International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 9 Issue 3, May-Jun 2025 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Adoption of Cloud Computing for Information Management in National Identity Management Commission (NIMC), Abuja

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ABSTRACT

This study looks on the National Identity Management Commission (NIMC) Headquarters in Abuja, Nigeria's adoption of cloud computing technology for information management. Even with computerization and resource automation available, NIMC still faces many obstacles that impair data security and operational effectiveness. These difficulties include low power supplies, unstable WAN/LAN connections, inadequate maintenance, a lack of personnel with computer literacy, and inadequate funding for information technologies. Using a cross-sectional survey design and semi-structured interviews with key IT staff members at NIMC, the study uses a qualitative research approach to collect data on the ICT infrastructure that is currently in place, how it affects service delivery, and the difficulties that come with adopting cloud computing. The results show that NIMC is mostly dependent on local servers and a restricted WAN/LAN infrastructure, both of which are vulnerable to disruptions from external variables, power outages, and device malfunctions. The need for a more dependable and secure network infrastructure was brought up by the participants; cloud computing may be able to meet this need. At NIMC, cloud computing adoption is still in its infancy, nevertheless, with considerable obstacles to wider implementation including the requirement for specific technical skills and limited funding. Major advantages of cloud computing were mentioned as improved data security, lower long-term expenses, and increased operational efficiency due to less maintenance required of technology. The study suggests that NIMC look for more funding sources to support cloud computing investment, conduct in-depth cost-benefit analyses, upgrade network infrastructure and security measures, implement comprehensive technical training programs, and create a strategic plan for cloud computing adoption in phases based on these findings. By utilizing cloud computing technologies effectively, these ideas seek to improve NIMC's data security, operational effectiveness, and service delivery.

How to cite this paper: Adegbile Mary Adetoun "Adoption of Cloud Computing for Information Management in National Identity Management Commission (NIMC), Abuja" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-9 | Issue-3, June 2025, pp.491-515, URL: www.ijtsrd.com/papers/ijtsrd80029.pdf

IJTSRD80029

1. INTRODUCTION

1.1. Background of Study

There is a great deal of debate about what cloud computing is, or is not. Hayes (2008) defined “cloud computing as a kind of computing which is highly scalable and use virtualized resources that can be shared by the users. Users do not need any background knowledge of the services before using it. Moreover, a user on the internet can communicate with many servers at the same time and these servers exchange information with one another. Basically, data and adoption in the cloud are available through the internet; it can also be accessed from everywhere and from any device with internet connectivity.

Stroh et al, (2009) defined “cloud computing as “the computing software and services that can be accessed via the internet rather than residing on a desktop or internal server.” Gartner (2012) defined cloud computing as “a style of computing in which

massively scalable and elastic IT-enabled capabilities are delivered as a service to external customers using internet technologies. "In various presentations Klynveld Peat Marwick Goerdeler (KPMG) broke this into four different types of cloud computing, namely: Infrastructure, Platform, Applications and Services. Infrastructure is buying Space/ times on external servers, Examples are Amazons, A3, and Bungee. Platform on the other hand, is an existing software platform in which one can build its own application on, such as Facebook. While Application is a software application accessed with a Web browser, examples are Google Docs, Salesforce.com, whereas, Service is a ready to use services accessed with a Web browser such as ADP. Mell and Gance (2011) defined each of the three services models thus: Software as a Service (SaaS) which allows users to use the provider's applications on a cloud through a web browser, while Platform as a Service (PaaS) allows users to deploy their own applications on the provider's cloud infrastructure under the provider's environment. Infrastructure as a Service (IaaS) allows users to control and manage computing resources.

Cloud computing can transform the way information systems are built and services delivered. This provides organizations with an opportunity to extend its impact to its users anywhere anytime. Anyone connected to the internet is probably using some type of cloud computing on a regular basis. Whether they are using Google's Gmail, organizing photos on Flickr or searching the Web with Bing they are engaged in cloud environment. As Geoffrey (2013) pointed out, the interesting thing about cloud computing is that it did not start as a technology for the business enterprise, but was driven by the public with services like Facebook and Flickr.

Government organization today is becoming completely associated with Information Technology (IT) on content delivery, communication and collaboration. The need for server, storage and software are highly demanding, for example, the National Identity Management Commission (NIMC), that provides its services via online, operates an e-Identity card generation. It also operates a digital records corrections and ID card through it App platform known as MWS: NIMC Mobile ID which offers Multiple national ID related services. Whong (2014) remarked that the primary purpose organizations is to support it functions, learning, research and community services in ways consistent with and supportive of the institution's mission and goals.

According to Tuncay (2010), organization can benefit from using cloud computing technology by increasing computing performance, storage capacity, universal accessibility and cost reduction. This can help organizations in terms of fixed and maintenance cost reduction in the IT investment of both hardware and software as well as computer services. With cloud computing, National Identity Management commission may prevent financial waste, better track staff activities, and avert technological headaches such as computer viruses, system crashes, and loss of data. When cloud computing is used in the organization, this will likely have a significant impact on identity card related services. According to Spreeuwenberg (2012), with cloud computing, it becomes easier to access data with several devices. Especially for mobile devices, this can be really useful since the only thing that is needed is an internet connection. organizations are shifting their services to cloud computing technology to facilitate its services anywhere and anytime. In National Identity Management commission, the following have been identified as possible areas of applying cloud computing: Building Digital Repositories, Searching indigene Data, Web Site Hosting, File Storage, Building Community Power and Data Automation.

Nevertheless, the biggest benefit of the adoption of cloud computing technology is that one does not "buy" the cloud as purchases for software and hardware and hitherto being made for identity card management automation. Much like a common utility, one just pays for what was used, and then turn it off when one is done. The ability to have a server somewhere, to not have to worry about it, turn it up as needed, and pay for only what is used attracts a lot of people to cloud deployment (Creeger: 2009), business community can apply cloud infrastructure to amplify the power of cooperation and to build a significant, unified presence on the Web. This approach to computing can help information managers save time and money while simplifying workflows. To date, the main focus of organizations moving into the cloud has been due to, the need to streamline their workflows. (Gbaje and Aliyu 2014).

In order to contend with the barrage of information available in today's society, a medium, and an information institution such as National Identity Management commission needs to be put in place for proper acquisition, processing, documenting, retrieving and disseminating of information. The mode of information storage and transmission has undergone many radical changes in format; ranging from print materials to other information storages and transmitting media like non-print sources such as Compact Disc (CD); Diskettes; Magnetic tapes; CD ROMS; hard disks; punched paper tapes; Internet publications; zip disks; and cloud computing.

organizations have been using some cloud computing services for over a decade. Online databases are accessed as cloud applications. Large union catalogs can also be defined as cloud applications. The selection of which of these information resources to use is a continuous process dictated by changing curriculum, availability of new materials for information managers. Ordi (2006) observed that these media are useful for storage of data, information, and programs for safe keeping. Creeger (2009), as cited by Gbaje & Aliyu (2014), asserted that cloud computing comes into focus when there is need for increased capacity or added capabilities of computer without investing in new infrastructure, training new personnel, or licensing new software. Users can access database resources via the internet from anywhere for as long as they need without worrying about any maintenance or management of information technology infrastructure.

1.2. Statement of the Problem

The National Identity Management Commission (NIMC) in Nigeria continues to encounter obstacles while attempting to implement contemporary digital solutions, even in spite of notable progress in information technology. Progress is still being hampered by problems including poor maintenance procedures, erratic power supplies, a lack of computer-literate workers, and restricted finance (Nok, 2006). Software flaws, hardware issues, erratic power supply, a lack of finance, and inadequate personnel training all further impede automation initiatives (Adegbore, 2010). Government agencies also face significant challenges from ongoing computer upkeep, expensive bandwidth, and uneven funding for information services (Gbadamosi, 2012).

Furthermore, by depending too much on manual processes, NIMC leaves itself open to cyberattacks, jeopardizing the security and integrity of vital data. This emphasizes how urgently we need an information management system that is more trustworthy and secure. Cloud computing presents viable remedies for these problems. By refocusing attention from technology maintenance to innovation and service delivery, it can lessen the impact of technology-related issues, such as hardware and software malfunctions (Goldner, 2012). Cloud computing makes data sharing simple and does away with the need for maintenance, backups, and local storage (Geoffrey, 2013). In addition, it facilitates file storage, digital platform creation, website hosting, improved community involvement, and automation (Breeding, 2012).

