliances. The public cloud service in a hybrid cloud can be leveraged to fulfil peak loads or to spread redundant data inside the cloud to attain great accessibility [13]. This can be attained by an exceptional installation of the hybrid cloud called virtual private cloud where resources of a service provider are clearly plotted into a consumer network by use of a network tunnel. It combines multiple structures of public and private cloud, as well as any combination of service providers and consumers and may also contain several service layers. All the functions are drawn together through a mix of private, shared public cloud systems [14].

2.1.4. Community cloud

With a community cloud, many organisations with related issues share the cloud infrastructure (e.g. compliance considerations, mission, policy, and security requirements). It is regularly accomplished by the organisations in the community or a third party and can be existent either on-premises or off-premises. Benefits of community clouds are that they are secure than public cloud and sharing of resources between several organisations. Drawbacks are that it is less secure than private cloud and obliges governing policies for administration [12].

2.2. Cloud computing service models

2.2.1. Platform as a Service (PaaS)

The platform providers in PaaS model a present middleware load and compute capabilities architecture that is typically organised for developers or sophisticated IT users. Providers can agree to offer a diversity of service products, configurable to changeable degrees by the users.

Examples include database, Web or application server software [12]. The cloud operator may offer more on top of the hardware, including the base operating systems or a stack of capabilities such as web server, database and runtime environment, will increasingly be used to identify those operators providing a distinct cloud platform such as Microsoft, Amazon EC2, Google App Engine [12]. Business Process Management is the centre of the enterprise Information Technology System, which in the predictable business process management driven enterprise usually involves bundles of software as well as upholding Information Technology infrastructure to challenge both business oriented process modelling and Information Technology centric process development, deployment and monitoring responsibilities [15].

2.2.2. Infrastructure as a Service (IaaS)

According to Bunkar & Rai [12] IaaS model is where the cloud users directly use Information Technology infrastructure such as processing, storage, networks, and extra necessary computing resources provided in the IaaS cloud. To address the rising resource demand from cloud customers, virtualisation is primarily employed in IaaS clouds to combine physical resources in an ad hoc manner. Setting up separate virtual computers is the fundamental step in virtualisation. Amazon is a prime example of IaaS. A consumption-based business model can be utilised to supply the service, for instance, by the instance-hour used, the gigabyte transferred, or as a fixed price for a virtual device with a predefined volume and configuration [15]. The network, usually the internet, is used to access the resources. Cloud services for infrastructure may also come with an operating system, either with or without fundamental system management features.

2.2.3. Software as a Service (SaaS)

According to Andrade [16], users of the cloud can publish their programs on a hosting environment that can be accessible across networks from a variety of clients by users of the apps, for instance web browsers and PDAs. Cloud users do not govern over the cloud infrastructure that often hires multi-tenancy system architecture. Specifically diverse cloud users applications are arranged in a single logical environment on the SaaS cloud to accomplish economies of scale and optimisation in relation of speed, security, availability, disaster recovery [16]. Examples of SaaS consist of SalesForce.com, Google Mail, Google Docs and so forth.

2.3. Cloud computing advantages

There are many advantages and advantages of implementing cloud computing for organisations, the cloud can decline costs and except money for both small and large enterprises because it compromises an outsourcing model which permits to lease resources and pay a fee only for the service they use, rather than constructing up in-house IT infrastructure. The preservation of IT resources and the renovations are accomplished by a third party, which permits organisations to hand over accountability and save money [10]. By consuming the cloud background in organisations, the amount of IT infrastructure resources, such as servers will be concentrated and as a result the total cost of energy consumption will be compact. Cloud computing agree to enterprises to run their applications with a minimum failure percentage. Lastly the elasticity of distributing computing services is the fundamental value that pushes or motivate organisations to migrate their IT system to the cloud [17].

2.3.1. Flexibility and storage

The "Cloud" is where files are kept when using cloud computing. Users no longer have to worry about document storage, which enables growth inside the company. Users can also access office files at any time and from any location. Even when users are not present at the same time or

location, they can still collaborate virtually. If an internet connection is available, many papers can be browsed at once [10].

2.3.2. Time saving

Cloud computing facilitates simple information access in addition to easy collaboration. How quickly Gmail, Yahoo Mail, and mail boxes in general may be accessed in this situation is an example of ease of access. Compared to the time it would take to download and install software, it is quick and simple [17].

2.3.3. Data Availability

One of the key requirements customers have for any software or computing system is data availability. Users frequently desire to move their data around. For instance, most people would carry around an eight or sixteen gigabyte memory chip that included their personal information, such as images. They can insert the memory chip into a camera and view or use the images whenever they need to view photos [18].

2.3.4. Efficiency

Cloud computing is an internet based technology where information is stored in servers and provided as on-demand service to the users. This is promising because the cloud infrastructure that entail of reliable services that simplify the creation of application accessible anywhere, with the cloud serving as a single point of access for the entire user's computing requirements. Due to the numerous advantages of cloud computing, many businesses are investing in the development of new platforms to draw users to these systems [18]. This enables economies of scale while decreasing expenses, a significant amount of hardware, and data centre facilities and technical staff are removed by sharing and exploiting the environment among multiple customers. Cloud services enable platform and device neutrality and make it simpler to quickly satisfy changing customer needs without the need to handle peak traffic. The programs are browser-based, so they can be used on almost any device and almost anywhere [2]. The management of the infrastructure, whether it be hardware or software, is made easier, which causes less issues for the information technology team. Also, programs that require a lot of storage are simpler to operate in a cloud environment than they are when utilised by the business alone. However, at the user level, all you really need is a basic web browser with internet access [19].

2.3.5. Cost reduction is the main advantage.

Chibuye & Phiri [20] indicate that cloud computing will discontinue the illegal reproduction and distribution of software. It is stated that, with cloud computing a fee is made for only software used. For instance, some cloud-based software is free; most SaaS solutions have a pay-as-you-go pricing model rather than requiring a substantial upfront commitment. These pricing structures enable customers to only pay for the services they really use, freeing up resources like time and money for other, more crucial corporate operations. For instance, the Sales force Company charges between $5 and $17.50 USD per month for its services [14]. The expense of purchasing server hardware and purchasing software licenses will decrease with the adoption of cloud computing. As a result, cloud computing is more affordable and time-efficient for businesses because there is no need to purchase, track, and manage pricey software.

2.4. Cloud computing disadvantages

The biggest concerns about cloud computing are security and privacy. Handing over of crucial confidential data to another company scares some people. Due to their inability to keep their company's information under lock and key, corporate users will undoubtedly be somewhat hesitant to use cloud services [19]. However, companies that propose cloud computing services debate to this saying that they live and die by their reputations. Customers pay these companies as they are consistent in security measures. Otherwise, they would lose their clients. It's their consideration to supply greatest services to their clients [7].

2.4.1. Reliability is an issue

Cloud computing has significant implications for the privacy of personal information as well as for the confidentiality of business and government information. The terms of service and privacy policy set forth by the cloud provider, among other things like the POPI Act, affect how much a user's privacy and confidentiality risks vary [13]. When a user reveals information to a cloud provider, there may be changes to the types of information, some categories of cloud computing users, privacy and confidentiality rights, obligations, and status. The location of information in the cloud may have significant effects on the privacy and confidentiality protections of information and on the privacy obligations of those who processes or stores the information. Information in the cloud may have extra one legal site at the equivalent time with different legal penalties [19].

