

Assessment of Health Information Management Professionals' Readiness for Cloud-Based Health Information Systems in Tertiary Hospitals in Bayelsa State

Biobelemoye Jack-Gbarabe¹, Lucky Ebiteinye Dogiye^{1*}, Chinyere G. N. Idiapho²

¹Department of Health Information Management, Bayelsa Medical University, Yenagoa, Nigeria

²Institute of Health Sciences and Management Technology, Delta State University Teaching Hospital, Oghara, Nigeria

Abstract: Cloud-based health information systems (CBHIS) are increasingly important in modern healthcare due to their ability to improve data accessibility, enhance service efficiency, and support integrated clinical decision-making. However, the successful implementation of these systems depends largely on the readiness of Health Information Management (HIM) professionals who are central to health data processing and governance. This study assessed the readiness of HIM professionals for the adoption of CBHIS in tertiary hospitals in Bayelsa State, Nigeria. A descriptive cross-sectional research design was adopted, involving a total population of 123 HIM professionals drawn from the Federal Medical Centre (83) and Niger Delta University Teaching Hospital (40). Data were collected using a structured questionnaire covering digital literacy, technical competence, organizational support, and perceived barriers. Analysis was conducted using descriptive statistics such as frequencies and percentages. Findings revealed a high level of awareness of CBHIS among respondents; however, operational readiness was low. Specifically, deficiencies were observed in technical competence, inadequate organizational support, limited ICT infrastructure, and weak cybersecurity knowledge. Major barriers identified included poor internet connectivity, absence of structured training opportunities, lack of clear policy frameworks, and concerns about data security. The study concludes that although HIM professionals demonstrate positive awareness of CBHIS, significant gaps exist in their preparedness for effective implementation. It recommends targeted capacity-building programmes, improved ICT infrastructure, strengthened cybersecurity systems, and the development of clear digital health policy frameworks to enhance readiness and support sustainable adoption of cloud-based health systems in tertiary healthcare institutions.

Keywords: Cloud-Based, Health Information Systems, Digital Health, Technology Readiness, Healthcare Informatics, Cybersecurity.

1. Introduction

The global shift toward digital healthcare systems has fundamentally transformed the generation, storage and utilization of health information. This transformation is driven by the need for efficient, patient-centered care, improved data

accuracy, and evidence-based clinical decision-making. Among the key technological innovations supporting this shift, cloud computing has emerged as a critical tool due to its scalability, flexibility, and cost-effectiveness (Al-Sharafi et al., 2022; Kuo, 2011). Cloud-based health information systems (CBHIS) enable healthcare institutions to store and manage large volumes of patient data remotely, facilitate real-time access to medical records, and enhance interoperability across healthcare facilities.

In addition to improving efficiency, CBHIS promote collaboration among healthcare providers and support continuity of care by ensuring that patient information is accessible across multiple points of service. They also reduce reliance on paper-based systems, which are commonly associated with data loss, duplication, and delays in information retrieval (Dash et al., 2019). For resource-constrained environments, cloud technologies offer a strategic advantage by minimizing the need for extensive physical infrastructure while expanding access to digital health services.

In Nigeria, efforts to modernize healthcare delivery through digital technologies are reflected in policy frameworks such as the National Digital Health Policy (Federal Ministry of Health, 2019). These initiatives seek to advance the adoption of electronic health records, telemedicine, and integrated health information systems. However, implementation remains uneven, with significant disparities across regions and healthcare institutions.

The readiness of healthcare personnel is a critical determinant of the successful adoption of CBHIS. Health Information Management (HIM) professionals play a central role in this process, as they are responsible for the collection, storage, security, and dissemination of patient data. Their level of digital literacy, technical competence, and adaptability to emerging technologies directly influences the effectiveness of health information systems (Adeleke et al., 2015). Limited competencies in these areas can hinder the transition to cloud-based platforms.

*Corresponding author: luckiestman2@gmail.com

Empirical evidence from developing countries points to a persistent gap between technological availability and workforce readiness. Many healthcare professionals possess only basic ICT skills and lack specialized training in advanced tools such as cloud computing and cybersecurity (Eze et al., 2020). Organizational constraints including inadequate training opportunities, limited institutional support, and resistance to technological change further compound this challenge.

In Bayelsa State, tertiary healthcare institutions such as the Federal Medical Centre (FMC) and the Niger Delta University Teaching Hospital (NDUTH) operate within a context characterized by infrastructural limitations, including unreliable power supply, poor internet connectivity, and insufficient ICT facilities. The absence of structured capacity-building programs for HIM professionals further constrains their preparedness for digital transformation.