Even with these possible advantages, NIMC hasn't embraced cloud computing yet. The purpose of this study is to ascertain the causes of this non-adoption. Determining these obstacles is essential to creating recommendations that will work in helping NIMC adopt cloud computing.

The study is to investigate the reasons behind NIMC's non-implementation of cloud computing, taking into account issues with data security, insufficient infrastructure, a shortage of trained staff, and budgetary limitations. The study aims to tackle the aforementioned concerns and offer ideas and insights that will aid NIMC in utilizing cloud computing to enhance information management and operational effectiveness.

1.3. Research Questions

The following research questions will be addressed by the study:

1. What infrastructures for information and communication technology are accessible at NIMC?
2. To what degree will NIMC's service delivery be improved by the existing ICT infrastructures?
3. To what extent will the available ICT infrastructures facilitate the adoption of cloud computing in NIMC?
4. What difficulties does NIMC face in implementing cloud computing?

1.4. Research Objectives

Examining the National Identity Management Commission (NIMC), Abuja's embrace of cloud computing technology is the study's goal. The particular goals are:

1. To identify and catalog the infrastructures for information and communication technology accessible at NIMC.
2. To evaluate the degree to which NIMC's service delivery will be improved by the existing ICT infrastructures.
3. To determine the extent to which the available ICT infrastructures will facilitate the adoption of cloud computing in NIMC.
4. To identify the difficulties that NIMC faces in implementing cloud computing.

1.5. Significance of the Study

The study will be significant in a number of ways:

First of all, it will be beneficial to NIMC and its management in the sense that it will reveal to them the degree of effectiveness of the cloud computing technology in meeting the information needs of the users and consequently encourage them towards working out modalities to improve the functionality of cloud computing technology if the need arises.

More also, it will help to reveal the extent to which cloud computing technology is being adopted for

information organizations as it will highlight the past and present state of the adoption of cloud computing technology and its services. The improvement of cloud computing in the NIMC will lead to better services for the fulfilment of the objectives for NIMC identity card services.

In addition, it will be useful to government and security agencies of the country in their research and policy formulation. It will also serve as an important knowledge contribution in the area of adoption of cloud computing for information management services.

1.6. The Scope of the Study

The study examined the adoption of cloud computing technology for information management in the National Identity Management Commission Headquarter Abuja, Nigeria. Although NIMC have branches all over the country, For the purpose of this study, the researcher will focus on the Headquarter in Abuja, and the reasons is due to the fact that cloud computing administration takes place in Headquarter.

1.7. Operational Definition of Terms

The following terms are defined operationally as used in this study.

Cloud: Public or Semipublic space in the cloud used for transmission.

Scaling: The measurement of dimensions using a scale.

Software as a Service (SaaS): Allows users to use the provider's applications on a cloud through a web browser or an application programming interface.

Platform as a Service (PaaS): Allows users to deploy their own applications on the provider's cloud infrastructure under the provider's environment.

Infrastructure as a Service (IaaS): Allows users to control and manage computing resources.

Client platform: Device(s) to access cloud resources. E.g. mobile phone, tablets, laptop, etc.

Multi-tenancy: many applications users

Virtualization: Act of creating virtual object (rather than actual).

Resource pooling; Enables provider's computing resources to serve multiple consumers or users, using a multi-tenant model with different physical and virtual resources assigned and reassigned according to user's demand.

Rapid elasticity: Allows for resources and capabilities to be elastically provisioned and released in some cases automatically to scale rapidly outward and inward commensurate with demand.

2. REVIEW OF RELATED LITERATURE

2.0. Introduction

This chapter is presented under the following sub-heading: -

2.1. Computer Networks available in Information Management
2.2. Rationales for the adoption of cloud computing in Information Management
2.3. Information Services provided through cloud computing in Organizations Information Management
2.4. Implication of cloud computing in Organizations
2.5. Summary of literature review

2.1. Computer Networks available in Information Management

Information network is a collective or co- operative activity of linking members/users to the resources hosted on computers by means of telecommunication connections. Lihitkar, (2012) asserted that a network is developed when a group of information centers have common interest to exchange information through computer and communication technology. Dhenavandah & Tamizhchelvan (2014) identified classification of Networks based on Utility criterion: Resource sharing network, Data sharing network communication and data exchange network. Resource sharing network main purpose is sharing of resources and other applications that are subordinate in nature, data sharing network provides access to unique databases from workstations situated at distance apart, while communication data exchange network allows users to exchange data, graph or documents and to communicate with each other using such devices as electronic mail, bulletin board etc.

The state of information management networking system depends on the availability and quality of electrical power and the type and distribution of electrical wiring in the information centers through computer network observed by Eric (2012). Computers operate better and last longer when the computer network that powers the centers is continuous and of consistent voltage. Many information centers, especially government organizations need sufficient supply of network to withstand the additional demand made by the computers asserted by Kessler (2013). Furthermore, networks cables may not be the correct gauge to withstand the additional load caused by computers being connected to the information centers networking system according to Eric (2012). One reason why many information centers decide to install computer network in management of information is to overcome the challenges and issues of poor computer networking that may require the data centers to

refurbish the existing network system or add a whole new network supply system which reduces the amount of electrical wiring needed. Also, computers, especially those connected to a local area network (LAN), require a grounded electrical system to operate smoothly and trouble-free. Again, this is less costly if done to one or two computers in the centers.

The computer network used during the last several decades in information management has made a massive shift from traditional concepts of "information or record keeping". The catalyst for this shift has been the computer network asserted by Kessler (2012). The computer network has been developed to provide access to information promised by traditional work. Today, developments like high-capacity networks and broadband communications offer physical access to data to average users on a level never dreamed of by the inventors of the paper-and-cardboard book or the card catalog. And yet intellectual access to that data appears to be impeded, by lack of organization and by the inability of average users to find useful information within it.

Ineffectual hand wringing often characterizes the response of the profession traditionally concerned with the provision of information in the information management community. Mark (2014) asserted that reaction of "information-overloaded" results to the recent history of the interaction between users and the computer. Network is a system of interconnected computers for sharing information and resources that may involve two or more computer in a single office or several computers in different units or across so many in a country. Networks include: Local Area Network (LAN), Wide Area Network (WAN) and World Wide Web (WWW). With computer networks, organization can access and see information from different locations and download for users need.

Krubu and Osawam (2011) noted that the impacts of computer networks are felt by information centers in every aspect. They further added that computing technology, communication technology, and mass storage technology are some of the areas of continuous development that reshape the way information is access, retrieve, store, manipulate and disseminate information to users. Gbaje and Aliyu (2014) however lamented that unfortunately, in developing countries particularly Nigeria, organizations started automating with an underdeveloped information and telecommunications infrastructure which include inadequate computer network. Similarly, the use of open-source automatism software often sees as a panacea for automation in developing countries has been very gradual in Nigeria. Reason being the dearth of its skills required for both development and maintenance of open-source software, it is expensive and high storage capacity which are poorly developed or beyond the financial reach of most government organizations.

Creeger (2009) cited in Gbaje and Aliyu, (2014) asserted that cloud computing comes into focus when there is the need to increase capacity or add capabilities of computer without investing in new infrastructure, training new personnel or licensing new software that can be built on the existing network in oraganizations.

Several types of computer network can be characterized by their size as well as their purpose. The size of the network can be expressed by the geographic area they occupy and the numbers of computer that are part of network. Eric (2012) also posited that networks can cover anything from a handful of devices within a single to millions of devices spread across the entire globe. Some of the different computer networks based on size are: Personal Area Network (PAN), Metropolitan Area Network (MAN), Storage Area Network (SAN), Enterprise Private Network (EPN) and Virtual Private Network (VPN).

A network as asserted by Lihitkar, (2012) can be kept entirely private by restricting some communications to the connection within the network. This means that those communications never go over the internet. Geoffrey (2012) posited that one approach to information centers having private network is to build an enterprise private network (EPN) and it is use to connect multiple locations and can also use it to control its services and data.