2.5. Related work

Few studies have addressed the issue of switching behaviour from traditional information technology services to cloud services from the user's perspective [15], [10], [17]. This study seeks to identify switching enablers and inhibitors from the two factor theory of technology usage which is adapted from Herzberg's theory of motivation [21]. Switching to cloud services is a decision to reject old technology and adopt new technology. The two predictors (enablers and inhibitors) would be relevant factors in determining end user inability to switch unless cloud computing is able to offer some advantages over their incumbent Information Technology (IT) infrastructure [15]. The two factor theory provides overall theoretical structure of this model which is accompanied with observation and insights from IT usage and consumer switching literature.

Scholtz, et al. [2] investigated how prevalent these elements are in the public sector of developing countries like South Africa. A thorough literature study identified numerous adoption-related criteria, and using a survey approach, they were empirically validated. The survey was completed by 51 respondents from 40 South African public sector organisations. The results showed that most respondents expressed concern about the accessibility and privacy of data. Adoption methods for cloud computing deployments, as well as the availability of usage guidelines and regulatory requirements in organisations, were the environmental aspects that respondents felt were most important [2].

According to Polyviou & Pouloudi [22] government bodies are in search of ways to decrease their costs and increase the quality of the services provided to the citizens. In the last 15 years there has been an on-going debate for reforming the public sector by transforming its structures through the usage of cloud computing and in this manner the service provided by public sector are projected to be more resourceful and operative. A relatively new computing paradigm, cloud

computing is considered to be bringing major changes in the information technology service provisioning field. The public sector is anticipated to significantly benefit from the use of cloud computing as it can experience cost reduction, minimisation of information technology management overheads, increased employee relationship, create greater opportunity to transform and other benefits [22].

By taking into account the technological, organisational, and environmental aspects of cloud adoption, Polyviou & Pouloudi [22] suggested leaning-to-the-light on decisions regarding cloud adoption in the public sector. Two research questions are also emphasised in it: 1) What are the factors that influence the adoption of cloud computing in the public sector? 2) What are the challenges that arise when it comes to making decisions about cloud adoption in the public sector? How could they be overcome and contributed to by improving our understanding of the importance of adopting traditional information systems and increasing the adoption of cloud computing in the public sector?. The research was exploratory, directing at representing the views on adopting cloud services in the public sector in designated European countries [22]. The criteria for selecting the participants were to have a good level of knowledge and experience on the targeted subject.

Liang, et al. [23] studied the drivers and barriers of SaaS adoption in the South Korean market using Herzberg's hygiene factors and motivators. The reduction of costs, ease of maintenance and possible economies of scale were the three most important factors found to have complete influence on the adoption. Lack of self-assurance in the safety and legal issues were among the obstacles with the greatest negative influence. Additionally, there are cloud computing adoption empirical studies that are founded on the grouping of other theoretical frameworks [23]. By merging three theoretical foundations, theory of planned behavior, transaction cost theory, and resource-based view of the organisation, the study by Cho, et al. [4] produced a SaaS adoption model. It has concluded that social influence, adoption and uncertainty and application value are the most consistent SaaS adoption drives across all application types [4].

3. THEORETICAL FRAMEWORK

According to Davis [24] there are elements influencing user perception and attitudes of cloud computing. Technology Acceptance Model was used to observe the acceptance of cloud computing. Technology acceptance model take part in particular features such as availability, reliability, liability, access and security. Perceived usefulness and perceived ease of use are also projected variables which together impact the intention. Perceived usefulness highpoints the capability of being used beneficially, how users perceive cloud computing as being useful and advantageous compared with another computing service. The term "perceived ease of use" relates to the extent to which a user thinks utilising a particular technology will be simple. According to studies on technology acceptability, perceived usefulness and perceived ease of use are positively correlated [25]. Technology Acceptance Model, which is derived from the study of social psychology through the theory of reasoned action and the theory of diffusion of innovation, has a strong projection capability in technology acceptance investigations. Perceived ease of use, perceived usefulness, behavioural intention and attitude to use are the concepts utilised to examine the technology adoption paradigm. According to the technology acceptance paradigm, two beliefs affect people's intentions to utilise information technology: perceived usefulness and perceived ease of use. As previous note, the perceived usefulness is well-defined as the degree to which a person believes that using information technology will improve their performance and perceived ease of use is defined as the degree to which a person believes that using cloud computing will be free of effort [26].

The perceived ease of use: this includes attributes like: Personal factors that may include, age, academic qualification and experience with networking technology. Technology; users may find new technology with improved-on and friendly user interfaces easier to use than the old technology. Cloud computing suppliers, some users may be well competent with a particular supplier's equipment or technology than others.

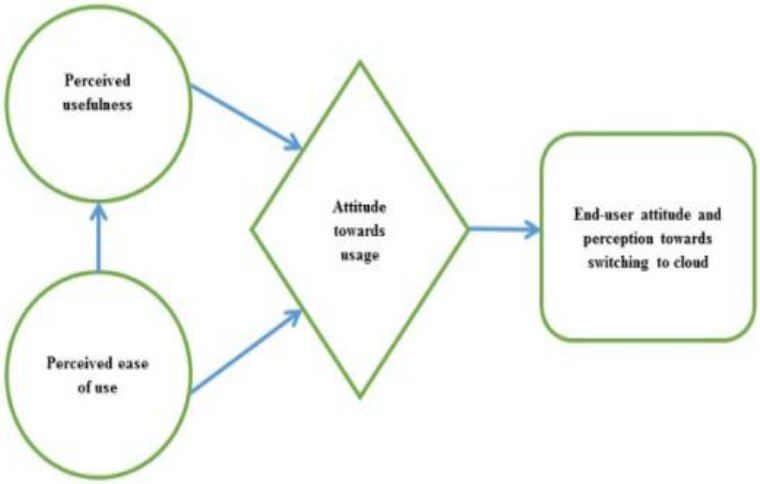

Figure 3: Technology Acceptance Model (Davis, 1989)

Cloud computing offers many benefits for enterprises such as cost reduction, flexibility and green IT. The decision of an organisation is still influenced by the possibility of moving an existing system to the cloud. Therefore this research reveals how to encourage organisations to adopt cloud computing services and discover the aspects that may impact an organisation's intention to adopt cloud computing [23].

Currently, a few studies have been conducted on user's attitudes and perceptions in relation to switching to cloud computing. Furthermost of the studies conducted were approved out in countries with differing conditions to South Africa, i.e. developed countries such as Korea and industrialised, but developing countries such as India [27]. Users' attitudes and perceptions will indicate to the researcher if they are prepared and accept to switch to the cloud computing platform, there are only few study in this area therefore technology acceptance model was used.

