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Leveraging Cloud Computing Technology for Efficient Students' Data Management in Niger Delta University

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Abstract
This study examines the role of cloud computing in enhancing the efficiency of students' data management at Niger Delta University (NDU). The study employed a descriptive survey design, targeting ICT personnel and exam officers, with a sample size of 86 respondents. Data were collected using structured questionnaire and analyzed using Pearson correlation to determine relationships between cloud computing adoption and student data management outcomes. The results revealed a statistically significant moderate positive relationship between cloud computing and student data accessibility ($r = 0.491$, $p < 0.01$), as well as student data safety ($r = 0.507$, $p < 0.01$), indicating that cloud adoption substantially improves both the ease of access and security of student records. The study concludes that leveraging cloud technologies offers a viable pathway to enhance administrative efficiency and data security at NDU. Recommendations include phased cloud adoption, investment in ICT infrastructure, capacity-building for staff, and the establishment of governance frameworks to ensure data privacy and compliance with regulatory standards.

Keywords: Cloud computing, Student Data Management, Accessibility, Safety,

Introduction

The management of students' data has become a critical administrative function in higher education, influencing decision-making, resource allocation, academic planning, and the protection of sensitive personal information. Traditional on-premises student information systems (SIS) employed by many universities in Nigeria, including Niger Delta University (NDU), have often been characterized by fragmented databases, manual record-keeping, and limited interoperability between units (Adebayo, 2018). These legacy approaches create inefficiencies such as duplicate records, prolonged response times for information retrieval, and heightened risk of data loss or unauthorized access (Okoye & Ibrahim, 2019). In a context where student populations are expanding and administrative tasks are increasing in complexity, the limitations of conventional data management systems undermine institutional effectiveness and the quality of student services.

Cloud computing has emerged globally as a transformative technology with the potential to address many of the constraints of traditional SIS. Defined broadly as the delivery of computing services such as servers, storage, databases, networking, software, analytics, and intelligence, which is needed to perform tasks over the internet, cloud computing offers scalability, cost-efficiency,

ubiquitous access, and enhanced disaster recovery capabilities (Mell & Grance, 2011; Alhassan & Musa, 2020). For universities, cloud-based Student Information Systems enable real-time access to centralized student records, automated backup and recovery, role-based access control, and integration with other campus systems such as learning management systems (LMS), finance, and human resources (Khan & Al-Badarneh, 2020). These attributes make cloud solutions particularly attractive for institutions seeking to improve data accuracy, reduce administrative overhead, and support remote learning and digital service delivery.

In the Nigerian higher education environment, the adoption of cloud technologies has been uneven. While some universities have piloted cloud-hosted services for email, learning platforms, and document storage, comprehensive migration of sensitive administrative systems to the cloud has been slower due to concerns over data sovereignty, funding constraints, limited ICT skills among staff, and unreliable internet infrastructure (Eze & Chinedu, 2020; World Bank, 2019). Moreover, institutional policies and regulatory guidance regarding the storage and protection of student data in cloud environments are still evolving, which complicates procurement decisions and risk assessments (Okafor, 2021). Nonetheless, several case studies from comparable institutions indicate that when properly planned and governed, cloud adoption can yield measurable improvements in service delivery, operational resilience, and cost predictability (Smith & Okafor, 2020).

Empirical studies from African universities point to several tangible benefits from cloud adoption for student data management: improved data integrity and accessibility, faster administrative workflows (e.g., registration, transcript requests), reduced on-campus hardware costs, and enhanced disaster recovery capabilities (Mensah & Boateng, 2018; Afolabi, 2020). Equally important are the institutional factors that mediate these benefits such as governance structures, staff competence, internet and power infrastructure, and legal frameworks for data protection (Chukwu, 2019). Thus, while cloud solutions can provide technical affordances, the realization of efficiency gains depends on organizational readiness and appropriate change management strategies.

Given these considerations, the present study seeks to explore how cloud computing technology can be leveraged to improve students' data management at Niger Delta University. The research aims to examine the current state of students' data management practices at NDU, identify the operational and technical gaps that impede efficiency, evaluate the perceived benefits and risks of cloud-based migration among stakeholders, and propose a contextually appropriate implementation framework. By situating the investigation within both local institutional realities and broader scholarly debates, the study intends to generate practical recommendations that support informed decision-making at NDU and contribute to the literature on cloud adoption in higher education in developing contexts.