2.2. Rationales for the adoption of cloud computing in Information Management

Some many reasons are provided for the acceptance of cloud computing technology in information management. Goldner (2012) pointed out that information centers moving into the cloud have been discovery services, the need to disclose their vast services on the Web.

Combining systems into a cloud environment reduces the workload, making information management efficient, these improvements can be grouped into three basic areas: technology, data and community. Each offers some general and some unique opportunities for information managers. Looking first at the technology that most current systems employ several benefits of cloud computing solutions surface include:

2.2.1. Technology improvements

Cloud computing solutions at their essence are built on current technology and should be architected to allow for technology shifts. Looking at the explosion of mobile devices one sees how businesses, organizations operating in a cloud environment are able to adapt and deliver their services to the new devices much more quickly and less expensively.

The mainstay of information management is the information management system (IMS). information management systems were developed before the Internet and Web existed and is generally closed proprietary systems. It has been difficult and costly for these closed systems to take advantage of new technologies as they emerge. It is also challenging to integrate to external systems and information must rely on their vendors to do any such integration. Over time information centers have needed to add more systems to manage their changing collections which moved from strictly physical management to a combination of physical, licensed and digital. Since each of these systems has stood alone integrating them has been difficult and at times not possible.

First would be the possibility of open service-oriented architecture. Many cloud solutions offer this type of openness with published application program interfaces (APIs) that any programmer can take advantage of. This means if a new service or technology emerges information centers will not always be dependent on a vendor or other third party to start taking advantage of these services and technologies Geoffery (2013). Existing systems have used is a set of routines, protocols and tools for building software applications. APIs to connect to external services but they have remained closed proprietary systems making it hard to integrate them into external services. This makes it possible to integrate two services once and re-use it across the community with the help of cloud computing.

Information centers can equally get out of the business of technology such as hardware breakdown, software problem, patron services and innovation posited out by Goldner (2012). Servers can be decommissioned and no longer require replacement every five years (or less). Staff no longer has to maintain the complex software stack necessary to run local systems and worry about compatibility of the tack during upgrades. Instead, technical skills can be re-deployed for extending cloud services into their environment and their environment into other cloud services.

2.2.2. Data efficiencies

Geoffery (2013) added that when data is stored in the cloud, it offers several advantages such as common data can now be easily shared among services and users. The need for local storage, maintenance and backups is removed. Agreements can be forged to share data that normally would be considered private to a single data centers or organization. He also added that information centerss can achieve Web scale when they massively aggregate data and users, sometime a cloud environment makes possible.

Like the advantages of technology deployed and accessed as cloud solutions, data storage in the cloud brings many benefits for information managers. The easy one to recognize is the same data being stored hundreds and thousands of times across database. Consider how many copies of the data there are for a serial entry. And if a change is needed to the data to keep it current each entry must perform that change. When this data is maintained in the cloud, maintenance and backup of this data is now done once and if a change is needed, once one entry performs the change all share it.

2.2.3. Community Power

Another rationale for the adoption of cloud computing is the opportunity for collaboration and cooperative intelligence Breeding (2012). Information centerss can agree to share pools of data for cooperative preservation or digitization, cooperative sharing of materials, etc. And with massively aggregated data new services can be created such as recommender services based on a broad base of usage data.

2.3. Information Services provided through cloud computing in Organizations Information Management

Cloud computing provides information centers with a cost effective infrastructure or environment. It has attracted significant attention in the realms of academia, industry, governing, military and the organizations to solve storage and computerization problem. Yang (2012) opined that starting from 2011, more and more information centers began to deliver Integrated information management System (IMS) and discovery tools as cloud solutions. While many vendors offer options to host the classic IMS as cloud solution, some are developing a new generation of IMS especially for the cloud she stressed further. Analysis of literature on information management and cloud computing reveals that organizations can use this technology to build digital solutions that streamline the activities of the organization as a whole, such as store file, build community power, and automate information sharing.

2.3.1. Website Hosting

Breeding (2012) noted that many information centers rely on institutional or commercial hosting services

for their websites. Thus, organizational presence is not provided directly by the information centers itself but by its parent organization. With cloud computing, information centers have the forum to host their own website on a third-party service provider's service. This takes the responsibilities of hosting and maintaining their own servers. Google sites serve as an example for hosting websites outside of the information centers servers and allows for multiple editors to access the site from varied locations.

2.3.2. File storage

Data storage in cloud is necessitated by the inherent fragility of all physical storage devices. A USB flash drive can be misplaced, a laptop or desktop could crash, or even be hacked; there are also incidences of hardware failures, software malfunctions, and malware attacks and so on. File storage capacity provided in the cloud is virtually limitless in addition to a much higher of level of reliability than most on premises servers can accomplish within their own data center according to Breeding (2012 cited in Gbaje Aliyu 2014). Turner (2009) also noted that backups are much easier to create and risk associated with hardware failure is minimized with cloud computing.

2.3.3. Building Community Power

Cloud computing technology offers great opportunity for information centers to build networks and information science professionals as well as other interested people, including information seekers by using social networking tools. The most famous social networking services are Twitter and Facebook. They play a key role in building community power. Such cooperative effort of information managers will promote time saving, efficiencies, wider recognition, and cooperative intelligence for better decision–making. It also provides a platform for innovation and sharing of intellectual conversations, ideas and knowledge

In addition, cloud computing allows pooled of resources that customers draw from usually in remote data Center. Services can be scaled larger or smaller; and use of a service is measured and customers are billed accordingly. Different services can be provided by cloud computing company over the Internet. According to Han (2012) three main service models of cloud computing includes:

- **Infrastructure-as-Service (IaaS)**

The IaaS model provides just the hardware and network; the customer (NIMC) installs or develops its own operating systems, software and applications. The hardware and other basic services are provided through virtual machine accessible through a Wide Area Network or the Internet. Under this model, the IaaS service provider owns the equipment and is responsible for housing, running and maintaining it, and the client NIMC typically pays on a per-use basis.

Some writing on adoption of cloud computing appears to favor IaaS over other service models. Liu & Cai (2012), for one, explained that in this service model, the server administration and maintenance responsibilities are moved from local personnel to the hosting vendor, while the management of the application remains in the traditional way, that is, systems analysts are still able to access the backend of the system for local customizations as if they were managing the system locally. Breeding (2012) defined IaaS as subscribing to computing and storage capabilities on an as-need basis. It allows a organization to gain access to computing resources – such as Linux or Widows scaled to the demands and duration of a project. With IaaS, information centers will not see the physical hardware involved but will perform much of the system administration tasks as they would for local servers. Operating an application through IaaS saves the information centers from the purchase of its own hardware but retains the tasks associated with installing and maintaining software application. NIMC might use IaaS to operate its integrated information management system(IMS) rather than purchase local hardware. Examples of IaaS according to Kaushik and Kumar (2013) are Amazon Web services, Rackspace, Savis, HP, IBM, Sun and Google Base.

Furthermore, IaaS offers data storage capacity. Thus, with IaaS, the fear associated with sensitive file leaking, lost or crash or software malfunction or malware associated with laptop or desktop is eliminated. Han (2011), however, lamented that from his analysis and study of the use of IaaS in information automation, data centers do not exploit fully the storage capacity availed by IaaS. Breeding (2012) provides examples of storage facility available in the cloud for information management to consider in their quest to take advantage of cloud infrastructure. They include drop box (http://www.dropbox.com), windows Live SkyDrive (http://explorelive.come/windows.live-skydrive), Amazon Cloud Drive (http://www.amazon.com/clouddrove/learnmore), Box.net (http://www.box.net), and so on.

- **Software–as–a Service**

In Software as a Service model, a pre- made application, along with any required software, operating system, hardware, and network are provided. SaaS delivers a single application through the browser to thousands of customers using a multitenant architecture. From the customer's end, it

means no upfront investment in servers or software licensing; on the provider side, with just an app to maintain, cost are low compared to conventional hosting. Breeding (2011), asserted that most Software -as -a- Service offering involve many organizations or individuals sharing a single instance of the software, where all updates and enhancements can be applied once and for all. The different individuals or institutions using the service can configure their software as needed, customize the branding, color schemes, and navigation controls and to set functional preferences and policies according to local needs. Since the service provider takes care of enhancement, upgrades and patches, users are relieved from the burdensome responsibility as it would apply to local software.