4. RESEARCH METHOD

For the researcher to get familiar with the topic under study, several literatures were reviewed. In addition to this literature review, the researcher also conducted focus group discussions with the statisticians before the main survey was carried out. The aim of this research study was to find out the user's perceptions and attitudes towards the adoption of cloud computing, a case study approach was used at Stats-SA. The researcher used on questionnaires to rich a wider representation of the respondents. Therefore, quantitative and qualitative methods were used. Grounded on the research problem statement, primary and sub-objectives were articulated for this study to answer the main research question. The multi-method approach was chosen since both qualitative

and quantitative methods were proven to be the most effective for answering the research questions. The drive was that the use of qualitative data results to support quantitative findings was found necessary in understanding the adoption of cloud computing in Statistics SA [28].

4.1. Questionnaires

The researcher administer questionnaires to a sample of a population to learn about their attitudes and perceptions on adoption of cloud computing. Researchers make a crucial assumption before conducting a survey of a group of people: that a characteristic or belief may be adequately characterised or assessed by self-reporting [28]. Researchers completely rely on the participants' honesty and correctness while utilising a questionnaire to collect data. A questionnaire often has a number of questions with predetermined response categories, along with a few open-ended inquiries. The questions were checked for bias, sequence, clarity, and face-validity. Questionnaires were usually pre-tested on small groups to determine their usefulness and, perhaps, reliability. In this study, questionnaires were distributed to 80 participants at Statistics SA, (management, ICT staff and end-users)

A 5-point Likert-type was used to render responses in the questionnaire. Participants received questionnaires one per unit, had time to complete them, and were instructed to email the completed forms back to the researcher. Participants had a due date to send back the completed questionnaires but only few returned them on the due date. The questionnaires were sent by email. Out of the 80 questionnaires sent out, 55 with responses were received. Returned questionnaires were captured and analysed using statistical packages for social sciences (SPSS).

4.2. Interviews

In this study, the respondents were questioned face-to-face, either in a structured format where the interviewer pre-arranges the questions and each respondent is asked the same question, in a semi structured format where the interviewer allows one question's response to prompt additional questions up to a certain point, or in an open-ended or non-structured format where the preceding questions are prompted by the interviewee's responses [29]. The select of the interview participants for this study was grounded on the people that have understanding and awareness of cloud computing (purposive sampling). Even though they did not have a basic required experiment on it, they must have a basic understanding of cloud computing. The selected 10 interview participants included: Deputy Director General: ICT, Executive Manager: ICT, Director: End User Support, Director: Network supports, Deputy Director: End User Support, Deputy Director: Risk and Statisticians from different Statistics units. The interviewer secured an appointment with participants by sending them email for meeting request. Participants confirmed their availability by accepting the meeting request. The participants were informed of the purpose of the interview, the study objective and what is anticipated from them. For the aim of reliable and accurate study results, participants were urged to be as honest as they could. Interviews were conducted in English to all participants face to face. Participants were asked the permission if the interview could be recorded. All the participants permitted recording of the interview sessions, the data was later transcribed [30]. Participants were interviewed on different days which took 20 minutes to conduct the interviews.

4.3. Sampling

This study followed a non-probability judgment sampling whereby the selected participants followed a certain criteria [30]. The current study targeted a group of people who have information or expected to be more knowledgeable in the field of ICT service delivery. The

research purpose was find out the users' attitude and perceptions towards the adoption of cloud computing and the researcher had to involve those people who were thought to be of relevance to the study. Therefore, the ICT management, staff and the Statisticians who use ICT services on a daily basis to do their work were selected.

The research participants consisted of various stakeholders in the Stats-SA. The Information Communication Technology (ICT) Management, Information Technology staff and Statisticians were requested to participate in the survey. The stakeholders include ICT Deputy Director General, ICT Executive Manager, Networks Manager, End user Support Manager, Risk Manager, System Applications Manager and the Information Communication Technology staff which include the Local Area Network technicians, Service Desk Operators, Network Administrators, System Analyst and Testers, Security Specialists. The six sections which participated were from population, Social Statistics, Financial Statistics, Labour Statistics, Census, Economic and Statistics. A total 55 participants took part in this study, 10 participants from the 55 also took part in the interviews.

5. ETHICAL CONSIDERATIONS

Before gathering data, ethical approval was obtained from the Tshwane University of Technology Ethics Committee to ensure that ethics were taken into consideration. A permission to conduct the study was sought from Stats-SA. Additionally, the following measures were undertaken by the researcher prior to conducting an interviews and questionnaire distribution: Participation in the study was on voluntary basis and participants were informed that they had a choice to participate or not and will not be rewarded for participating and the researcher was honest and opens with the respondents.

Respondents were requested to read and understand the content of the information leaflet which describes ethical standards governing research and could help them decide whether to participate or not. The animosity and privacy of participants cover for sensitive information from the participants was also ensured. Information gathered from participants was kept private and solely utilised for academic research. This means that access to participant's records were strictly restricted to the researcher and the supervisors of the study. Data and personal information are kept and stored for 3 years in a confidential format which was only accessible to the researcher and the supervisors.

6. RESEARCH RESULTS

This section presents the results of the study. The section also discusses the out comes attained through the data collection tools using questionnaires and interviews. The purpose of using these data collection tools was to response the main and sub research questions. The results of the analysis are used answer the research questions. Data analysis was completed in two phases in order to achieve the study objective. Phase one was quantitative data collection using closed-ended questionnaire and qualitative data collection using both semi-structured interviews. The survey's five-point Likert scales ranged from 1 to 5, with 5 being the strongest agreement. The descriptive analysis is used to indicate how respondents answered the questions relating to cloud computing adoption. The variability was also measured using the standard deviation. It shows how much variation there is from the "average" (mean). A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data is spread out over a large range of values (Andrade, 2020).

6.1. Demographic Data of the respondents

A questionnaire was distributed to 80 participants but only 55 participants completed the questionnaires. The participants included ICT Managements, ICT staff and Statisticians.

6.1.1. Participants

Most of the participants were ICT staff and ICT Managers. These groups were more likely to understand cloud computing and the ICT Management that take the decision to migrate to the cloud platform. ICT Management included the End User Support, Networking, SAN, Risk Management, Business Analysis, Senior Managers, IT Executive and IT Deputy Director General and the ICT staff included the IT Technicians, System Analyst, Security Specialist, Developers, Service Desk Operators and Network Administrators.

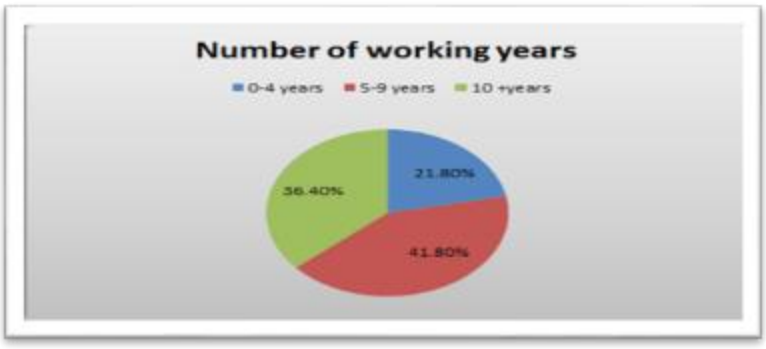

Figure 4: Number of working years

Participant length of service was categorised into three groups namely, 0 to 4 years, 5 to 9 years, and 10+ years. High percentages (41.8%) of participants are within 5 to 9 years in the organisation. Less (36.4%) participants are 10+ years in the organisation whereas a lesser (21.8%) are within 0-4 years in the organisation. The majority of the participants were between 5 to 9 years in the organisation which are more to be expected to understand the Stats-SA IT environment.