Problem Statement

The effective management of students' data is foundational to academic administration, yet Niger Delta University currently contends with multiple, interrelated problems that compromise data quality, responsiveness, and security. First, NDU's prevailing data management processes remain largely decentralized and heavily dependent on manual interventions such as paper records, spreadsheets, and disparate departmental systems, which create inconsistencies and duplication across student records (Adebayo, 2018; Okoye & Ibrahim, 2019). Such fragmentation leads to

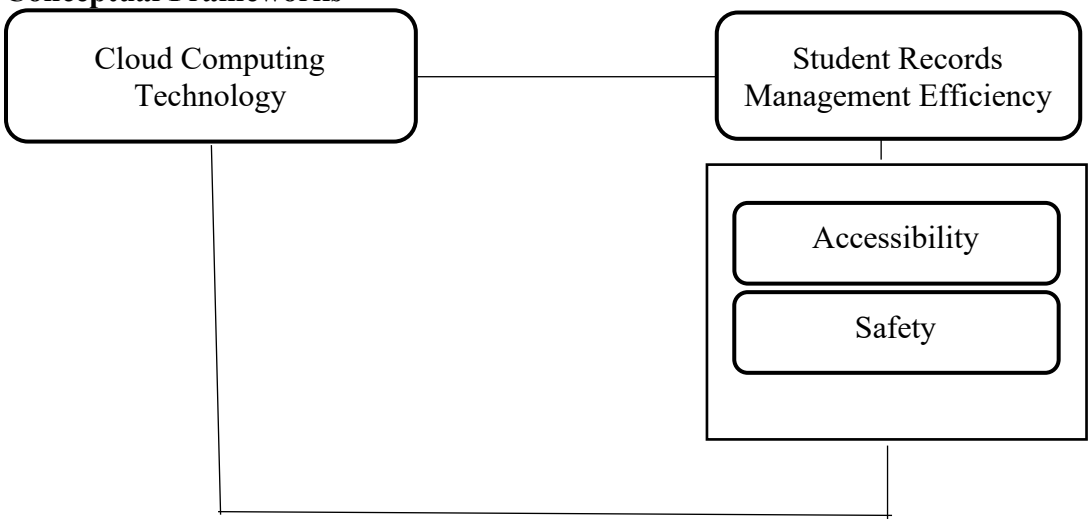
frequent delays in routine administrative tasks (e.g., registration verification, transcript issuance, graduation processing) and increases the workload of administrative staff, diverting human resources from more strategic functions (Mensah & Boateng, 2018).

Second, the university's limited ICT infrastructure and constrained maintenance budgets have led to challenges with system availability and data backups. On-premises servers and local databases are vulnerable to hardware failures, power outages, and inadequate backup protocols, increasing the risk of data loss or prolonged service outages that disrupt academic activities (Eze & Chinedu, 2020). Third, the absence of a unified, secure, and auditable student information system complicates compliance with data protection obligations and risk management. With increasing attention to privacy and legal accountability, NDU's current arrangements may expose the institution to reputational and legal risks, especially if student data were to be breached or mishandled (Adetunji, 2021; Okafor, 2021).

Fourth, stakeholders' limited awareness of cloud computing's capabilities and the perceived risks associated with outsourcing data storage to third-party providers have slowed institutional momentum toward modernizing data management. Academic and administrative staff often express concerns about data sovereignty, vendor lock-in, hidden costs, and the reliability of internet connectivity required for cloud operations (Chukwu, 2019). These perceptions, coupled with weak institutional policies and a lack of cloud governance frameworks, create an environment of uncertainty that inhibits investment and strategic planning.

Finally, the broader socio-technical environment in which NDU operates is characterized by unstable power supply, variable broadband access in the Niger Delta region, and competing budgetary priorities, raises legitimate questions about the feasibility and sustainability of cloud migration if implemented without careful planning (World Bank, 2019; Afolabi, 2020). There is therefore a pressing need for empirical research to clarify whether, how, and under what conditions cloud computing can deliver meaningful efficiency gains for students' data management at NDU. However, the core problem this study addresses is the lack of an efficient, secure, and scalable students' data management system at Niger Delta University and the institutional uncertainty about adopting cloud computing as a viable solution.

Conceptual Frameworks



Source: Okoye & Ibrahim (2019).