In this service model, users can access and use any software available with cloud vendors. With SaaS, it is not necessary for users to buy the software, install and run, or maintain the applications on a system or a server. Kaushik and Kumar (ibid) noted that SaaS provides online email applications, free services, limitless storage and remote access from any computer or device with an Internet connection. Breeding (2012) however reminded that the concept of using software applications via the Internet is not especially recent, with many software firms offering their products in hosted arrangement since the 1990s through an arrangement called Application Service Provider or ASP. Han (2012), on the other hand, opined that the SaaS primary users are the general public. Gmail, Google Drive, Google Calendars, Windows Sky Drive and dropbox are popular SaaS Service

- **Platform-as-a-Service**

In PaaS, an Operating System, Hardware, and Network are provided, and the customer installs or develops their own software and applications. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application.

Platform as a Service model helps in generating the computing platforms to run the software and other tools over the Internet without managing the software and hardware at the end of user side. PaaS offers a complete development and production environment, abstracted from concerns with details of underlying infrastructure. Amazon Elastic Cloud (AEC), EMC Atmos, Aptana are examples of PaaS model which provide platforms to users in maintaining and supporting their IT infrastructure without spending huge amount in buying hardware, software and related/technology.

2.4. Implication of cloud computing in Organizations

While cloud computing technology have arrived in the mainstream, information management have been reluctant to apply and adopt a cloud- based system to enterprises users (Bleeding, 2012) Cost, staff and maintenance implication in the adoption of cloud computing.

2.4.1. Cost implication of cloud computing in Organizations

Cloud is moving past the hype stage and starting to deliver tangible benefits, primarily increased flexibility and agility. But moving to the cloud can be also mean added cost posited out by Breeding (2012). It can cost tens of thousands of dollars per year to move large volumes of data to public cloud services and to store that data for long periods of time.

Network bandwidth accounts for much of the cost of moving data, cloud providers might charge upload and download fees and even though data and systems are being hosted off – site, as Ambrust et al (2010) posited out that there is internal labor cost, “People think there are no labor costs with cloud, but as you scale up to handle workload, there is a complexity with managing large numbers of cloud instances just like managing a large number of servers”.

Creeger (2009) asserted that using cloud can reduce total cost of ownership of infrastructure significantly. Some clients report savings of fifty to seventy – five percent. Because each client is unique, the potential saving achieved by leveraging cloud technologies or services will vary. Several factors impact the overall total cost of ownership of operating infrastructure:

- Reduced Upfront Cost: spending capital on equipment allows companies to depreciate the cost of over three to five years; however, this mean that NIMC will recognize the same CapEx (Capital Expense) each month of the project regardless of the actual usage.
- Usage based Pricing: temporary workloads such as software testing and development; load testing and quality assurance; troubleshooting; big data analytics; and seasonal web sites require IT typically needs to spend time acquiring the equipment, deploying the equipment in data center and then configuring the environment for the end users of cloud computing pay only for the resources they use.
- Automation: cloud computing simplifies provisioning, de-visioning and re- deploying

resources through automation and easy – to use web consoles and APIs. The efficiency of cloud computing reduces the amount of time an IT systems administrator has to spend on managing and supporting infrastructure.

- Operational Services and Support: the automation and self- provisioning benefits with managing infrastructure. Additionally, by leveraging the managing infrastructure. Additionally, by leveraging the managed services of a cloud provider and systems integrator, NIMC information management can reduce the cost of managing and maintaining their web server, database and middleware software and system; collaboration; mobility; storage; backup; and enterprise application.

- Reduced Downtime: being able to spin up a temporary environment of servers, storage and networking allows it to more quickly troubleshoot issues that lead to system downtime. Adjusting the processing power, memory and storage performance of a server during troubleshoot issues that lead to system utilization being a constraint.

- Virtualization: using virtualization technology creates multiple virtual machines on a single physical machine can significantly reduce the hardware and power costs. Most large enterprises have already implemented virtualization.

- Resource leverage: multi- tenant architecture in a private or public cloud allows users to take advantages of better leverage and economies of scale for resources

The cost advantages between local storage and cloud storage change dramatically with very large- scale data set. This is worth noting for information centers especially NIMC that deal with very large sets of data, involving many terabytes. (Gbaje & Aliyu 2014).

2.4.2. Staff implication of cloud computing in NIMC

As more mid-sized organizations move to the cloud, the staffing implications for IT departments are becoming clearer. Whether the size of a giving organization IT staff will need to change as it ascends into the cloud depends on current staffing and staffing shifts will take place: individuals who are working in IT today will need new skills, and certain jobs will shift from the enterprise to the cloud service provide posited by Geoffery (2013).

Experts have pointed out that it is wishful to think that cloud – based systems will manage themselves. If the IT department is working in a cloud computing environment, then the organization will continue to need individuals who understand the software applications and how the applications relate to the business. Cloud computing challenges are interdisciplinary in nature and cannot be fully addressed from a purely technical perspective (Khajeh & Sriram,2010). To successfully adopt cloud computing in information management of NIMC, cooperation among administrators and practitioners, other information managers, personnel, cloud users (Nigerian citizens), and cloud services providers is needed. It is important to note that the migration of IT applications and system to the cloud takes time. The timeline for cloud adoption can vary from several months to several years (Thethi, 2009, Sullivem, 2009).

It is of great importance that qualified and adequate staff be involved in the running and adoption of cloud computing. Inadequacy and incompetency of the staff might lead to ineffective utilization of cloud computing for services according to Breeding (2012). He further observed that regular training and retraining is needed to have a positive outlook of the provision of relevant information centers services.

Resolutions passed on all these issues are favorable although there are reservations on security. Breeding (2012), for one, noted that from a privacy and security perspective, comfort levels for using cloud – based products vary depending on the type of information and activity involved. Thus, organizations involved with highly sensitive information may gravitate towards private rather than public cloud offerings for instance, Kaushik and Kumar (2012) maintained that although the issues were not fully resolved, there is no doubt that organizations are moving towards cloud computing technology in present time and taking advantage of cloud-base services especially in building digital platforms, social networking and communication with manifold flexibilities. Romero (2012) added confidentiality, theft, and loss of file to the list. It stands to reason, therefore, that IT departments will need individuals who understand security issues at a deep level.

2.4.3. Maintenance implication of cloud computing in NIMC

Romero (2012) posited that the ability to stores seemingly endless number of documents, data is enticing- the ability to access these things from the any phones, tablet, or computer is what is driving the popularity to cloud computing. Despite its brilliance,

cloud computing raises many concerns regarding maintenance. It seems very few people feel comfortable having personal, confidential information stored up in some "cloud'' of unknown location.

Geoffery (2013) noted that because cloud computing is invisible and intangible does not mean that it is not a safe way to store information. However, the major benefits of cloud computing are maintenance of data which is handle by cloud provider.

NIST (2012) recommends the following solution to maintenance of cloud computing. Nine concerns: Nine solutions

1. Governance: Develop organization policies, procedures, and standards of use.
2. Compliance: Ensure that the cloud provider's offerings adequately meet the data security controls, and records management requirements.
3. Trust: Create a service arrangement with cloud provider that characterized by high visibility into the security and maintenance actions of cloud provider
4. Architectural: Develop an understanding of the technology the cloud provider utilizes.
5. Identity Access Management: Ensure the correct controls are communicated to the service provider so as they can secure authentication, and other identification and access management functions.
6. Software Isolation: Understand virtualization and other isolation techniques of the cloud provider will implement.
7. Data Protection: Evaluate the cloud provider's data management solutions and maintenances.
8. Availability: Ensure that the contract provisions and procedures for availability, data backup and recovery, and disaster recovery meet the organizations continuity and contingency planning requirements.
9. Incident Response: Ensure that the contract provisions and procedures for incident response meet the requirements of your organization.