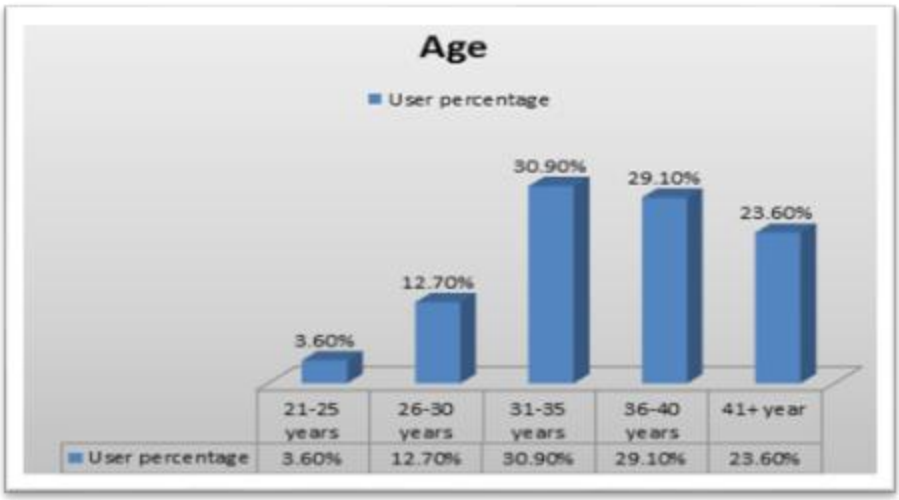

Figure 5: Age of respondents

This indicates that the age group between 31-35 years are aware of cloud computing 30.90% of participants are aware of cloud computing. 36 - 40 years participants are also aware of cloud computing, 29.1 % have used Gmail, Dropbox and ICloud. Age group 41+ are aware of cloud computing and only 23.6 % participated. Age group 26-30 only participated and the percentage is 12.7%. The lowest percentage is on 21-25 age group 3.6 %.

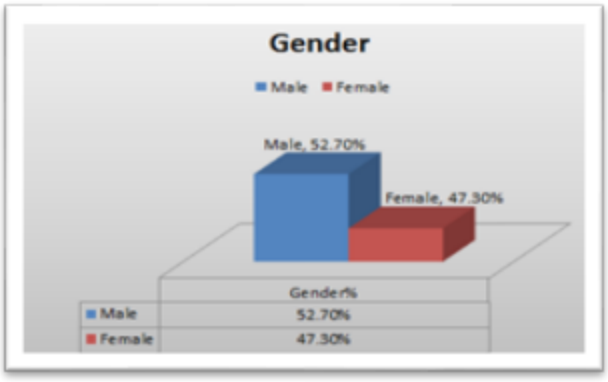

Figure 6: Gender of respondents

The majority of the respondent are males, 52.7% and 47.3 % of females responded to the questionnaire.

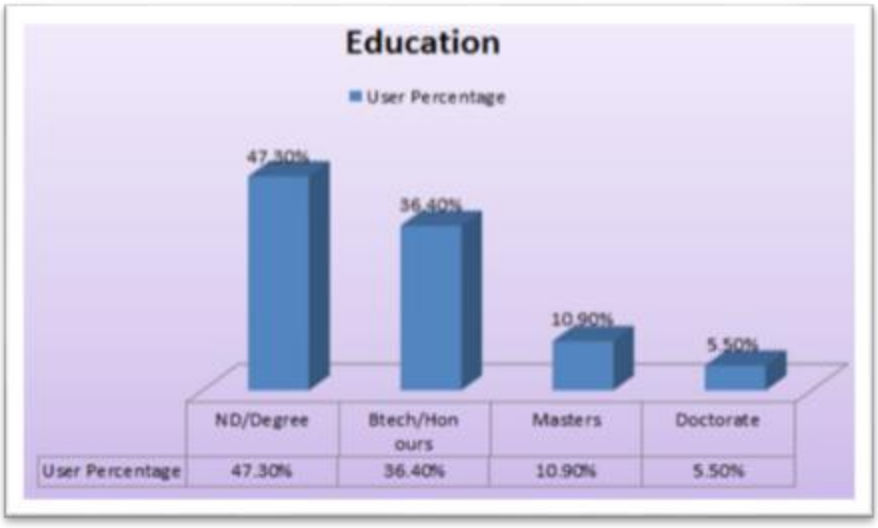

Figure 7: Education levels of respondents

The highest education is B-Tech and Honours as a result that might have contributed to the alertness of cloud computing. The overall implication is that the users are aware of cloud computing but they do not guarantee the safety and security on the adoption of cloud computing in the South African Stats-SA.

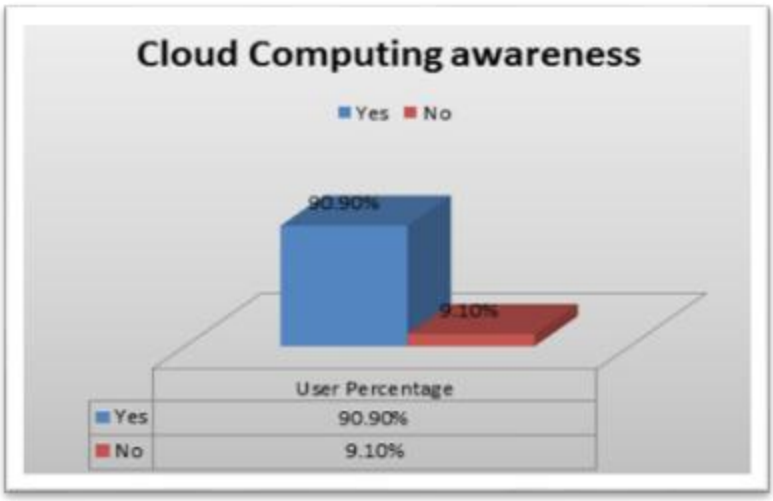

Figure 8: Cloud computing awareness

figure 8 indicate that most participants demonstrates that only 90.9 % of the respondents had overheard of cloud computing and they have used applications like Google Docs, iCloud, Dropbox and Gmail applications, this implies that cloud computing responsiveness is satisfactory among the employees in Stats-SA which include the ICT Management, staff and the Statisticians. 89.1% of users have access to the computers equipment. Participants were required to indicate their areas of employment. Some questionnaires returned were rejected as unusable because of incomplete data. Statistical package for social scientists SPSS was used for data analysis

