

DIGITAL HEALTH POLICY IMPLEMENTATION AS GOVERNANCE PRACTICE: LESSONS FROM GOMBE STATE PUBLIC HOSPITALS

Muhammad Aminu Yahaya¹, Yusuf Abdu Yusuf² Hindatu Maigari Yerima³, Naziru Mohammed Musalli⁴, Baba Mustapha⁵, Ibrahim Mohammed⁶ Hauwa Yahaya Muhammed⁷ and Lydia Yakubu⁸

^{1,5,6& 8}Department of Public Administration, Faculty of Arts and Social Sciences, Gombe State University Nigeria.

^{2, 3,4}Department of Public Administration, Faculty of Management Sciences, Sa'adu Zungur University, Bauchi State Nigeria.

⁷Department of Sociology, Faculty of Arts & Social Sciences, Gombe State University, Nigeria.

*Correspondence e-mail: aminumuhammad@gsu.edu.ng

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Abstract

This study explores digital health policy implementation as a governance practice in public hospitals in Gombe State, Nigeria. Despite national policy commitments, implementation remains fragmented in resource-constrained settings. Using an explanatory sequential mixed-methods design, we investigate how Technology, Organization, and Environment (TOE) factors influence digital health adoption. We distributed 285 questionnaires and retained 247 valid responses for Partial Least Squares Structural Equation Modeling. Quantitative results indicate that organizational readiness and policy clarity strongly predict implementation success. Qualitative findings from 32 interviews and four focus groups explain these statistical pathways. The data reveal that weak interdepartmental coordination and misaligned incentives undermine technological readiness. Furthermore, environmental instability acts as a governance multiplier that exacerbates coordination failures. This study extends the TOE framework by empirically testing governance as a mediating mechanism. We conclude that digital health success depends on formalized governance structures rather than technology alone. We recommend appointing a senior clinician as a digital health focal point and mandating clinical shadowing for IT vendors. These targeted interventions offer a pragmatic roadmap for fragile settings.

Keywords: Digital Health Governance, Policy Implementation, Public Sector Management, TOE Framework, Fragile Settings.

Introduction

Digital health has emerged globally as a transformative force, widely recognized as a critical catalyst for achieving health system resilience and effective public sector governance (WHO, 2021). Global frameworks increasingly recognize that the success of digital health programs depends not merely

on the adoption of technology but on robust structures of governance (Azubuike et al., 2025). This view emphasizes shift in thinking: from thinking of digital tools as technical solutions to understanding their implementation as a basic practice of public sector governance. In Nigeria, the healthcare system is decentralized and operates at the federal, state, and local government levels (Ajisegiri et al., 2022). The country has made a formal commitment to leveraging technology through the National Health Act (2014) and the subsequent National Digital Health Strategy (NDHS) (Federal Ministry of Health, 2014; Azubuike et al., 2025). In spite of these policy efforts, digital health implementation has remained fragmented, with persistent challenges such as inadequate infrastructure, limited state ownership, and an absence of coordinated and sustainable frameworks (Adler-Milstein et al., 2020).

A critical gap in the existing literature is the dominant focus on technical barriers such as hardware, connectivity, and digital literacy, which often obscures systemic governance failures (Brown & Miller, 2021). In many contexts, digital health policies fail not due to a lack of technology but because of weak inter-agency coordination, inadequate stakeholder engagement, and the absence of formal governance mechanisms (Azubuike et al., 2025). This study seeks to reframe digital health policy implementation as a fundamental governance practice, shifting the analytical focus toward the processes, relationships, and power dynamics that mediate policy outcomes. Gombe State falls within the resource-constrained and security-challenged North-Eastern region of Nigeria; thus, it presents a crucial test case of the viability of digital health interventions in fragile and conflict-affected settings (Exley et al., 2019; Azubuike et al., 2025). The intersection of resource scarcity, regional instability, and fragmented governance in Gombe State public hospitals provides a singular and challenging environment to explore how governance mechanisms influence the success of digital health policy implementation.

Overview of the Problem

Despite the obvious potential for digital health initiatives to transform healthcare delivery in Nigeria, implementation in public hospitals remains characterized by low adoptions, poor integration, and unsustainable results (Kabore et al., 2023). This challenge is mainly manifested through dispersed pilot projects, coupled with an overarching lack of interoperability within the existing systems (Azubuike et al., 2025; Chima & Homedes, 2016). Given such fragmentation, data is not allowed to flow freely across different systems, facilities, and locations, thus essentially compromising effective coordination of care and dampening the utility of the investments made into digitization (Hohman, 2023; Hussaini et al., 2025). Besides, most of the digital health interventions are resisted by staff due to an absence of engagement, misaligned workflow, and insufficient training, thus making them unable to scale beyond the initial pilot phases (Hussaini et al., 2025; Kaboré et al., 2023).