Geoffery (2013) explained that once the relationship is established the organization can rest that the information is safe and well maintained in a capable hand. Much of the works on cloud computing attempts to allay the concerns and fears of potential users of the service. Although, as Gates (2000) observed, the main advantage of any new technology is that it amplifies human potentials, which of course that can be settle by maintenance as Goldner (2012) posited out that with the adoption of cloud computing technology, organizations can get out of the business of technology and focus on services and innovation. Servers can be decommissioned and no longer require replacement every five years (or less).

Staff will no longer maintain the complex software stack necessary to run local systems and worry about compatibility of the stack during upgrades. Instead, technical skills can be re-deployed for extending cloud services into their environment and their environment into other cloud services asserted by Geoffrey (2013).

2.5. Summary of the review

This chapter reviewed literature that is related to the adoption of cloud computing technology for information management in National Identity Management Commission (NIMC) Abuja. It reviewed literatures on computer networks in organizations, rationales for adopting cloud computing in organizations, information services provided through cloud computing, implication of cloud computing in terms of cost, staff and maintenance and summary of the literature review. However, it has been revealed that although much works has been done in this area, and equally much more work still remained to be done especially on the adoption of cloud computing technology in information management of National Identity Management Commission and its information management centers. This revelation has offered the opportunity for the researcher to fill the missing gap with information on cloud computing technology for information management in National Identity Management Commission.

3. RESEARCH METHODOLOGY

3.1. Introduction

This chapter is presented in the following sub-headings: research method adopted population of the study, sampled population and sampling procedures, research instrument, procedures for data collection and analysis.

3.2. Research Method Adopted for the study

This study adopted the qualitative methodology approach. Qualitative research is defined as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (Strauss & Corbin, 1990). According to Creswell (2003), qualitative research takes place in the natural setting. He states that the qualitative researcher often goes to the site (office) of the participants to conduct the research. This enables the researcher to develop a level of detail about the individual or place and to be highly involved in actual experiences of the participants.

According to Denzin and Lincoln (1994), qualitative methodologies include "interviewing; observing;

artifacts, documents, and records; visual methods; personal experience methods; data management methods; computer-assisted analysis; and textual analysis". All of these methods may be useful in gaining an insight into the adoption of cloud computing technology for National Identity Management Commission (NIMC).

3.2.1. Research Design Adopted for the Study

The study utilized a cross-sectional survey design. As described by Akuezuilo and Agu (2003), the cross-sectional survey research method involves the collection of standardized information from a sample deemed representative of a specific group or population. Therefore, this research design is deemed suitable as it facilitated the generation of relevant and useful data from a sample representative of the population, enabling generalization of findings. Moreover, Saunders et al. (2009) in "Research Methods for Business Students" discussed various research methods suitable for different types of studies by incorporating these sources into the citation for the research design adopted for the study, it enriches the framework with insights from different perspectives on research methodology and design.

3.3. Population of the Study

The population of this study consisted of five (5) members of National Identity Management Commission. The target population of the study includes the Director of Enterprise Service & Network Infrastructure and the (4) staff of the Information Technology (IT) unit of the National Identity Management Commission who were responsible for the administration of cloud computing technology.

3.4. Sample and Sampling Procedure

Purposive sampling technique was used to select four (4) staff of the Information Technology unit and the Director of Enterprise Service & Network Infrastructure. According to Crossman (2012),'' a purposive sampling is very useful for situations where you need to reach the targeted sample quickly and the sampling is not proportional in nature". Therefore, the subject of the study is made up Four (4) Information Technology (IT) staff and the Director of Enterprise Service & Network Infrastructure.

3.5. Instruments for Data Collection.

The instruments used to collect data for this study were direct observations, semi- structured, unstructured interviews and the use of digital recorder to record the interview process. The semi-structured interview involved the researcher personally interviewing staff of the Information Technology (IT) unit, based on a structured set of questions that was prepared before the interview. This enabled the researcher to explain or elaborate on any question that is not well understood by the respondents.

3.5.1. Interview

The semi-structured interview was directed at finding out the existing infrastructure available in NIMC; the extent the existing infrastructure enhance service delivery; the extent at which the existing infrastructure facilitate the adoption of cloud computing in NIMC; the challenges in terms of staff, costs and maintenance of the adoption of cloud computing in NIMC.

The other question was directed towards finding out the level of the adoption of cloud computing in NIMC, areas that NIMC have implemented cloud computing in its information management; any positive effect of the adoption of cloud computing in NIMC; devices that NIMC use for cloud computing; layers of cloud services in NIMC; cloud computing deployment model in NIMC, cloud services provided in NIMC; cloud based information management services for NIMC; In conclusion the Interviewees will be asked to comment on how NIMC feel in storing data online.

The unstructured interview emanated from follow-up questions in response to some of the structured questions as well as observations during visit. The response were captured using digital recorder and analyzed thereafter.

3.5.2. Observation

Observation involves the use of eyes of the researcher rather than ear and voice (Lofland and Lofland 1995). Direct observation on the facilities that is available for cloud adoption, such as computer hardware and software. A condition of storage medium was also conducted to provide additional information that may be needed for the research.

3.5.3. Focus Groups

The researcher systematically questioned the staff of the Information Technology (IT) unit of NIMC as a focus group. The focus group was unstructured and semi-structured questioning techniques in order to elicit information on the adoption of cloud computing technology for information management in NIMC and the strategies adopted for long-term cloud solutions, (Fontana & Frey, 2003). The focus group interview was used to build on data collected from individual interviews by verifying and elaborating on information supplied by the informants individually. The interview was audio taped and transcribed verbatim. Lofland and Lofland (1995) recommended considering focus group interviews as a supplement to intensive, one-on-one interviews if the topic is reasonably public and not something that would cause

embarrassment to participants. They believe that the focus group offers "the advantage of allowing people more time to reflect and recall experiences.

3.6. Validity and Reliability of the Instrument

The instruments used for collecting data was validated by the supervisor(s), academic staff, research experts and colleagues in the Department of Library and Information Science, Faculty of Education, Ahmadu Bello University Zaria. Corrections, vetting and suggestions by the aforementioned were incorporated in the final copy before administering it.

The reliability of the instrument was established by conducting a pretest within two weeks at the NIMC branch Office in Minna with the following purpose:

1. To test the method of data collection, and
2. To pre-test the interview schedule.

Reliability deals with the face validation of the interview and questions; some questions will be used to ascertain the reliability of the result. This is because reliability deals with the consistency of measure and stability. According to Bryman (2008), reliability of instrument is very important as it deals with consistency, stability and detail treatment of issues using appropriate techniques.

3.7. Procedure for Data Collection

The researcher personally visit the site selected for this study, and conduct the semi-structured and unstructured interviews, examined appropriate documents and conduct observations. The researcher also spent three days in the selected site observing the process and strategies of cloud adoption as well as examining relevant documents.

3.8. Procedure for Data Presentation and Analysis

The data collected from the research instruments was first be organized for analysis and transcribed into different types, depending on the source of information. The data was then be tabulated and discussed descriptively.

4. DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1. Introduction

The data collected from participants, data analysis, and interpretations are presented in this chapter. This was given in accordance with the study's research questions. The following is how the chapter is presented:

4.2. Data Analysis

Phrases and sentences were used to represent the data that were gathered from the study participants during the semi-structured interview. These records were audio files that underwent transcription. Every transcript from the interview was carefully read, scrutinized, and reread in search of words and sentences that fit into patterns that support the study's goals (Belotto, 2018).

Table 4.1 shows the emergent categories with their respective subcategories for each of the research questions.