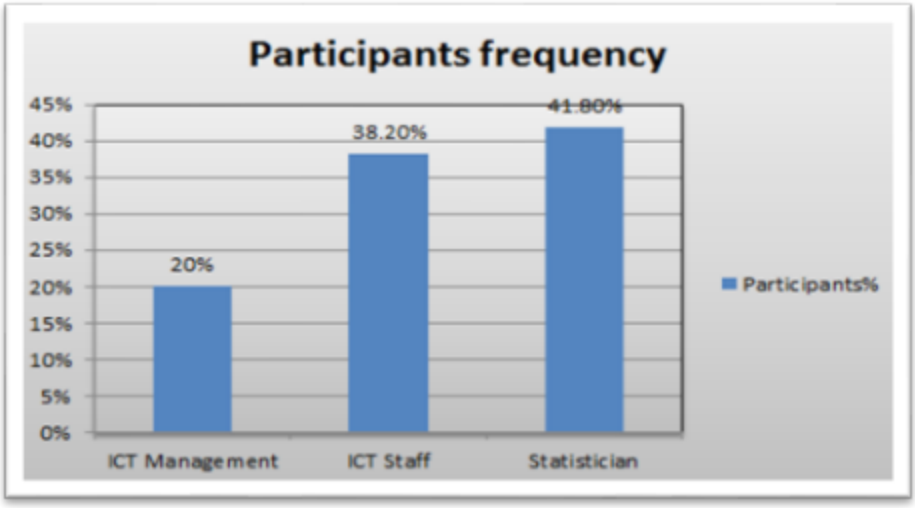

Figure 9: Demography of the Respondent

6.2. Results of research questionnaires

The questionnaire was used to report each research question resulting from the main research questions. The general results of the questionnaire propose that there is requirement for cloud computing adoption to save ICT service costs. The following key implementation is the availability of the infrastructure, top management support, performance and cost and resource efficiency. All of the information gathered from respondents was analysed and presented in this section as graphs for simple comprehension.

6.2.1. ICT Management staff perceptions

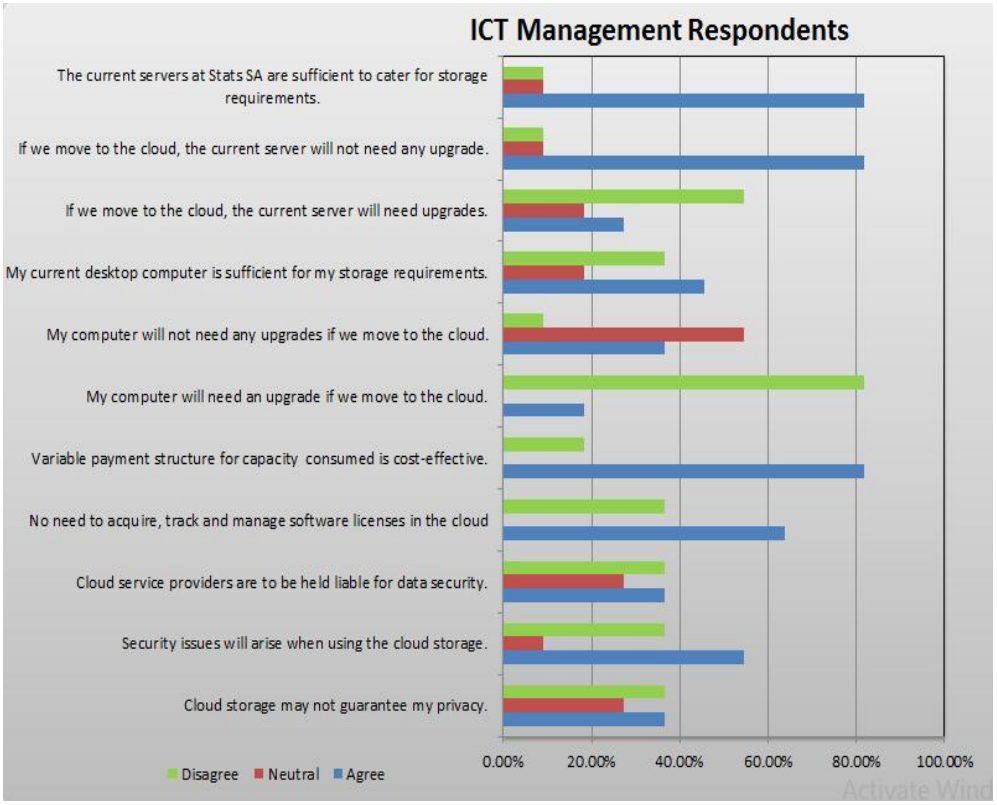

Figure 10: User perceptions and attitudes of ICT management staff on cloud computing adoption

The findings revealed that 36.4% of the respondents agreed that the current servers are sufficient to cater for storage requirements. According to the results 36.4% of the respondent disagreed that the storage requirements are not sufficient, a 27.3% of the respondents were neutral. It shows that when compared to the traditional way of buying of hardware/software, installations and deployment cloud computing could be understood as easy and simple to use. The respondent's results has shown that 54.6% agree that if they migrate to the cloud platform the current servers will not need any upgrade and 36.4% disagree that the servers will require no updates when migrating to the cloud. 9.1% are neutral which is created from neither agree nor disagree responses.

A high proportion of 36.4% agree that current desktops storage requirement is sufficient and 36.4% disagree that the servers will require upgrade when moving to the cloud. 27.3% are neutral which is created from neither agree nor disagree responses. The results revealed that 63.7% of the respondents agree that the current desktop computer is sufficient for storage requirements and 36.4% disagree that the storage requirements for the desktops is adequate. Largely, most participants did not experiment Cloud Computing technology and any of its service layers as it is not implemented at Statistic SA. It is for this intention that this research study investigates the attitude and perception towards the adoption of Cloud Computing at Statistics SA.

A high proportion of 81.8% agree that the current desktop computer does not have sufficient storage requirements and 18.2% respondents disagree that the desktop does not have sufficient storage. The results revealed that 36.4% agree that cloud will reduce the costs and 9.1% do not agree that the cloud will reduce the cost. A high promotion of 54.5% is neutral. As a result it can be determined that cloud computing is perceived to reduce cost. The department will not pay for

services not used and will not pay for migration cost. The department will only spend money on hosting or services based on the deployment and cloud service model. The results revealed that a 45.5% of the respondents agree that there is no need to acquire, track and manage software licenses if we move to the cloud and 36.4% do not agree that software licenses can be managed and tracked if they migrate to the cloud. 18.2% are neutral that software licenses can be managed on the cloud platform.

According to the results 27.3% agree that it is essential that cloud service providers are to be held liable for data security and most respondents on 54.6% disagreed that cloud service providers must be held accountable for data security. 18.2% of the respondents are neutral. Promoters for cloud computing have widely recognised it to have a high power of helping to maintain an affordable and effective business steadiness. Though, cloud computing is deployed with improved reliability and availability merged in the Service Level Agreements (SLAs) as compared to the traditional in-house IT services.

High proportions (81.9%) of respondents agree that security issues will arise when using the cloud storage and 9.1% disagree that the security issues will arise when using the cloud storage. 9.1% are neutral. Findings showed that due to the nature or sensitivity of data in Statistics SA consider private cloud more suitable to address the needs of the department. The department will require assessing the type of data and what cloud delivery model will be applicable. The results have shown that 81.9% of the respondents agree that cloud storage may not guarantee privacy and 9.1% disagree that cloud may not guarantee privacy. 9.1% of the respondents are neutral.