Aim and Objectives

The general aim of the study is to investigate the relationship between cloud computing technology for efficient students' data management in Niger Delta University. However, the specific objectives of the study are to;

1. Determine the relationship between cloud computing technology and students' data accessibility in Niger Delta University.
2. Examine the relationship between instant cloud computing technology and students' data safety in Niger Delta University.

Hypotheses

The following null hypotheses was formulated to guide the study.

H_{01}: There is no significant relationship between cloud computing technology and students' data accessibility in Niger Delta University.

H_{02}: There is no significant relationship between cloud computing technology and students' data safety in Niger Delta University.

Conceptual Review

Cloud Computing Technology

One of the most revolutionary developments of the modern digital age, cloud computing has changed the way people, organisations, and governments store, retrieve, and analyse data. Rather than depending on local servers or personal computers, cloud computing essentially means delivering computing resources including storage, databases, networking, software, analytics, and artificial intelligence over the internet. Thanks to this technology, a cost-effective, versatile, and scalable platform is available to help small businesses and major corporations better manage their operations (Mell & Grance, 2011). New business models have emerged, and digital transformation has accelerated, in many industries, thanks to on-demand access to computer power and storage.

Utility computing, which provides computational resources like power or water, is where the idea of cloud computing first emerged. A key component of cloud services has been the infrastructure provided by tech giants like Amazon, Google, and Microsoft. This allows smaller businesses to have access to the same amount of computing power as larger corporations, but without the expense of owning and maintaining physical data centres (Armbrust et al., 2010). According to Mell and Grance (2011), cloud computing is described by the National Institute of Standards and Technology (NIST) as a model that allows users to have easy, on-demand access to a shared pool of configurable computing resources. These resources can be quickly provisioned and released with minimal administration effort. The key features of the technology are outlined in this definition: measurable service, on-demand self-service, quick elasticity, resource pooling, and extensive network connectivity.

Organisations now have more leeway in how they implement cloud computing thanks to the variety of deployment types available, including public, private, hybrid, and community. While third-party companies own and run public clouds that anybody can access, a single organisation has more control and security over its own private cloud. While community clouds cater to groups with common interests or goals, hybrid clouds mix public and private models to help organisations strike a compromise between security and scalability. According to Marinescu (2017), these

models make it possible for organisations to embrace cloud solutions that align with their specific requirements, financial constraints, and regulatory frameworks.

The reduction of expenses is a major benefit of cloud computing. A large initial investment, as well as continuing expenditures for maintenance and upgrades, were associated with traditional computers. Cloud computing, on the other hand, has a pay-as-you-go model, so customers only pay for the resources they really utilise. The accessibility to sophisticated computing resources has been made more affordable, which has opened up formerly dominant markets to small and medium-sized businesses (Dillon, Wu & Chang, 2010). In addition, businesses may easily adapt their computer resources to meet fluctuating demands thanks to the scalability of cloud platforms, which helps to decrease operational waste and maximise operational efficiency.

The use of the cloud not only reduces overhead but also boosts efficiency and teamwork. When users put their data and apps on the cloud, they can access them from any device, anywhere, as long as they have an internet connection. In this era of globalised commercial operations and remote work, where teams are spread out across multiple areas, this has been especially useful. Google Workspace, Microsoft 365, and Zoom are just a few examples of collaboration applications that depend significantly on cloud infrastructure to facilitate real-time communication, file sharing, and project management (Buyya, Vecchiola & Selvi, 2013). Because of the accessibility options, e-learning, telemedicine, and RPM systems have all been game-changers in the medical and educational fields.

Concerns about data safety in the cloud continue to spark heated discussions. Even though providers use cutting-edge security methods like intrusion detection, identity management, and encryption, worries about data breaches, unauthorised access, and control loss of critical information continue. Cloud companies are under increased pressure to comply with data privacy requirements due to regulatory frameworks like the General Data privacy Regulation (GDPR) (Subashini & Kavitha, 2011). However, a lot of people think that top cloud providers have more invested in security-related infrastructure and knowledge than most organisations do, therefore they can usually give greater security.

The ability of cloud computing to encourage new ideas is another major perk of this technology. Research and development in many different industries has been sped up thanks to the availability of cloud-based platforms and technologies. As an example, cloud computing enables AI, machine learning, and big data analytics—all of which depend on extensive computational resources. Businesses may optimise their supply networks, forecast market trends, and learn more about customer behaviour by processing massive databases. Cloud computing has revolutionised genomic research and personalised medicine by streamlining the analysis of massive genetic databases (Marinescu, 2017). Cloud computing has also been adopted by governments as a means to enhance public services, such as e-governance apps and disaster management systems.