Table 4.1: Emerging Categories along with the corresponding Subcategories

Research Questions	Categories	Sub-Categories
RQ1: What infrastructures for information and communication technology are accessible at NIMC??	1. Networks Infrastructure	1.1 Local Area Networks (LAN) 1.2 Wide Area Networks (WAN) 1.3 Virtual Private Networks (VPN)
	2. ICT Infrastructure	2.1 Hardware Infrastructure 2.2 Software Infrastructure
	3. Network Coverage	3.1 Coverage within NIMC Offices 3.2 Remote Access Capabilities
RQ2: To what degree will NIMC's service delivery be improved by the existing ICT infrastructures?	1. Adoption Levels	1.1 Full Adoption 1.2 Partial Adoption
	2. Cloud Services Utilized	2.1 Infrastructure as a Service (IaaS) 2.2 Software as a Service (SaaS)
	3. Extent of Usage	3.1 High Usage 3.2 Limited Usage
RQ3: To what extent will the available ICT infrastructures facilitate the adoption of cloud computing in NIMC?	1. Cost Efficiency	1.1 Reduction in Operational Costs 1.2 Pay-as-you-go Model
	2. Flexibility and Scalability	2.1 Resource Scalability 2.2 Operational Flexibility
	3. Improved Collaboration and Accessibility	3.1 Improved Collaboration 3.2 Remote Accessibility

RQ4: What difficulties does NIMC face in implementing cloud computing?	1. Cost	1.1 Initial Setup Costs 2.1 Ongoing Operational Costs
	2. Staffing Challenges	2.1 Training and Skill Development 2.2 Changes in Staff Roles
	3. Maintenance Difficulty	3.1 System Maintenance 3.2 Technical Support

4.3. Available ICT Infrastructures Available at National Identity Management Commission

During research writing, the study's goal was to identify the NIMC infrastructures that were already in place. The categories and their subcategories are displayed in Table 4.2.

Table 4.2 Existing computer Networks available at NIMC

Research Question	Categories	Sub-Categories
RQ1: What infrastructures for information and communication technology are accessible at NIMC??	1. Network Infrastructures	1.1 Local Area Networks (LAN) 1.2 Wide Area Networks (WAN) 1.3 Virtual Private Networks (VPN)
	2. ICT Infrastructure	2.1 Hardware Infrastructure 2.2 Software Infrastructure
	3. Network Coverage	3.1 Coverage within NIMC Offices 3.2 Remote Access Capabilities

Interview Data 2024

Category 1: Networks Infrastructure

The many kinds of networks that NIMC offers fell into this category as a result of the interviews. Local Area Networks (LAN) and Wide Area Networks (WAN) are its two subcategories. The explanations of these subcategories will be provided below.

Subcategories

The participant narratives concerning the many kinds of networks infrastructure utilized in NIMC gave rise to these divisions. Within an enterprise, networks make it easier to communicate, transmit data, and access resources.

Local Area Networks (LAN)

Participants of this study recounted that they use Local Area Networks (LAN) within the NIMC offices.

- "...we have Local Area Networks in our offices for internal communication and data sharing." (Participant 1)
- "...our LAN is crucial for day-to-day operations and connecting different departments within the building." (Participant 3)
- "...the LAN setup allows us to efficiently manage internal workflows and data access." (Participant 4)
- "...we rely heavily on our Local Area Networks to maintain smooth internal communication." (Participant 5)
- "...the internal networks (LAN) are essential for our administrative functions." (Participant 2)

Wide Area Networks (WAN)

Participants also highlighted the use of Wide Area Networks (WAN) for broader connectivity across different NIMC offices and locations.

- "...we have a Wide Area Network to connect our different offices across the country." (Participant 2)
- "...the WAN enables us to link with our regional offices and manage national operations." (Participant 3)
- "...our WAN is crucial for maintaining connectivity between the headquarters and other locations." (Participant 5)
- "...the Wide Area Network helps us coordinate and share information nationwide." (Participant 1)
- "...WAN is vital for our nationwide communication and data transfer needs." (Participant 4)

Category 2: ICT Infrastructure

The interview results revealed this category as an essential component of the NIMC computer that are currently in place. Hardware infrastructure and software infrastructure are its two subdivisions. The explanations of these subcategories follow.

Subcategories

These subcategories are derived from the narratives of participants related to the components of the ICT infrastructure at NIMC. The infrastructure encompasses both the physical hardware and the software necessary for network functionality.

Hardware Infrastructure

Participants emphasized the importance of physical hardware in their network setup.

- "...we have a robust setup of routers, switches, and servers to support our network." (Participant 1)
- "...the hardware infrastructure includes high-end servers and backup systems." (Participant 2)
- "...our network hardware is maintained regularly to ensure reliability." (Participant 3)
- "...we invest in quality routers and switches to keep the network running smoothly." (Participant 4)
- "...the servers and storage systems are critical parts of our hardware infrastructure." (Participant 5)

Software Infrastructure

Participants also highlighted the significance of software in managing and operating the network.

- "...we use various network management software to monitor and control our systems." (Participant 1)
- "...the software infrastructure includes firewall programs and security tools." (Participant 2)
- "...we rely on software for network configuration and troubleshooting." (Participant 3)
- "...network management tools help us ensure efficient performance." (Participant 4)
- "...software applications are essential for maintaining network security and operations." (Participant 5)

Category 3: Network Coverage

The interviews revealed that this category represented the breadth of NIMC's network coverage. Internal Network Coverage and External Network Coverage are its two subcategories. The explanations of these subcategories follow.

Subcategories

These subcategories are derived from the narratives of participants regarding the coverage of the network within and outside NIMC offices.

Internal Network Coverage Participants discussed the reach and reliability of the network within NIMC facilities.

- "...our network covers all the departments and offices within the building." (Participant 1)
- "...internal coverage is comprehensive, ensuring all areas are connected." (Participant 2)
- "...we have ensured that the entire building has strong network coverage." (Participant 3)
- "...the internal network is robust and covers all our internal needs." (Participant 4)
- "...coverage within the office is seamless, providing connectivity throughout." (Participant 5)

External Network Coverage

Participants also described the network's reach beyond the main NIMC offices, extending to regional and field offices.

- "...our network extends to regional offices through our WAN." (Participant 1)
- "...external coverage is crucial for maintaining communication with field offices." (Participant 2)
- "...we have good network reach to support our external operations." (Participant 3)
- "...the WAN ensures that remote offices are also connected to the main network." (Participant 4)
- "...external coverage allows us to operate efficiently across different locations." (Participant 5)

4.4. Degree at which existing ICT infrastructures improved service delivery at NIMC

During research writing, this objective of the study's goal determined what degree will NIMC's service delivery be improved by the existing ICT infrastructures in NIMC. To classify the degree of adoption, three categories were employed. These categories and the corresponding subcategories are displayed in Table 4.3.

Table 4.3 Level of Adoption of Cloud Computing

Research Question	Categories	Sub-Categories
RQ2: To what degree will NIMC's service delivery be improved by the existing ICT infrastructures?	1. Adoption Levels	1.1 Full Adoption 1.2 Partial Adoption
	2. Cloud Services Utilized	2.1 Infrastructure as a Service (IaaS) 2.2 Software as a Service (SaaS)
	3. Extent of Usage	3.1 High Usage 3.2 Limited Usage

Interview Data 2024

Category 1: Levels of Cloud Adoption

The interview results revealed this category as a crucial component for comprehending the extent of NIMC's adoption of cloud computing. Partial Adoption and Full Adoption are two of its subcategories. The explanations of these subcategories follow.

Subcategories

These subcategories are derived from the narratives of participants describing the extent to which cloud computing has been integrated into NIMC's operations.

Full Adoption

Participants highlighted instances where cloud computing has been fully integrated into the organization's processes.

- "...we have fully transitioned some of our services to the cloud, ensuring better scalability and flexibility." (Participant 1)
- "...our data storage is now entirely cloud-based, which has improved our data management practices." (Participant 2)
- "...we use cloud computing for our main operational applications, which has streamlined our processes." (Participant 3)
- "...all our new projects are designed with a cloud-first approach." (Participant 4)
- "...we rely on cloud services for most of our IT infrastructure." (Participant 5)

Partial Adoption

Participants also described areas where cloud computing has only been partially implemented, often due to various constraints.

- "...while we have moved some functions to the cloud, others are still on-premises due to security concerns." (Participant 1)
- "...certain legacy systems are not yet compatible with cloud infrastructure." (Participant 2)
- "...we have a hybrid approach, using both cloud and on-premises solutions." (Participant 3)
- "...budget constraints have limited our full adoption of cloud services." (Participant 4)
- "...we are gradually transitioning to the cloud, but it's a step-by-step process." (Participant 5)

Category 2: Types of Cloud Services Adopted

This category, which represents the particular cloud service types that NIMC has accepted, was formed from the interviews. Software as a Service (SaaS) and Infrastructure as a Service (IaaS) are two of its subcategories. The explanations of these subcategories follow.