6.2.2. IT personnel/staff members

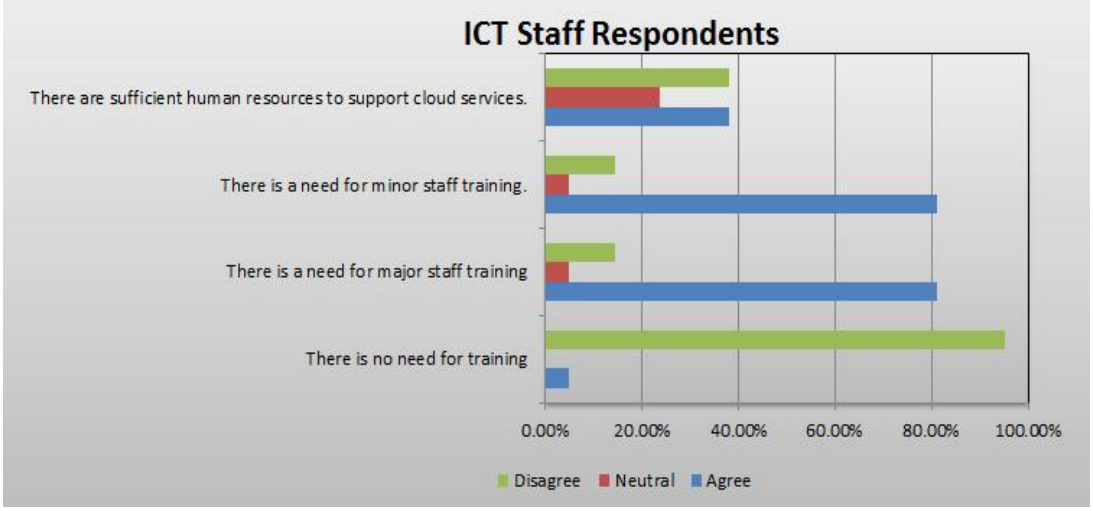

Figure 11: User perceptions and attitudes of ICT staff on cloud computing adoption

The results revealed that 38.1% of the respondents agree that there is sufficient human resource to support the cloud services and 38.1% of respondents disagree that there is adequate human resources to support the cloud. 23.8% of the respondents are neutral. A high proportion of respondents (81%) agree that there is a need for minor staff training and 14.3% disagree that there is a need for minor staff training. Finding revealed that 4.8 % of the respondents are neutral about the statement. A high proportion of respondents (81%) agree that there is a need for major staff training and 14.3% disagree that there is a need for major staff training. 4.8% of the respondents are neutral about the statement. The findings showed that a low percentage of 4.8%

of respondents agree that there is no need for training and a significant percentage of 95.2% of respondents disagree.

6.2.3. Statisticians

The following results are from the statisticians in response to the perceived ease-of-use and usefulness of cloud computing.

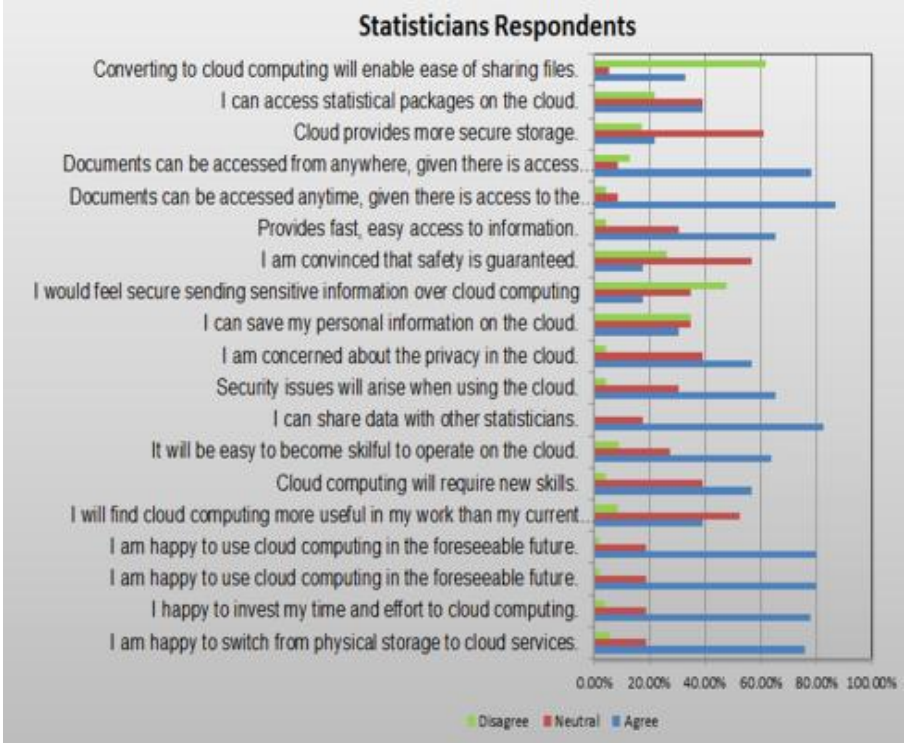

Figure 12: User perceptions and attitudes of statistics staff on cloud computing adoption

The finding has shown that 32.8% of the respondents agree that converting to cloud computing will enable ease of sharing files and 61.8% disagree that converting to cloud computing will enable ease of sharing files. A 5.5% of the respondents are neutral about the statement. A percentage of 39.1% agree that they can access statistical packages on the cloud and 21.7% of the respondents disagree that they can access statistical packages on the cloud. A percentage of 39.1% are neutral. Findings revealed that a 21.7% of the respondents agree that cloud provides more secure storage and 17.3% of the respondents disagree that cloud provides more secure storage. A high proportion of 60.9% of the respondents are neutral about the statement.

A high proportion of the respondents (78.2%) agree that documents can be accessed from anywhere, given there is access to the internet and a 13% of the respondents disagree that documents can be accessed from anywhere, given there is access to the internet. A percentage of 8.7% are neutral about the statement. A high proportion of respondents (87%) agree that documents can be accessed anytime, given there is access to the internet and 4.3% of the respondents disagree documents can be accessed anytime, given there is access to the internet**.** A percentage of 8.7% are neutral about the statement.

The results revealed that 62.5% of the respondents agree that cloud computing provides fast, easy access to information and 4.3% of the respondents disagree that cloud computing provides fast, easy access to information. A percentage of 30.4% are neutral. The results revealed that 17.4% of

the respondents agree that they are convinced that safety is guaranteed on the cloud platform and 26.1% disagree that they are convinced that safety is guaranteed. A high proportion of 56.5% of the respondents are neutral. A 17.4% of the respondents revealed that they would feel secure sending sensitive information over cloud computing and 47.8% of the respondents would feel secure sending sensitive information over cloud computing. A percentage of 34.8% are neutral about the statement.