Cloud computing also shows promise in the area of environmental sustainability. Cloud computing lowers energy consumption and the requirement for redundant hardware by consolidating IT infrastructure into centralised data centres. According to Armbrust et al. (2010), major cloud providers are making strides in powering their data centres with renewable energy. This helps with worldwide efforts to minimise carbon footprints. Despite data centres' high power consumption, they are often more energy efficient than older IT systems, which reduces their total environmental effect.

Cloud computing has many advantages, but it also has certain problems. When information is kept across nations with different legal systems, data privacy becomes even more of a worry. Another problem that may make migration and flexibility harder is vendor lock-in, which happens when

businesses rely too much on the technology of just one source. Furthermore, areas with inadequate digital infrastructure face challenges in adopting cloud services due to the requirement for consistent and fast internet connectivity. According to Dillon, Wu, and Chang (2010), these difficulties can only be solved via continuous innovation, regulation, and investment in digital infrastructure.

It is believed that cloud computing technology will keep developing in tandem with new technologies in the years to come. Complementing cloud systems, edge computing improves efficiency and reduces latency by moving processing closer to data sources like IoT devices. Similarly, cloud platforms should expect to see improvements to their capabilities and applications from developments in AI, blockchain, and quantum computing. By bringing these technologies together, we can build computing environments that are smarter, safer, and more responsive, which will enable digital transformation in all parts of society.

A new era in the distribution, utilisation, and management of computer resources has dawned with the advent of cloud computing. In terms of efficiency, sustainability, innovation, security, cost, and scalability, it offers substantial benefits. Cloud computing has the ability to revolutionise sectors and enhance digital infrastructure worldwide, but it also comes with some difficulties that need to be handled, such as data protection, vendor lock-in, and connection. Cloud computing is already a mainstay of the internet economy and will continue to play a pivotal role in driving innovation in the years to come as more and more businesses and people use it (Buyya, Vecchiola & Selvi, 2013).

Students' Data Management

Students' data management denotes the systematic process of gathering, storing, organising, analysing, and securing information pertaining to learners inside educational institutions. It includes data produced from academic, administrative, financial, and extracurricular activities. As educational institutions progressively use digital technology, the quantity and diversity of student data expand, rendering efficient data management a crucial aspect of educational administration. Student data may encompass personal information like names, addresses, and demographics; academic information such as grades, attendance, and performance records; in addition to behavioural, financial, and health-related statistics. The effective management of this information is essential for academic and institutional objectives, as well as for adhering to regulatory mandates and protecting students' rights (Selwyn, 2014).

The principal aim of student data management is to facilitate academic advancement and enhance administrative efficacy. By preserving precise academic records, institutions can assess students' performance throughout semesters, oversee progress towards graduation, and furnish transcripts as required. In the absence of dependable data systems, inaccuracies in grading, course registration, or academic progression may arise, thereby impacting students' academic results and opportunities (Alhassan & Sammon, 2019). Institutions implementing contemporary student information systems (SIS) can consolidate records, facilitating effortless access for authorised personnel and students. This centralisation enhances transparency and minimises information duplication, guaranteeing that records are consistent and current.

Beyond academic record-keeping, student data management facilitates essential support services for schools and institutions. Attendance data and performance records can be analysed to identify pupils at risk of attrition or subpar performance. Proactive measures, such counselling, academic help, or financial aid, might be instituted to mitigate issues prior to their escalation. Learning management systems (LMS) like as Blackboard, Moodle, and Canvas gather interaction data that indicates student engagement with course materials and examinations. This information allows

educators to create more tailored learning experiences, improving student engagement and performance (Ferguson, 2012). The proficient utilisation of this data enhances retention rates and overall institutional efficacy.

The amalgamation of data management and digital platforms has transformed schooling in recent years. Students can utilise online portals to enrol in courses, retrieve results, remit payments, and correspond with faculty members. This digital transition alleviates administrative impediments and affords students convenient access to vital services. Furthermore, data analytics technologies enable institutions to examine extensive datasets for strategic decision-making. Patterns in enrolment and dropout rates can guide policy modifications, curriculum revisions, and resource distribution. Educational institutions are progressively employing predictive analytics to anticipate student requirements and formulate evidence-based treatments (Pardo & Siemens, 2014).