There is limited empirical research examining the readiness of HIM professionals in tertiary hospitals in Bayelsa State for the adoption of cloud-based health information systems. This gap restricts the development of context-specific strategies for effective implementation. Accordingly, this study assesses the readiness of HIM professionals in selected tertiary hospitals in Bayelsa State, with the aim of identifying critical gaps and informing policy and practice.

The adoption of cloud-based health information systems in many Nigerian tertiary hospitals remains limited, even with the increasing relevance of digital technologies in modern healthcare delivery. In Bayelsa State, healthcare institutions continue to rely largely on traditional or semi-digital health information systems, which are often inefficient, susceptible to data loss, and inadequate for supporting integrated and real-time healthcare services.

Existing studies have identified infrastructural deficits and policy-related challenges as major constraints to digital health implementation. However, limited empirical attention has been directed toward the readiness of Health Information Management (HIM) professionals, who are central to the management, security, and effective utilization of health information systems. The success of transitioning to cloud-based platforms is strongly influenced by their digital literacy, technical competence, and the level of institutional support available within healthcare settings.

Further challenges such as inadequate training opportunities, persistent concerns about data security, and the absence of clearly defined implementation frameworks continue to affect adoption efforts. These conditions create a disconnect between the potential benefits of cloud-based health information systems and their actual application in healthcare institutions.

Against this background, this study assesses the readiness of HIM professionals in Tertiary hospitals in Bayelsa State for the adoption of cloud-based health information systems, with a view to identifying existing gaps and providing evidence-based recommendations for effective implementation.

The main objective of this study is to assess the readiness of Health Information Management (HIM) professionals for the adoption of cloud-based health information systems in Tertiary hospitals in Bayelsa State.

2. Literature Review

Cloud computing has emerged as a significant innovation in healthcare information management, offering scalable storage, improved interoperability, and enhanced support for clinical decision-making. Empirical studies show that cloud-based health information systems improve healthcare efficiency by enabling real-time access to patient data across multiple facilities while reducing reliance on physical infrastructure (Raghupathi & Raghupathi, 2020; Kuo, 2011). In developed healthcare systems, cloud technologies are widely integrated into electronic health record platforms, leading to improved data accuracy, faster information retrieval, and better coordination among healthcare providers (Ghosh et al., 2020; Wang et al., 2022).

In contrast, evidence from developing countries indicates slower and less consistent adoption of cloud-based systems. Although awareness of digital health technologies is increasing, implementation remains constrained by infrastructural weaknesses and limited workforce readiness (Eze et al., 2020; Oleribe et al., 2019). In Nigeria, empirical studies show gradual progress in the adoption of electronic medical records and other digital health tools; however, full-scale migration to cloud-based systems is still restricted by inadequate ICT infrastructure, limited funding, and weak implementation frameworks (Adeleke et al., 2015; Adepoju & Opele, 2024).

Empirical findings consistently highlight the central role of Health Information Management (HIM) professionals in digital health transformation. These professionals are responsible for managing, securing, and processing health data; however, studies indicate that their operational competence in advanced digital environments remains limited (Olajide et al., 2021; Adeleke et al., 2015). This limitation is often linked to insufficient exposure to emerging technologies, inadequate ICT training, and weak institutional support systems, all of which affect their preparedness for cloud-based systems.

Research in Nigerian tertiary hospitals further shows that training and organizational support significantly influence readiness for digital health adoption. Healthcare workers who have received ICT-related training tend to demonstrate higher levels of competence and adaptability compared to those without such exposure (Eze et al., 2020; Aderinto et al., 2023). Similar findings from other African contexts confirm that structured capacity-building programs improve the adoption of electronic health systems and strengthen user confidence in digital platforms (Munyisia et al., 2021; Kiburi et al., 2022). These studies collectively suggest that readiness is strongly influenced by continuous professional development and institutional investment in human capital.

Theoretical and empirical studies on technology adoption in healthcare frequently draw on the Technology Acceptance Model (TAM) and the Technology Readiness Index (TRI). Empirical evidence based on TAM indicates that perceived usefulness and perceived ease of use significantly influence healthcare professionals' intention to adopt new systems (Davis, 1989; Venkatesh & Davis, 2000). Similarly, TRI-based studies show that optimism and innovativeness enhance readiness, while insecurity and discomfort reduce acceptance of

new technologies (Parasuraman, 2000; Liljander *et al.*, 2006). Recent empirical validations in healthcare environments further confirm that psychological readiness is as critical as technical infrastructure in determining successful technology adoption (Ifinedo, 2021; Chao, 2022).