The results revealed that 30.4% of the respondents agree that they can save their personal information on the cloud platform and 34.8% disagree that they can save their personal information on the cloud. A percentage of 34.8% is neutral about the statement. An overwhelming majority of respondents 56.5% agree that they are concerned about the privacy in the cloud, while only 4.3% of respondents disagree. A 39.1% of the respondents are neutral about the statement.

A big proportion (65%) of the respondents agrees that security issues will arise when using the cloud and 4.3% of the respondents disagree that security issues will arise when using the cloud. A 30.4% of the respondents are neutral about the statement. The results revealed that a big proportion of 82.6% of the respondents agree that security issues will arise when using the cloud and 0% disagree that security issues will arise when using the cloud. A 17.4% of the respondents are neutral. The results revealed that 63.6% of the respondents agree that it will be easy to become skilful to operate on the cloud and that 9% disagree that it will be easy to become skilful to operate on the cloud. A 27.3% of the respondents are neutral about the statement.

A 56.5% of the respondents agree that cloud computing will require new skills and 14.3% disagree that Cloud computing will require new skills**.** A 39.1% of the respondents are neutral that cloud computing will require new skills**.** The results revealed that a 39.1% of the respondents agree that they would find cloud computing more useful in their work than the current network and 8.7% of the respondent disagree that they would find cloud computing more useful in their work than the current network

According to the results, a large majority of respondents (79.6%) say they are glad to use cloud computing in the near future, while 1.9% of respondents say they are not as satisfied with it. 18.5% of those surveyed expressed no opinion. It is discovered that 77.8% of respondents concur that they are delighted to devote time and effort to cloud computing, whereas 3.8% of respondents disagree. An 18.5% of the respondents are neutral about the statement. A high proportion of the respondents (75.9) agree that they are happy to switch from physical storage to cloud services and 5.6% disagree that they are happy to switch from physical storage to cloud services. An 18.5% of the respondents are neutral about the statement.

6.3. Qualitative results

Interviews were used to collect data and the purpose of qualitative analysis is to validate quantitative results in answering the primary and sub research questions. The qualitative results were crucial in providing an answer to the why issue, which the quantitative results from the interviews were unable to do.

6.3.1. Interview results

Interviews were conducted to five ICT Management officials and five Statisticians. The ICT Management were selected to elaborate and validate the questionnaire as they will make a decision if the Statistics SA migrate to cloud computing and Statisticians were also questioned to participate on the qualitative because they are the key primary users of statistical packages that

might also be accessed on the cloud platform. A qualitative analysis is used to get a deeper understanding of some of the questions answered in the questionnaire.

Table 1: Interview participants

Role	Number of participants	Occupation
ICT Managers	5	Deputy Director General: ICT Executive Manager: ICT Director: End User Support Director: Networks Deputy Director: End user Support
Statisticians	5	Population Statistics Social Statistics Labour Statistics Census Economic Statistics

Semi-structured interviews were steered using arranged questions. Participants were encouraged to be truthful, open and comment on the overall interview. Outcomes of the interviews to answer research question are accessible as follows: Based on the primary research question: What are users' attitudes and perceptions at Stats-SA about moving toward cloud computing?

The interview general outcomes from the ICT Management exposed that the current storage capacity is sufficient and they trust that the cloud computing is cost effective than the physical infrastructure. Majority of the participants consider that cloud computing can provide better benefits. The outcomes from Statisticians indicate that they are willing to migrate to the cloud as long there is internet connection as it will offer benefits of sharing files and statistical packages from the cloud. Cloud Computing security is known as a fear.

7. DISCUSSION OF RESULTS

This section discusses the study results. The findings from testing the hypotheses are evaluated in light of attitudes and beliefs surrounding cloud computing adoption. The findings are also discussed in regard to the study's predetermined research questions and how the goals were met. It also presents conclusions and recommendations. This study's key objective was to find out users' perceptions and attitudes towards the adoption of cloud computing in Stats-SA and to define significant factors that would be liable to influence users' acceptance of cloud computing services and to explore factors that may discourage users from embracing cloud computing.

The results indicated that the storage capacity can always be increased but in the future cloud computing might also be the solution and from the literature cloud computing is a specialised distributed computing paradigm, it is hugely scalable. It is determined by economies of scale, in which a group of abstracted, virtualised, dynamically scalable, managed computing power, storage, platforms and services are provided on request to external customers over the internet. The participant trust that cloud computing is more effective than the physical infrastructure. Numerous researchers specified that presently there are three primary influences subsidising to the flow and interest in cloud computing, rapid reduction in hardware cost and growth in computing power, and increase in computing power and storage capacity, and the initiation of multi-core design and modem supercomputers consisting of several core processors (Mhlanga *et al.*, 2019).

The findings demonstrate that cloud computing privacy is a problem, that the technology is new, that security research is still in its early stages of implementation, which the department does not have complete control over the cloud, and that security is still a problem. Sensitive data must not be compromised. It will also depend on the configuration of the cloud. The literature pointed out that a user's privacy and confidentiality risks vary significantly with the terms of service and privacy policy established by the cloud provider. (For example, POPI Act). Handing over of vital confidential data to the cloud contribute sun certainties to some individuals although, as already, companies offering cloud computing services debate to this say that they live and die by their reputations and that it is their attention to deliver best services to their clients.

8. RECOMMENDATIONS AND CONCLUSIONS

One of the research objective is to recommend appropriate cloud computing service and deployment model for at Stats-SA if any. To accomplish the stated objectives, it was essential to gain an in depth understanding of the phenomena studied in an actual existence environment, thus the research philosophy within triangulation method was followed where questionnaires and interview were utilised. A Case Study Research Strategy was implemented and used to understand the attitude and perceptions about the phenomena investigated in this study. The research objectives were met as the users have defined their perceptions and attitude towards the adoption of cloud computing and a questionnaire was directed to the respondents to complete, qualitative and quantitative methods were used to analyse the factors. Quantitative method used questionnaire while qualitative method used interviews for participants to elaborate.

The initial point elaborated a detailed literature study of diverse characteristics of Cloud Computing adoption, types of cloud platforms, history of cloud computing, the importance of cloud computing, advantages and disadvantages of cloud computing, theories of cloud computing and theoretical framework. The findings from both the qualitative and quantitative data were then analysed to obtain the users 'attitude and perception of the users towards switching to the cloud platform. Based on the study results from various data collection instruments revealed that the perceived ease of use which include the personal factors that may include age, academic qualifications and experience with networking technology, users find new technology with improved on and user friendly. Minority of the users indicated that the server storage is not enough as it always runs out of the space and cloud computing platform is more effective as you pay for what you request and the most attractive benefit of Cloud Computing is cost saving.

In support to this finding, it showed that majority (50%) of participants perceives Cloud Computing as a cost decrease method for ICT services. It was also shown that the questionnaire findings and interview participants also highlighted that Cloud Computing have the capacity of decreasing ICT service costs. The findings reveal that participants are concerned about security. It is also indicated that security issues will always arise whether the users migrate to the cloud platform or remain working on the physical infrastructure. Cloud technology is still new and research is still conducted on security.

Perceived usefulness includes the quality of the services provided, satisfaction of users, expected benefits. The findings revealed that the majority of the participants are content to share files if internet connectivity is available and most of the Statistician participant agrees that they can share statistical packages on the cloud if there is a connection of internet and software is provided as a service. The study findings indicate that participants agree that documents can be accessed anywhere, anytime as long there is internet access.