Student data management plays a crucial role in institutional accountability and compliance. Governments, accrediting organisations, and financing entities mandate precise reporting on enrolment statistics, graduation rates, financial aid allocation, and employment results. Institutions that fail to generate reliable data jeopardise their legitimacy, accreditation, or financial backing. Demonstrating student success and institutional performance with credible data boosts the reputation of educational organisations, facilitating the attraction of students, staff, and collaborations (Batty, 2020).

The administration of student data presents considerable ethical and security issues. Educational institutions manage sensitive personal information, such as health records and financial data, rendering them susceptible to hackers. Data breaches may lead to identity theft, financial fraud, and reputational harm for both students and institutions. To counteract these threats, educational institutions must implement robust cybersecurity safeguards, including data encryption, firewalls, and multi-factor authentication. They must adhere to data protection regulations, including the Family Educational Rights and Privacy Act (FERPA) in the United States and the General Data Protection Regulation (GDPR) in Europe, which establish stringent guidelines for the collection, storage, and dissemination of personal data (Romero, Ventura & García, 2020).

In addition to security, the ethical utilisation of student data is of paramount significance. The growing dependence on data-driven decision-making prompts apprehensions over student privacy and autonomy. Extensive monitoring of online learning activities may engender a perception of surveillance, thereby undermining students' trust in institutions. Moreover, biases inherent in data analytics platforms can unintentionally disfavour specific groups of students. Predictive models constructed from biassed datasets may perpetuate existing inequities instead of mitigating them (Williamson, 2017). Institutions must consequently implement transparent data governance policies that explicitly delineate the methods of data collection, use, and protection. Engaging students in dialogues around data rights and privacy fosters trust and guarantees that data practices honour their dignity and liberties (Prinsloo & Slade, 2014).

The potential of student data management transcends academic administration, influencing larger educational research and policy formulation. Data gathered from student demographics offers significant insights on social trends, learning behaviours, and the effects of educational initiatives. Researchers can utilise this information to assess the efficacy of instructional methods, establish innovative pedagogical strategies, and create inclusive educational initiatives. Furthermore, alumni data can be used to monitor graduate results, thereby informing curriculum development and aligning educational programs with labour market requirements (Shum & Ferguson, 2012).

Student Data Accessibility

Access to student data is a crucial element of contemporary education, guaranteeing that authorised personnel, including students, instructors, and administrators, can efficiently and securely retrieve necessary information. The proliferation of digital technology and online platforms, including Student Information Systems (SIS) and Learning Management Systems (LMS), has revolutionised the management of student records, academic progress, and administrative data. Accessibility enables students to manage their educational experience, encompassing course registration, grade verification, and tracking graduation prerequisites. Institutions enhance transparency and minimise service delivery delays by facilitating direct access to personal records (Selwyn, 2014).

Accessibility is fundamental to improving teaching and learning. Accessible data offers instructors essential insights into student engagement and performance. LMS solutions monitor student engagement with course material, enabling educators to recognise underperforming learners and formulate specific interventions. This corresponds with the expansion of learning analytics, wherein available data empowers schools to customise teaching and enhance student retention rates (Ferguson, 2012). Administrators also get advantages, since access to enrolment statistics, demographic information, and graduation rates facilitates resource distribution, policy formulation, and institutional responsibility. Reports derived from available data enhance credibility with accreditation organisations and financial entities (Batty, 2020).

The COVID-19 pandemic highlighted the significance of accessibility as institutions transitioned to online and hybrid education. Students extensively utilised digital tools for accessing lectures, examinations, and administrative functions. Nonetheless, disparities in internet access and digital gadgets underscore that accessibility is not solely a technology concern but also an issue of equity. Neglecting the digital divide jeopardises efforts to mitigate educational inequality (Daniel, 2020).

Notwithstanding its advantages, accessibility encounters obstacles including data saturation, privacy issues, and technological inequities. Ensuring extensive access for students must be coupled with robust protections to avert unauthorised usage or breaches. Furthermore, students and staff may find it challenging to analyse intricate data without sufficient training or visualisation tools (Romero, Ventura & García, 2020). Institutions must consequently develop systems that are accessible, fair, and secure. Access to student data improves openness, efficiency, and involvement in education. Although it facilitates personalised learning and informed decision-making, institutions must also confront difficulties pertaining to privacy, digital inequality, and usability. Effectively administered, accessibility enhances the capabilities of all stakeholders and fortifies institutional performance.