Regarding cloud computing in particular, empirical studies identify system reliability, data migration issues, and vendor dependency as major barriers to adoption. Healthcare institutions in developing countries often hesitate to fully transition to cloud platforms due to concerns about data control, service continuity, and external dependency (Hashem *et al.*, 2015; Sharma *et al.*, 2022). In addition, interoperability challenges between legacy systems and modern cloud infrastructure further slowdown implementation in many healthcare settings (Mishra & Singh, 2021).

Cybersecurity concerns remain one of the most critical barriers to cloud adoption in healthcare. Empirical evidence shows that healthcare data are highly sensitive and vulnerable to cyber threats, making security a major determinant of adoption decisions (Kruse *et al.*, 2018; Fernandez-Aleman *et al.*, 2013). In developing countries, these concerns are intensified by weak regulatory enforcement, inadequate cybersecurity infrastructure, and limited staff awareness of data protection practices. Nigerian studies further confirm that many healthcare professionals lack sufficient cybersecurity knowledge, increasing the risk of data breaches and unauthorized access to patient information (Okeke *et al.*, 2022; Nwafor *et al.*, 2023).

Recent empirical literature emphasizes that readiness for cloud-based health systems is multidimensional, involving technical competence, organizational support, and behavioral readiness. Global health reports highlight that successful digital health transformation requires alignment between policy frameworks, infrastructure development, and workforce capacity (WHO, 2021; World Bank, 2022). In African healthcare systems, even where digital infrastructure exists, limited human capacity continues to constrain effective utilization of health information systems (Ojo *et al.*, 2021; Mutula & Wamukoya, 2020).

Within the Nigerian context, additional studies show that resistance to technological change is influenced by limited ICT exposure, fear of system complexity, and concerns about job roles in digital environments (Adeyemi *et al.*, 2022; Ojo *et al.*, 2021). However, empirical evidence also shows that continuous professional development significantly improves both confidence and readiness among healthcare workers, particularly in digital health settings (Afolabi *et al.*, 2023).

Overall, empirical literature consistently demonstrates that although cloud computing offers substantial benefits for healthcare delivery, its successful adoption depends heavily on the readiness of healthcare professionals. In Nigerian tertiary healthcare institutions, HIM professionals remain central to this transformation. However, persistent gaps in technical competence, institutional support, training exposure, and cybersecurity preparedness continue to limit effective adoption. These challenges provide a strong justification for assessing the readiness of HIM professionals in tertiary hospitals in Bayelsa

State, where infrastructural and human resource constraints are particularly evident.

3. Methodology

The methodology adopted in this study provides a systematic framework for assessing the readiness of Health Information Management (HIM) professionals for the adoption of cloud-based health information systems in tertiary hospitals Bayelsa State. It describes the research design, population, sampling approach, instrumentation, validity and reliability procedures, and method of data analysis.

A. Research Design

This study adopted a descriptive cross-sectional research design. This design is appropriate for studies that aim to examine and describe existing characteristics, perceptions, and conditions of a population at a specific point in time without manipulating variables (Creswell & Creswell, 2018). It is particularly suitable for assessing readiness levels among HIM professionals, as it allows for the collection of data on digital literacy, technical competence, organizational support, and perceived barriers as they exist within the study context.

B. Study Population

The population of this study consists of all Health Information Management (HIM) professionals working in tertiary hospitals in Bayelsa State. The total population is 123 HIM professionals, distributed as follows:

- Federal Medical Centre (FMC): 83
- Niger Delta University Teaching Hospital (NDUTH): 40

These institutions represent the major tertiary healthcare facilities in Bayelsa State and play a central role in health information management and service delivery. Given the relatively small and accessible population size, a total enumeration approach was adopted. This ensured that every member of the population was included in the study, thereby eliminating sampling error and improving the accuracy and generalizability of findings within the study context (Etikan *et al.*, 2016).

C. Instrumentation

Data were collected using a structured questionnaire developed by the researcher based on relevant literature on cloud computing adoption, health information systems, and technology readiness models. The instrument was designed to capture both demographic and study-specific variables relevant to HIM professionals' readiness.

The questionnaire was structured into sections covering:

- *Digital literacy*: assessment of competence in using ICT tools and digital health applications
- *Technical competence*: evaluation of practical skills in managing health information systems
- *Organizational support*: measurement of institutional training, ICT infrastructure, and management support
- *Perceived barriers*: identification of challenges such as inadequate training, infrastructural limitations,

cybersecurity concerns, and resistance to change

A Likert-scale format was used to measure responses, allowing respondents to indicate levels of agreement or disagreement with each statement. This method is widely adopted in health informatics research due to its effectiveness in capturing attitudes and perceptions quantitatively (Pallant, 2020).