Subcategories

These subcategories are derived from the narratives of participants regarding the specific cloud services utilized by NIMC.

Software as a Service (SaaS)

Participants noted the use of various SaaS applications to enhance their operations.

- "...we use SaaS applications for email, document management, and collaboration." (Participant 1)
- "...our HR and accounting systems are managed through SaaS platforms." (Participant 2)
- "...SaaS solutions have improved our efficiency in handling routine tasks." (Participant 3)
- "...we rely on SaaS for project management and communication tools." (Participant 4)
- "...customer relationship management is handled through a SaaS application." (Participant 5)

Infrastructure as a Service (IaaS)

Participants discussed the adoption of IaaS to support their IT infrastructure needs.

- "...we use IaaS for virtual servers and storage solutions." (Participant 1)
- "...IaaS has allowed us to scale our IT infrastructure as needed." (Participant 2)
- "...our development and testing environments are hosted on IaaS platforms." (Participant 3)
- "...using IaaS has reduced our need for physical hardware." (Participant 4)
- "...IaaS services support our disaster recovery and backup processes." (Participant 5)

Category 3: Extent of Usage

This category, which reflected the degree of cloud computing utilization at NIMC, was identified through the interviews. There are two subcategories within it: Limited Usage and High Usage. The explanations of these subcategories follow.

Subcategories

These subcategories are derived from the narratives of participants regarding how extensively cloud computing is utilized within the organization.

High Usage

Participants described scenarios where cloud computing is heavily utilized in their operations.

- "...we use cloud services extensively for data analytics and reporting." (Participant 1)
- "...most of our daily operations are cloud-based." (Participant 2)
- "...cloud computing is integral to our workflow." (Participant 3)
- "...we depend on cloud solutions for remote work and collaboration." (Participant 4)
- "...our IT strategy focuses heavily on cloud adoption." (Participant 5)

Limited Usage

Participants also mentioned areas where cloud computing usage is still minimal or in early stages.

- "...some departments are still testing cloud solutions." (Participant 1)
- "...cloud usage is limited to specific projects and tasks." (Participant 2)
- "...there is cautious adoption of cloud services in certain areas." (Participant 3)
- "...we use cloud computing sparingly due to regulatory concerns." (Participant 4)
- "...not all teams are comfortable with full cloud integration yet." (Participant 5)

4.5. Extent of available ICT infrastructures to facilitate the adoption of cloud computing in NIMC

The purpose of this objective in the study's research paper is to ascertain the justification for NIMC's adoption of cloud computing. Four categories were utilized in order to highlight the reasoning behind the adoption. Table 4.4 lists these groups along with the associated subgroups.

Table 4.4 Extent of Available Network

Research Question	Categories	Sub-Categories
RQ3: To what extent will the available ICT infrastructures facilitate the adoption of cloud computing in NIMC?	1. Cost Efficiency	1.1 Reduction in Operational Costs 1.2 Pay-as-you-go Model
	2. Flexibility and Scalability	2.1 Resource Scalability 2.2 Operational Flexibility
	3. Improved Collaboration and Accessibility	3.1 Improved Collaboration 3.2 Remote Accessibility

Interview Data 2024

Category 1: Cost Efficiency

This category emerged from the interview data as a key reason for adopting cloud computing in NIMC. It includes two subcategories: Reduced Operational Costs and Pay-as-you-go Model. These subcategories will be explained below.

Subcategories

These subcategories are derived from the narratives of participants explaining the financial benefits of adopting cloud computing.

Reduced Operational Costs

Participants highlighted how cloud computing helps in lowering operational expenses.

- "…cloud computing has significantly cut down our operational costs, especially in terms of hardware maintenance." (Participant 1)
- "…we've saved a lot on physical infrastructure and energy costs since moving to the cloud." (Participant 2)
- "…the reduction in IT expenses has been substantial with our cloud adoption." (Participant 3)
- "…cloud solutions have minimized our spending on IT resources." (Participant 4)
- "…we've noticed a drop in costs related to IT management and support." (Participant 5)

Pay-as-you-go Model

Participants noted the financial flexibility provided by the pay-as-you-go model of cloud services.

- "…the pay-as-you-go model allows us to manage our budget more effectively." (Participant 1)
- "…we only pay for the resources we use, which helps in cost control." (Participant 2)
- "…this model offers great financial flexibility and scalability." (Participant 3)
- "…pay-as-you-go helps in avoiding upfront costs for hardware and software." (Participant 4)
- "…it provides a more predictable and manageable expense structure." (Participant 5)

Category 2: Scalability and Flexibility

This category emerged from the interviews as another major rationale for adopting cloud computing in NIMC. It includes two subcategories: Resource Scalability and Operational Flexibility. These subcategories will be explained below.

Subcategories

These subcategories are derived from the narratives of participants regarding the scalability and flexibility benefits of cloud computing.

Resource Scalability

Participants discussed how cloud computing enables easy scaling of resources as needed.

- "…cloud computing allows us to scale our resources up or down based on demand." (Participant 1)
- "…we can quickly expand our storage and computing power without significant delays." (Participant 2)
- "…scalability is crucial for handling fluctuating workloads efficiently." (Participant 3)
- "…the ability to scale resources has improved our operational efficiency." (Participant 4)
- "…cloud solutions provide the flexibility to scale our IT infrastructure effortlessly." (Participant 5)

Operational Flexibility

Participants also emphasized the operational flexibility gained through cloud computing.

- "…cloud computing has introduced a lot of flexibility in our operations." (Participant 1)
- "…it allows for more dynamic and adaptive business processes." (Participant 2)
- "…our ability to respond to changes quickly has improved with cloud adoption." (Participant 3)
- "…cloud services offer the flexibility to integrate various applications easily." (Participant 4)
- "…the flexibility in managing our IT resources has been greatly enhanced." (Participant 5)

Category 3: Enhanced Collaboration and Accessibility

This category emerged from the interviews as a key rationale for adopting cloud computing in NIMC. It includes two subcategories: Improved Collaboration and Remote Accessibility. These subcategories will be explained below.

Subcategories

These subcategories are derived from the narratives of participants discussing the collaborative and accessibility benefits of cloud computing.

Improved Collaboration

Participants highlighted how cloud computing has enhanced collaboration within the organization.

- "…cloud platforms have significantly improved our internal collaboration." (Participant 1)
- "…team members can work together more efficiently using cloud-based tools." (Participant 2)
- "…collaboration across different departments has become easier with cloud adoption." (Participant 3)
- "…cloud computing facilitates better teamwork and information sharing." (Participant 4)
- "…our collaborative projects have seen a boost in productivity." (Participant 5)

Remote Accessibility

Participants also noted the benefits of remote accessibility provided by cloud computing.

- "…the ability to access our systems remotely has been a major advantage." (Participant 1)
- "…cloud computing enables our staff to work from anywhere." (Participant 2)
- "…remote access to resources has improved our operational continuity." (Participant 3)
- "…cloud solutions offer the convenience of accessing data and applications on the go." (Participant 4)
- "…the flexibility to work remotely has been greatly enhanced by cloud services." (Participant 5)

4.6. The Implications in Terms of Cost, Staff, and Maintenance in the Adoption of Cloud Computing in NIMC

Finding The difficulties in Terms of Cost, Staffing, and Maintenance in the Adoption of Cloud Computing at NIMC is the goal of this study's objectives during the research writing. Three criteria were used to categorize the implication. Table 4.5 lists these groups along with the associated subgroups.

Table 4.5 Implications in Terms of Cost, Staff, and Maintenance

Research Question	Categories	Sub-Categories
RQ4: What difficulties does NIMC face in implementing cloud computing?	1 Cost	1.1 Initial Setup Costs
		1.2 Ongoing Operational Costs
	2 Staffing Challenges	2.1 Training and Skill Development
		2.2 Changes in Staff Roles
	3 Maintenance Difficulty	3.1 System Maintenance
		3.2 Technical Support

Interview Data 2024

Category 1: Cost

This category emerged from the interview data as a significant consideration in the adoption of cloud computing in NIMC. It includes two subcategories: Initial Setup Costs and Ongoing Operational Costs. These subcategories will be explained below.