Student Data Safety

Student data safety pertains to the safeguarding of learners' personal, academic, and financial information against unauthorised access, misuse, or breaches. As educational institutions progressively digitise their operations, they accumulate substantial quantities of sensitive information, including addresses, health records, and payment details. This data renders universities and schools appealing targets for hackers, underscoring the necessity for robust security measures. Data security guarantees adherence to legislation while safeguarding students' confidence in their institutions (Prinsloo & Slade, 2014).

Encryption, secure authentication, and firewalls serve to thwart unauthorised access. Role-based access control is crucial, as it restricts exposure by permitting only authorised personnel to access

certain categories of information. For example, instructors may evaluate academic performance, whereas financial officials manage billing information. Consistent system updates and security audits enhance defences against threats (Romero, Ventura & García, 2020).

The Family Educational Rights and Privacy Act (FERPA) in the United States and the General Data Protection Regulation (GDPR) in Europe impose stringent criteria for the collection, storage, and dissemination of student data. These statutes confer rights to students about their personal information and establish penalties for institutions that do not adhere to compliance. Compliance with such frameworks fosters accountability and enhances trust in institutional procedures (Williamson, 2017).

Nevertheless, the assurance of safety must be reconciled with accessibility. Increased data dissemination correlates with elevated exposure risks. Institutions frequently have difficulties in safeguarding third-party platforms, such as cloud storage or online learning tools, which may exhibit disparate security requirements. Moreover, the emergence of artificial intelligence and predictive analytics engenders ethical dilemmas around bias and equity in the use of student data (Alhassan & Sammon, 2019).

Establishing a culture of safety necessitates instructing staff and students on acceptable data practices. Even the most secure systems can be compromised by human mistake, including inadequate passwords or phishing schemes. Training initiatives, explicit policies, and transparency around data utilisation are essential for cultivating trust and accountability. The safeguarding of student data is crucial for preserving sensitive information and upholding institutional integrity. By integrating technology protections, legal adherence, and ethical accountability, schools can guarantee the security of student data while effectively fulfilling educational objectives.

Theoretical Underpinning

This study's theoretical framework on utilising cloud computing technology for effective student data management at Niger Delta University (NDU) is based on three interconnected theories: the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and the DeLone and McLean Information Systems Success Model. These theories offer a framework to comprehend the behavioural and organisational elements affecting the uptake and efficacy of cloud-based solutions in higher education.

Technology Acceptance Model (TAM)

The Technology acceptability Model (TAM), proposed by Davis (1989), asserts that technology acceptability and utilisation are predominantly determined by two factors: perceived usefulness (PU) and perceived ease of use (PEOU). Within the framework of NDU, personnel and administrators are inclined to embrace a cloud-based student information system if they recognise its use in improving the efficiency, accuracy, and accessibility of student records, and if the system is regarded as user-friendly with minimum technical challenges. This paradigm emphasises the significance of user perceptions, training, and system design in promoting adoption.

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) augmented the Technology Acceptance Model by integrating supplementary categories like performance expectancy, effort expectancy, social influence, and facilitating factors. The UTAUT approach is particularly pertinent in institutional environments such as NDU, where collective attitudes, peer influence, and the provision of infrastructural

support (including reliable internet connectivity and ICT resources) affect adoption decisions. If university leadership and colleagues robustly support cloud computing use, and if conducive conditions such as ICT training and dependable connectivity exist, then the probability of successful adoption markedly increases.

DeLone and McLean Information Systems Success Framework

DeLone and McLean (1992, revised in 2003) introduced a model delineating system quality, information quality, and service quality as essential factors affecting user satisfaction and overall organisational benefits. The efficacy of cloud-based student data management at NDU will hinge on the technical excellence of the cloud platform (e.g., dependability, scalability, security), the precision and promptness of student information, and the responsiveness of service providers. This model highlights that the genuine success of cloud adoption lies not merely in installation, but in enduring user happiness and measurable enhancements in administrative efficiency.

The combination of TAM, UTAUT, and the Information Systems Success Model offers a comprehensive framework for examining the factors influencing and hindering cloud computing adoption at NDU. TAM and UTAUT concentrate on individual and organisational acceptance behaviours, whereas the DeLone and McLean model highlights post-adoption outcomes and system efficacy. The use of these theories enables the study to encompass both the attitudinal and structural aspects of cloud adoption, providing a thorough foundation for evaluating readiness, acceptance, and sustainability.