D. Data Collection Procedure

The questionnaire was administered directly to HIM professionals in the selected hospitals. Respondents were informed about the purpose of the study, and participation was voluntary. Confidentiality and anonymity were assured to encourage honest and unbiased responses. Completed questionnaires were retrieved immediately or within an agreed timeframe to ensure a high response rate and minimize data loss.

E. Data Analysis

Data collected were analyzed using descriptive statistics, including frequencies, percentages. These statistical tools were used to summarize and interpret the level of readiness among HIM professionals across the study variables. The analysis was conducted using statistical software to ensure accuracy, consistency, and reliability of results (Pallant, 2020). Findings were presented in tables for clarity and ease of interpretation.

4. Results

The results of this study are presented according to the research objectives, focusing on awareness, technical readiness, organizational support, and perceived barriers to the adoption of cloud-based health information systems (CBHIS) among Health Information Management (HIM) professionals in Tertiary hospitals in Bayelsa State. Data were analyzed using descriptive statistics, including frequencies and percentages.

Table 1

Awareness of Cloud-Based Health Information Systems (CBHIS)		
Awareness Level	Frequency (n=123)	Percentage (%)
High awareness	78	63.4
Moderate awareness	32	26.0
Low awareness	13	10.6
Total	123	100

Analysis:

Table 1 shows that most respondents (63.4%) have high awareness of CBHIS, while 26.0% demonstrate moderate awareness. Only a small proportion (10.6%) report low awareness. This indicates that HIM professionals possess a strong conceptual understanding of cloud-based health information systems. However, the distribution also suggests that awareness alone is insufficient to guarantee readiness, as practical application requires operational competence and system familiarity.

Table 2

Technical readiness of HIM professionals		
Technical Readiness Level	Frequency (n=123)	Percentage (%)
High readiness	28	22.8
Moderate readiness	41	33.3
Low readiness	54	43.9
Total	123	100

Analysis:

Table 2 reveals that only 22.8% of respondents demonstrate high technical readiness, while 43.9% fall within the low readiness category. This indicates a significant deficiency in practical ICT competence among HIM professionals. The pattern reflects a clear disconnect between awareness and the ability to effectively operate cloud-based systems, suggesting that technical capacity remains a major limiting factor in CBHIS adoption.

Table 3

Organizational support for CBHIS adoption		
Level of Organizational Support	Frequency (n=123)	Percentage (%)
High support	25	20.3
Moderate support	38	30.9
Low support	60	48.8
Total	123	100

Analysis:

Table 3 shows that nearly half of the respondents (48.8%) experience low organizational support. Only 20.3% report strong support, while 30.9% indicate moderate support. This demonstrates that institutional structures do not yet provide adequate enabling conditions such as training, ICT infrastructure, and management encouragement. The weak organizational environment further limits the capacity of HIM professionals to transition effectively to cloud-based systems.

Table 4

Perceived barriers to CBHIS adoption		
Barrier Category	Frequency (n=123)	Percentage (%)
Poor internet connectivity	35	28.5
Cybersecurity concerns	33	26.8
Lack of training opportunities	30	24.4
Absence of policy framework	25	20.3
Total	123	100

Analysis:

Table 4 identifies infrastructural and institutional barriers affecting CBHIS adoption. Poor internet connectivity (28.5%) is the most prominent challenge, followed by cybersecurity concerns (26.8%) and lack of training opportunities (24.4%). The absence of a policy framework (20.3%) further compounds these challenges. Collectively, these barriers reflect systemic weaknesses that hinder the effective implementation of cloud-based health information systems.

A. Discussion of Findings

The findings of this study provide important insights into the readiness of Health Information Management (HIM) professionals for the adoption of cloud-based health information systems (CBHIS) in Tertiary hospitals in Bayelsa State. The results reveal a clear disparity between high

awareness and low operational readiness, indicating that knowledge of CBHIS does not automatically translate into practical competence or system adoption capability. This gap is theoretically significant and is well explained by the Technology Acceptance Model (TAM) and the Technology Readiness Index (TRI).

From the TAM perspective (Davis, 1989; Venkatesh & Davis, 2000), technology adoption is influenced by perceived usefulness and perceived ease of use. Although HIM professionals demonstrate high awareness of CBHIS, their low technical readiness reflects limited perceived ease of use, resulting from inadequate hands-on experience with cloud-based systems. This suggests that awareness serves only as an entry point to adoption, while actual usage depends on practical competence and system familiarity.