A root cause analysis reveals that these issues go beyond technological weaknesses. Their core part lies in fragmented governance structures and weak inter-agency coordination. The absence of formal, documented governance mechanisms for digital health at the state level limits the capacity to coordinate efforts, harmonize donor contributions, and enforce standards (Kumar & Mostafa, 2020). This situation is further exacerbated by a lack of stakeholder buy-in, wherein incentives are not aligned performance metrics are not linked with successful digital adoption, which means no accountability. Moreover, the poor adaptation of policies to local environmental realities, such as security instability and resource scarcity, further undermines implementation efforts. The urgent need, therefore, is to move beyond technical fixes to a governance-centric approach in understanding digital health policy implementation for effective health system strengthening.

Based on the Technology-Organization-Environment (TOE) framework, this study assumes that the adoption and implementation of technological innovations depend on factors related to the technological context, organizational context, and external environment (O'Connor & LaRue, 2020). Yet, an important aim of the present study is the extension of the traditional TOE model by conceptualizing digital health implementation from the perspective of governance practice. Specifically, this study addresses the following key question: How do TOE factors, mediated by governance mechanisms, influence digital health policy implementation in the public hospitals of Gombe State?

To achieve this, the study tests the following hypotheses: H1: Organizational readiness, which pertains to leadership, culture, and capacity, predicts digital health implementation success. H2: Policy implementation clarity, defined by guidelines, roles, and monitoring, predicts implementation success (Kim & Lee, 2019).

The research will go further to investigate the mediating and moderating roles of governance and environmental factors. Specifically, it asks which of the following governance mechanisms (coordination, engagement, accountability, incentives) may mediate the relationship between TOE factors and implementation success. This is formalized in the hypothesis below: H4: Perceived strength of governance mechanisms mediates the relationship between TOE factors and implementation success.

But acknowledging that this research is set within a very specific context of Northern Nigeria, a second-order question is: How do contextual environmental challenges of insecurity and resource constraints shape governance practices and policy adaptations? Consequently, this leads to H3: Environmental instability, characterized by security and resource scarcity, negatively moderates the relationship between organizational and technological factors and implementation success.

Finally, this research objective explores in-depth the lived experiences of stakeholders in terms of governance challenges; it draws from Gombe State some governance lessons that can be used to implement digital health strategies in similar fragile contexts. It integrates these research questions, objectives, and hypotheses into a robust, governance-centered analysis of the implementation of digital health policy.

Theoretical Contribution

This study makes a specific theoretical contribution by empirically testing governance as a mediating mechanism within the TOE framework. While existing literature identifies weak governance as a barrier, this research moves beyond descriptive accounts to model how coordination, accountability, and incentives translate TOE factors into implementation outcomes. Furthermore, it provides a novel contextual application by focusing on a fragile and conflict-affected setting, demonstrating how environmental instability acts as a negative moderator that amplifies internal governance deficits.

Literature Review

Conceptual Review

Two interrelated concepts lay the theoretical foundation for this study. These are Digital Health Policy Implementation and Governance Practice. They are framed by the Technology-Organization-Environment framework.

Digital Health Policy Implementation

According to the World Health Organization, digital health broadly deals with information and communication technologies for addressing health problems (WHO, 2021). In practice, digital health involves a complex translation process of national or subnational strategies into functional systems. The literature emphasizes that successful implementation requires organizational change and workforce adaptation (Azubuike et al., 2025). Poor implementation often leads to fragmented systems and poor uptake. However, current literature often treats these failures as purely technical deficits rather than systemic governance failures.

Digital Health as Governance Practice

A core conceptual premise of this research is that digital health implementation is a governance practice. Governance in this context involves the structures and processes by which authority is exercised and decisions are made (Chima & Homedes, 2016). Good governance in digital health requires coordination across multiple actors and the enforcement of standards. Poor governance manifests as fragmented coordination without clear policy. This is the primary reason for implementation failure in decentralized health systems like Nigeria (Ajisegiri et al., 2022). While

some scholars view governance merely as a contextual backdrop, this study positions it as an active mediating mechanism.

The Technology-Organization-Environment (TOE) Framework

The TOE framework provides a robust lens to analyze factors affecting technological innovation adoption (Tornatzky & Fleischer, 1990; Azubuike et al., 2025).

1. **Technological context:** This refers to internal and external technologies relevant to the firm. Examples include system quality and interoperability.
2. **Organizational Context:** This includes characteristics such as size, structure, resources, and organizational readiness.
3. **Environmental Context:** This comprises external factors such as government regulations, policy clarity, and environmental instability. This study extends the TOE framework by positioning governance mechanisms as the mediating link between these contextual factors and the final implementation outcome.

Empirical Review Empirical studies on digital health implementation in Nigeria reflect consistent patterns of challenges.

Determinants of Implementation Success

Various studies confirm that non-technological factors determine digital health success. Azubuike et al. (2025) identified organizational readiness and policy clarity as stronger predictors of success than technological determinants. Hussaini et al. (2025) support this by establishing that strong leadership overcomes initial resistance. Conversely, some scholars argue that technological infrastructure remains the primary prerequisite for adoption in low-resource settings (Brown & Miller, 2021). This study bridges this debate by demonstrating that infrastructure alone is insufficient without organizational governance.