The study positions cloud computing adoption as a socio-technical process, driven by user attitudes, institutional support, system design, and service outcomes, rather than solely a technical update. This integrated framework establishes the conceptual basis for analysing the opportunities and difficulties related to utilising cloud computing for effective student data management at Niger Delta University.

Empirical Studies

Several empirical studies have investigated the function of cloud computing in data management within higher education, offering insights pertinent to Niger Delta University. Mensah and Boateng (2018) examined the impact of cloud adoption on administrative efficiency and data integrity in Ghanaian universities. Their findings indicated that institutions utilising cloud-based technologies diminished student record duplication and enhanced the efficiency of registration and transcript issuing. The research highlighted infrastructural preparedness and ICT training as critical factors for success.

Afolabi (2020) examined the implementation of cloud solutions at Nigerian polytechnics. The research demonstrated that cloud computing substantially lowered expenses related to server upkeep and manual documentation, while simultaneously improving data security via automated backup and recovery processes. Nonetheless, insufficient internet bandwidth and sporadic power supply were identified as significant obstacles.

Chukwu (2019) investigated staff perceptions regarding the adoption of cloud computing within a sample of Nigerian federal colleges. Findings revealed that although personnel acknowledged the prospective advantages of cloud systems, apprehensions around data protection, sovereignty, and reliance on vendors hindered comprehensive implementation. The report emphasised the necessity for robust governance systems and national regulatory assistance to cultivate confidence.

Okafor (2020) conducts a comparative case study of two Nigerian state institutions, evaluating the consequences of partial migration to cloud-hosted student information systems. The results indicated quantifiable enhancements in student happiness, expedited processing of academic records, and improved disaster recovery capabilities. Nonetheless, inadequate ICT literacy among personnel hindered the complete attainment of cloud advantages.

Research by Alhassan and Musa (2020) on Saudi Arabian universities revealed that cloud-based data systems facilitated scalability and flexibility, particularly in response to the rapid increase in student populations. The study indicated that institutions employing cloud solutions achieved enhanced integration of administrative and academic systems, hence minimising data entry redundancies and augmenting efficiency in resource allocation.

Eze and Chinedu (2020) examined the obstacles and opportunities associated with the implementation of cloud computing in Nigerian higher institutions. Their findings indicated that although adoption was frequently impeded by unstable internet infrastructure, organisations employing hybrid cloud models attained enhanced resilience and decreased costs. The report advocated for incremental implementation and capacity enhancement as effective solutions.

These empirical studies collectively highlight the capacity of cloud computing to revolutionise students' data management through enhanced efficiency, security, and accessibility. They also disclose persistent obstacles like infrastructural deficiencies, restricted ICT literacy, and governance issues. The findings indicate that for Niger Delta University, although cloud adoption offers potential efficiency improvements, meticulous planning, capacity enhancement, and supportive policies are essential for sustainable execution.

Methodology

This research employed a descriptive survey methodology to examine the feasibility of utilising cloud computing for effective student data management at Niger Delta University (NDU). The population consists of ICT staff and exam officers from Niger Delta University who directly or indirectly engage with student data management systems. The research chose 104 people from the target population to constitute the study sample size. This research mostly utilised primary data obtained via structured questionnaires. Cronbach's Alpha was employed to assess reliability, conforming to Nunnally's 1978 threshold of 0.7. Inferential statistics, namely the Pearson Moment Correlation Coefficient, was employed to examine the link among the study variables (Gujarati & Porter, 2020; Pallant, 2020). The Statistical Package for the Social Sciences (SPSS) version 23 was employed for data analysis.

Analysis, Results and Discussions

From the administered questionnaire of 104, eighty-sic (86) was retrieved, coded, input, and analysed using Pearson Product Moment Correlation to test the hypotheses. Each hypothesis was tested at a 0.01 significance level to establish statistical relevance, enabling a clear interpretation of the correlation between the variables under study.

Table 1: Correlational Outcome between Cloud computing and Student data accessibility in a Niger Delta University.

Correlations			
		Cloud computing	Accessibility
Cloud computing	Pearson Correlation	1	.491**
	Sig. (2-tailed)		.000
	N	86	86
Accessibility	Pearson Correlation	. 491**	1
	Sig. (2-tailed)	.000	
	N	86	86

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output, 2025.