Majority of participants believe cloud computing represents a new era in computing. How we all interact with computing resources and how computing power is acquired and maintained is quickly changing thanks to the cloud-based model. There is a need for education on cloud computing and its possibilities among those in positions of policymaking. Analyse the organisation's actual IT usage and the potential replacement or augmentation of current IT capacity with cloud-based storage, applications, and computing power.

The study was supported with a purpose to define the applicability of the TAM in cloud computing adoption by looking into the user's intentions in accordance with factors like perceived usefulness, perceived ease of use and the attitude towards the use. The results showed that perceived ease of use had considerable effect on the attitude, perceptions and intention towards the usage and perceived ease of use also had important result on the perceived usefulness. More over the users anticipate the usefulness for cloud computing technology and the study was a step towards examining the user's perceptions and attitude of using cloud computing (Yuvaraj, 2014).

9. CONTRIBUTIONS AND LIMITATIONS

It is marked that this research made an important support by exploring the perceptions and attitude of users towards the adoption of cloud of cloud computing, particularly in a developing country such as South Africa. The study contributed to cloud computing literature. In addition, the study is expected to help public organisations in particular to make a well-versed result in the background of cloud computing. According to the study's findings, public organisations in developing nations may be in a position to make well-informed decisions on whether to use cloud computing as a replacement for traditional computing. This research encountered some limitations. First, it must be acknowledged that this was a research report of lesser (limited) scope. Secondly, the study boundary was limited to Stats-SA. Third, some of the respondents for interviews mostly were unreachable to answer the interview questions.

REFERENCES

[1] Statistics South Africa (Stats-SA). 2016. Mission and Vision [Online]. Available from: http://www.statssa.gov.za/?page_id=560

[2] Scholtz, B., Govender, J. and Gomez, J.M., 2016. Technical and environmental factors affecting cloud computing adoption in the South African public sector.

[3] Rani, B.K., Rani, B.P. and Babu, A.V., 2015. Cloud computing and inter-clouds–types, topologies and research issues. Procedia Computer Science, 50, pp.24-29.

[4] Cho, S., Hwang, S., Shin, W., Kim, N. and In, H.P., 2021. Design of military service framework for enabling migration to military SaaS cloud environment. Electronics, 10(5), p.572.

[5] KIM, J.-M., JEONG, H.-Y., CHO, I., KANG, S.M. & PARK, J.H. 2014. A secure smart-work service model based OpenStack for Cloud computing. Cluster Computing, 17(3): 691- 702.

[6] Mhlanga, S.T., Chiyangwa, T.B., Lall, M. and Ojo, S., 2019, December. A hybrid-based architecture for web service selection. In 2019 IEEE International Conference on Engineering, Technology and Education (TALE) (pp. 1-8). IEEE.

[7] Maqueira-Marín, J.M., Bruque-Cámara, S. and Minguela-Rata, B., 2017. Environment determinants in business adoption of cloud computing. Industrial Management & Data Systems, 117(1), pp.228-246.

[8] Wyld, D. 2009. Moving to the Cloud: An Introduction to Cloud Computing in Government. IBM Center for the Business of Government.

[9] Mohlameane, M. and Ruxwana, N., 2016, November. The Impact of Existing South African Policies and Regulatory Laws on Cloud Computing: A Literature Review Networks. In CS &IT Conference Proceedings (Vol. 6, No. 13). CS & IT Conference Proceedings.

[10] Maluleka, S.M. and Ruxwana, N., 2016. Cloud computing as an alternative solution for South African public sector: A case for Department of Social Development. In New Advances in Information Systems and Technologies (pp. 481-491). Springer, Cham.
[11] Wang, C., Wang, Q., Ren, K., Cao, N. & Lou, W. 2012. Toward secure and dependable storage services in cloud computing. Services Computing, IEEE Transactions
[12] Bunkar, R. K., and P. K. Rai., 2017, "Study on security model in cloud computing." International Journal of Advanced Research in Computer Science 1.
[13] Sekwatlakwatla, P., Mphahlele, M. and Zuva, T., 2016, November. Traffic flow prediction in cloud computing. In 2016 International Conference on Advances in Computing and Communication Engineering (ICACCE) (pp. 123-128). IEEE.
[14] Rittinghouse, J.W. and Ransome, J.F., 2017. Cloud computing: implementation, management, and security. CRC press.
[15] Akar, E. and Mardiyan, S., 2016. Analyzing factors affecting the adoption of cloud computing: A case of Turkey. KSII Transactions on Internet and Information Systems (TIIS), 10(1), pp.18-37.
[16] Andrade, C., 2020. Understanding the difference between standard deviation and standard error of the mean, and knowing when to use which. Indian Journal of Psychological Medicine, 42(4), pp.409-410.
[17] Motema, J. and Appiah, M., 2019, August. Factors affecting the adoption of cloud computing in a South African hospital. International Conference on Advances in Big Data, Computing and Data Communication.
[18] Alnajdi, S., Dogan, M. and Al-Qahtani, E., 2016. A survey on resource allocation in cloud computing. International Journal on Cloud Computing: Services and Architecture (IJCCSA), 6(5).
[19] Floerecke, S. and Lehner, F., 2018. Success-driving business model characteristics of IaaS and PaaS providers. International Journal on Cloud Computing: Services and Architecture (IJCCSA), 8(6), pp.1-22.
[20] Chibuye, M. and Phiri, J., 2017. A remote sensor network using android things and cloud computing for the food reserve agency in Zambia. International Journal of Advanced Computer Science and Applications, 8(11).
[21] Herzberg, F., 1986. One more time: How do you motivate employees. New York: The Leader Manager, pp.433-448.
[22] Polyviou, A. & Pouloudi, N. 2015. Understanding Cloud Adoption Decisions in the Public Sector. System Sciences (HICSS), 2015 48th Hawaii International Conference on. IEEE:2085-2094.
[23] Liang, Y., Wang, W., Dong, K., Zhang, G. and Qi, G., 2021. Adoption of mobile government cloud from the perspective of public sector. Mobile Information Systems, 2021.
[24] Davis, F.D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly: 319- 340.
[25] Xue, C.T.S. and Xin, F.T.W., 2016. Benefits and challenges of the adoption of cloud computing in business. International Journal on Cloud Computing: Services and Architecture, 6(6), pp.01-15.
[26] Yuvaraj, M. 2014. Examining librarians' behavioural intention to use cloud computing applications in Indian central universities. Annals of Library and Information Studies, 60(4): 260- 268.
[27] Alkhater, N., Wills, G. & Walters, R. 2014. Factors influencing an organisation's intention to adopt cloud computing in Saudi Arabia. Cloud Computing Technology and Science (CloudCom), 2014 IEEE 6th International Conference on. IEEE:1040-1044.
[28] Bryman, A. 2012. Social Research Methods. New York: Oxford University.
[29] Yin, R.K. 2013. Case study research: Design and methods.London: Sage.
[30] Creswell, J.W. 2013. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.