Subcategories

These subcategories are derived from the narratives of participants discussing the cost implications of adopting cloud computing.

Initial Setup Costs

Participants highlighted the initial costs involved in setting up cloud computing infrastructure.

- "…the initial cost of setting up cloud infrastructure was substantial." (Participant 1)
- "…we had to invest a significant amount upfront for the cloud setup." (Participant 2)
- "…initial setup costs were a major financial consideration." (Participant 3)
- "…the cloud infrastructure required a large initial investment." (Participant 4)
- "…we faced high costs initially when adopting cloud services." (Participant 5)

Ongoing Operational Costs

Participants also discussed the ongoing costs associated with cloud computing.

- "…there are recurring costs for maintaining cloud services." (Participant 1)
- "…we have to budget for regular payments to cloud service providers." (Participant 2)
- "…ongoing operational costs are an important factor." (Participant 3)
- "…maintaining cloud services incurs continuous expenses." (Participant 4)
- "…we need to manage the recurring costs of cloud computing." (Participant 5)

Category 2: Staffing Challenges

This category emerged from the interviews as a key consideration in the adoption of cloud computing in NIMC. It includes two subcategories: Training and Skill Development and Changes in Job Roles. These subcategories will be explained below.

Subcategories

These subcategories are derived from the narratives of participants discussing the staff implications of adopting cloud computing.

Training and Skill Development

Participants emphasized the need for staff training and skill development.

- "…we had to train our staff to effectively use cloud technologies." (Participant 1)
- "…skill development was essential for our team to adapt to the cloud." (Participant 2)
- "…cloud adoption required comprehensive staff training programs." (Participant 3)
- "…training and skill development were critical for cloud integration." (Participant 4)
- "…we invested in training our staff for cloud computing." (Participant 5)

Changes in Job Roles

Participants also noted changes in job roles resulting from cloud adoption.

- "…cloud computing led to a shift in some job responsibilities." (Participant 1)
- "…we had to redefine certain roles to align with cloud operations." (Participant 2)
- "…job roles changed significantly with the introduction of cloud services." (Participant 3)
- "…cloud adoption brought about changes in staff roles and duties." (Participant 4)
- "…the shift to cloud computing altered some job functions." (Participant 5)

Category 3: Maintenance Implications

This category emerged from the interview data as an important consideration in the adoption of cloud computing in NIMC. It includes two subcategories: System Maintenance and Technical Support. These subcategories will be explained below.

Subcategories

These subcategories are derived from the narratives of participants discussing the maintenance implications of adopting cloud computing.

System Maintenance

Participants discussed the maintenance requirements for cloud systems.

- "…cloud systems require regular maintenance to ensure smooth operation." (Participant 1)
- "…we need to continuously monitor and maintain our cloud infrastructure." (Participant 2)
- "…system maintenance is a key aspect of cloud computing." (Participant 3)
- "…regular maintenance is necessary for cloud system efficiency." (Participant 4)
- "…ongoing maintenance is essential for cloud infrastructure." (Participant 5)

Technical Support

Participants also highlighted the need for technical support in cloud computing.

- "…having access to technical support is crucial for cloud services." (Participant 1)
- "…we rely on technical support for troubleshooting and issues resolution." (Participant 2)
- "…technical support is a critical component of our cloud strategy." (Participant 3)
- "…effective technical support is necessary for cloud operations." (Participant 4)
- "…we need consistent technical support for our cloud infrastructure." (Participant 5)

5. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

The following subheadings are used to convey this chapter: summary, significant results summary, conclusion, and recommendations.

5.2. Summary of the Study

The study looked on the National Identity Management Commission (NIMC) Headquarters in Abuja, Nigeria's adoption of cloud computing technology for information management. Even with resource automation and computerization, Nigerian companies such as NIMC still confront formidable obstacles. These difficulties include inadequate maintenance, poor power generation, WAN/LAN connection reliability, low staff computer literacy, and restricted budget for information technologies. Scholars like Nok (2006), Adegbore (2010), and Gbadamosi (2012) have brought attention to these problems, which highlight the need for a more dependable and secure information management system.

One possible remedy for these problems has been identified: cloud computing. It has advantages including lessened effects from tech-related issues, better data exchange, no need for local storage and maintenance, and more security. The purpose of this study was to investigate how much NIMC has embraced cloud computing and how it resolves problems with automation and physical resource management.

Since the NIMC Headquarters in Abuja is the primary location for cloud computing management, the study's scope was restricted to this location. Because of the qualitative methodology used in the study, important staff members working with cloud computing at NIMC were able to share their experiences and thoughts in great detail. The Director of Enterprise Service & Network Infrastructure and four employees from the Information Technology (IT) division made up the target population.

Digital recorders were used, together with semi-structured interviews and direct observations, as data collection techniques. The purpose of the semi-structured interviews was to learn more about NIMC's current computer networks, the benefits of cloud computing, the information services it offers, and the associated staffing, maintenance, and cost considerations.

5.3. Summary of Major Findings

The study's main findings regarding the National Identity Management Commission's (NIMC) Headquarters in Abuja, Nigeria's adoption of cloud computing technologies for information management are covered in this section.

According to the report, NIMC is overly dependent on its small WAN/LAN infrastructure and local servers, both of which have security flaws and dependability problems. Environmental causes, device failures, and power outages frequently cause disruptions to network connections. The necessity for a more dependable and secure network infrastructure was brought up by the participants; cloud computing may be able to meet this need.

At NIMC, cloud computing adoption is still in its infancy and has not yet reached its full potential. Another important obstacle to widespread adoption is financial constraints. Additionally impeding the adoption process is the requirement for specialist technical expertise.

Improved data security was mentioned by participants as the main justification for using cloud computing. One important advantage that was noted was the reduction in long-term costs. Additionally, by lessening the load of maintaining technology, cloud computing is viewed as a way to increase operational efficiency.

Cloud services enable better data accessibility, backup options, and effective data storage. Employees can work together more successfully and access information remotely thanks to cloud

computing. Participants reported feeling less worried about losing data in the event that cloud storage hardware malfunctions.

Adoption of cloud computing requires a substantial initial expenditure. For cloud services, ongoing financial commitments are necessary. Continuous training is necessary to give employees the abilities they need to manage

5.4. Conclusions

The analysis came to the conclusion that although NIMC's use of cloud computing has many advantages, there are drawbacks that must be taken into consideration. These include the necessity for continuing maintenance, the demand for professional labor, and financial limitations. However, cloud computing has the potential to greatly improve NIMC's information management and operational efficiency with proper installation and management.

The important findings are discussed, highlighting the possible advantages and difficulties of NIMC's cloud computing adoption. While there are many benefits to cloud computing, like cost savings, operational efficiency, and data security, there are drawbacks as well, including maintenance, staff training, and financial investment. The study comes to the conclusion that NIMC can effectively solve current difficulties and improve its information management capabilities by utilizing cloud computing, provided it is planned and managed properly.

5.5. Recommendations

The following suggestions are made based on the main findings of the research conducted at the National Identity Management Commission (NIMC) Headquarters in Abuja, Nigeria, on the usage of cloud computing technologies for information management:

1. Increasing Funding for Cloud Computing Investment: To cover the upfront and continuing expenses related to the use of cloud computing, NIMC should look for additional financing sources, both governmental and non-governmental.
2. Improving Technical Training and Capacity Building: In order to provide its employees with the technical know-how needed for efficient cloud computing administration, NIMC should put in place a thorough training program.
3. Enhancing Network Infrastructure and Security: In order to facilitate the incorporation of cloud computing, NIMC should modernize its current network infrastructure and put strong security measures in place.
4. NIMC should carry out a thorough cost-benefit analysis before implementing cloud computing in order to assess the long-term financial and operational effects of doing so.
5. Creating a Strategic Plan for the Adoption of Cloud Computing: NIMC needs to create a plan that outlines the cloud computing adoption in phases and includes timetables, goals, and KPIs (key performance indicators).

5.6. Suggestions for further Studies

Adoption of cloud computing technology among Nigerian government agencies.

Adoption of cloud computing technology in the economy's public and private domains.

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