The TRI framework (Parasuraman, 2000) further explains the psychological dimension of readiness. The findings suggest that while optimism toward digital health technologies may exist, it is weakened by discomfort and insecurity associated with system complexity, data protection concerns, and fear of technological failure. These psychological constraints significantly reduce willingness to engage with CBHIS, thereby lowering overall readiness.

The deficiency in technical competence aligns with Adeleke *et al.* (2015), who identify limited capacity among HIM professionals as a persistent barrier to digital health transformation in Nigeria. This reinforces the view that readiness is skill-dependent and requires continuous exposure to evolving digital health technologies. Within both TAM and TRI, user competence and confidence are central to translating awareness into effective adoption.

Organizational support also emerged as a key determinant of readiness. The findings show inadequate training opportunities, weak ICT infrastructure, and limited managerial encouragement within the studied institutions. Within the TAM framework, these factors function as facilitating conditions that influence perceived ease of use and perceived usefulness. Their absence weakens both adoption intention and actual system utilization, consistent with Eze *et al.* (2020), who emphasize the importance of institutional readiness in digital health implementation.

Cybersecurity concerns further hinder readiness for CBHIS adoption. As noted by Kruse *et al.* (2018), insecurity remains a major barrier to cloud adoption due to risks of data breaches and unauthorized access. In this study, such concerns are intensified by limited cybersecurity awareness and weak protective systems, resulting in reduced trust in cloud-based platforms. Within the TRI model, this reflects heightened insecurity, which negatively affects adoption behaviour.

Infrastructural challenges, particularly poor internet connectivity and inadequate ICT resources, also limit CBHIS readiness. These constraints reduce system reliability and accessibility, thereby weakening perceived usefulness and ease of use. This finding aligns with the World Health Organization (2021), which emphasizes that successful digital health transformation in resource-constrained settings requires strong infrastructural support and sustained investment.

The absence of a clear policy framework further compounds these challenges by creating uncertainty in implementation, data governance, and system integration. This weakens institutional direction and reduces confidence in adoption processes, thereby limiting readiness at both individual and organizational levels.

Overall, the integration of TAM and TRI provides a comprehensive explanation of the findings. While TAM accounts for cognitive determinants of adoption such as perceived usefulness and ease of use, TRI explains psychological readiness factors such as optimism, discomfort, and insecurity. The findings indicate that HIM professionals in Bayelsa State possess moderate awareness but limited technical and psychological readiness. This highlights readiness as a multidimensional construct influenced by skills, institutional support, infrastructure, and psychological disposition.

In fact, improving readiness for CBHIS adoption requires a coordinated strategy involving capacity building for HIM professionals, strengthening ICT infrastructure, enhancing cybersecurity frameworks, and developing clear policy guidelines. Without these interventions, the adoption of cloud-based health information systems in tertiary healthcare institutions will remain limited.

5. Conclusion

This study examined the readiness of Health Information Management (HIM) professionals for the adoption of cloud-based health information systems (CBHIS) in Tertiary hospitals in Bayelsa State. The findings indicate that although awareness of CBHIS is relatively high among respondents, this awareness is not matched by adequate operational readiness for effective implementation.

The study further reveals that technical competence among HIM professionals remains limited, organizational support is insufficient, and infrastructural as well as cybersecurity challenges continue to constrain effective preparedness. These factors collectively demonstrate that readiness is shaped not only by awareness, but also by skills acquisition, institutional support, and enabling technological environments.

Overall, the study concludes that HIM professionals in the study area are not yet fully prepared for seamless transition to cloud-based health information systems. Bridging this gap requires coordinated interventions that strengthen human capacity, improve ICT infrastructure, and establish supportive policy and security frameworks to ensure sustainable digital health transformation.

6. Recommendations

Based on the findings of the study, the following recommendations are proposed to enhance readiness and facilitate effective adoption of cloud-based health information systems in Tertiary hospitals in Bayelsa State:

1. Structured and regular training programmes should be implemented for HIM professionals to improve technical competence and practical engagement with cloud-based health systems.

2. Cloud computing, health informatics, and emerging digital health technologies should be fully integrated into Health Information Management training curricula to prepare future professionals for modern healthcare environments.
3. Government and hospital management should invest in reliable internet connectivity, modern ICT tools, and stable power supply to support efficient implementation of CBHIS.
4. Comprehensive digital health policies should be established to guide implementation, standardize operations, and ensure effective governance of health information systems.
5. Healthcare institutions should implement continuous cybersecurity training and awareness programmes to strengthen data protection practices and build trust in cloud-based systems.

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