The result in Table 1 indicates a moderate positive correlation (r = 0.491) between cloud computing and student data accessibility at Niger Delta University, which is statistically significant at the 0.01 level (p = 0.000), implying that increased adoption of cloud computing significantly improves the ease with which students and staff can access academic and administrative records. This finding aligns with Mensah and Boateng (2018), who observed that Ghanaian universities using cloud platforms reduced duplication of records and improved turnaround times for registration and transcripts; it is also supported by Afolabi (2020), who found that cloud solutions in Nigerian polytechnics enhanced data security and retrieval efficiency. Similarly, Smith and Okafor (2020) reported that partial cloud adoption in Nigerian universities improved student satisfaction and reduced delays in accessing records, while Alhassan and Musa (2020) confirmed that cloud systems in Saudi universities facilitated integration across platforms and widened accessibility. Taken together, these studies reinforce the evidence that cloud computing is a viable strategy for enhancing data accessibility in higher education, and the NDU result underscores its potential to address inefficiencies in student data management..

Table 2: Correlational Outcome between Cloud computing and Student data safety in a Niger Delta University.

Correlations			
		Cloud computing	Safety
Cloud computing	Pearson Correlation	1	.507**
	Sig. (2-tailed)		.000
	N	86	86
Safety	Pearson Correlation	.507**	1
	Sig. (2-tailed)	.000	
	N	86	86

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output, 2025.

The result in Table 2 shows a moderate positive correlation (r = 0.507) between cloud computing and student data safety at Niger Delta University, which is statistically significant at the 0.01 level (p = 0.000), indicating that the adoption of cloud computing significantly enhances the protection and security of student records within the institution. This finding resonates with Afolabi (2020), who reported that Nigerian polytechnics using cloud solutions experienced reduced risks of data

loss through automated backup and recovery systems, and with Chukwu (2019), who noted that staff perceived cloud computing as a means to strengthen data protection despite concerns over sovereignty and vendor dependence. Similarly, Smith and Okafor (2020) observed that universities adopting cloud-based systems enjoyed stronger disaster recovery measures and greater resilience against data breaches, while Alhassan and Musa (2020) highlighted that cloud systems in Saudi universities ensured scalability and security through role-based access control and encryption. Thus, the NDU finding confirms empirical evidence that cloud adoption not only enhances accessibility but also provides a more secure and reliable framework for managing sensitive student information.

Conclusion

This study examined the role of cloud computing in enhancing students' data management at Niger Delta University (NDU), with a focus on accessibility and safety of records. The correlational results demonstrated that cloud computing has a statistically significant and moderately positive relationship with both student data accessibility ($r = 0.491$, $p < 0.01$) and data safety ($r = 0.507$, $p < 0.01$). These findings imply that increased adoption of cloud technologies at NDU would substantially improve the efficiency of retrieving student records and strengthen their protection against loss, duplication, or breaches. The outcomes are consistent with empirical evidence from other higher education contexts, which highlight improved data integrity, accessibility, and resilience as key benefits of cloud migration. Thus, the study concludes that leveraging cloud computing is a viable and strategic pathway toward achieving efficient, secure, and scalable student data management in NDU and similar institutions in Nigeria.

Recommendations

1. NDU should gradually transition from fragmented manual and on-premises systems to cloud-based platforms to ensure smooth adaptation and minimize risks.
2. Reliable internet connectivity, adequate bandwidth, and stable power supply should be prioritized to support effective cloud operations.
3. Regular training and workshops should be organized for administrative and ICT staff to build competence in managing cloud-based systems.
4. Policies on data privacy, vendor management, and compliance with Nigeria Data Protection Regulation (NDPR) should be institutionalized to guide adoption.
5. Awareness campaigns should be carried out to address misconceptions about cloud computing, focusing on its benefits for security, efficiency, and service delivery.
6. Partnerships with reputable providers should be explored to ensure affordable, secure, and customized solutions for the university.

Contribution to Knowledge

1. The study provides empirical evidence from Niger Delta University showing that cloud computing significantly improves both the accessibility and safety of student data, reinforcing global and regional findings.
2. It highlights specific institutional challenges in the Nigerian context such as infrastructural deficits, staff capacity, and governance gaps, thereby contextualizing the broader discourse on cloud adoption in higher education.
3. The study proposes a framework of phased adoption, capacity-building, and policy development, offering practical guidance for universities in resource-constrained environments considering cloud migration.

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