Challenges in the Nigerian Context

Empirical evidence from Nigeria reveals recurring challenges rooted in weak governance.

- **Fragmentation and Siloed Systems:** Studies report a proliferation of donor-driven vertical projects. These projects are not interoperable, resulting in data silos (Kumar & Mostafa, 2020).

- **Staff Resistance and Engagement:** Frontline staff resistance stems from inadequate training and lack of involvement during design. This is a major barrier to scaling interventions (Kaboré et al., 2023).
- **Environmental Instability:** Factors such as insecurity and resource scarcity negatively moderate digital interventions in fragile settings (Exley et al., 2019).

Literature Gaps

While empirical research is abundant, important gaps remain.

1. **Governance as a Mediating Mechanism:** Few studies empirically test governance mechanisms as a formal mediator between TOE factors and implementation outcomes. This study closes this gap by testing the mediating role of governance rigorously.
2. **Integration of Policy Clarity and Organizational Readiness:** Most existing studies treat organizational and policy factors separately. This research integrates them to show their combined predictive power.
3. **Fragile Contextualization:** Rigorous mixed-methods studies focusing on fragile and conflict-affected settings like Gombe State are rare. This research provides empirical evidence on how environmental instability amplifies governance weaknesses.
4. **Explanatory Sequential Design:** This design is rarely used in this domain. Qualitative findings explain the quantitative results, providing depth unattainable with purely quantitative studies (Creswell & Plano Clark, 2018).

Significance of the Study

The findings have important implications for theory, practice, and policy.

Theoretical Contribution This study extends the TOE framework. Rather than viewing implementation through a purely technological lens, this research incorporates governance practice. It demonstrates how coordination and accountability act as mediating mechanisms. This provides a robust model for analyzing digital transformation in decentralized health systems.

Practical and Policy Relevance The research provides actionable insights for stakeholders. For the Ministry of Health, the findings emphasize the need to shift attention from technology procurement to organizational preparedness. Hospital administrators can use the findings to prioritize staff engagement and establish formal governance structures. Importantly, the study offers a pragmatic implementation roadmap for policymakers to tackle fragmentation and weak subnational

coordination. Consequently, its lessons hold great importance for other fragile or conflict-affected settings.

Methodology

Research Design and Study Setting

This study utilized an explanatory sequential mixed methods design. We used this design because complex social phenomena require in depth qualitative explanation for quantitative results (Creswell & Plano Clark, 2018). During the quantitative phase, we conducted a survey. We ascertained the prevalence and strength of relationships between TOE factors and implementation outcomes. This phase provided statistical evidence for the hypotheses. The qualitative phase interpreted and explained the quantitative findings. We specifically explored the role of governance failures in undermining implementation. We used the quantitative results to guide purposeful sampling for qualitative participants. This approach afforded a richer understanding of the governance mechanisms that produced the observed statistical outcomes.

Study Setting

The study took place in Gombe State within the North Eastern geopolitical zone of Nigeria. This zone faces severe resource constraints and security challenges. These factors make it an important test case for national digital health strategies. The research targeted two public healthcare institutions in the state capital. These were the Federal Teaching Hospital Gombe and the Specialist Hospital Gombe. The Federal Teaching Hospital is a tertiary institution and an early adopter of electronic medical records. The Specialist Hospital is a state level secondary facility. This pairing allowed us to investigate how different governance levels and resource allocations influence policy implementation.

Population, Sampling, and Data Collection Instruments Target Population and Sampling

The target population consisted of all healthcare professionals, administrative staff, and management personnel who implemented digital health systems. We used a stratified random sampling method for the quantitative phase. We distributed 285 questionnaires. We received 260 responses. After removing incomplete surveys, we retained a final valid sample of 247 participants for the quantitative analysis. The stratification ensured proportional representation across professional cadres and the two study sites. We adopted a purposive sampling strategy for the qualitative phase. We selected 32 key informants for in depth interviews and 4 focus group discussions. We selected participants with extensive knowledge of digital health policy.

Data Collection Instruments

We collected quantitative data through structured questionnaires. We adapted these from previously validated scales to measure the TOE framework constructs. We collected qualitative data using semi structured interview and focus group guides. These flexible guides enabled the exploration of participant experiences with governance issues. All interviews and focus groups were audio recorded and transcribed verbatim.

Data Collection Procedures and Data Analysis Data Collection Procedures

We administered paper-based questionnaires over a six-week period. Trained research assistants distributed the surveys to minimize disruption to hospital operations. Following the quantitative analysis, we began the qualitative phase. We conducted the interviews and focus groups based on our semi structured guides. We recorded all sessions after obtaining participant consent.

Quantitative Data Analysis

We performed quantitative data analysis using Structural Equation Modeling. We used Partial Least Squares Structural Equation Modeling to prevent model overstretch and handle complex relationships effectively (Hair et al., 2019). We tested the direct effects of TOE constructs on implementation success. We tested the moderating influence of environmental instability. We tested the mediating role of governance mechanisms.

Measurement Validity, Reliability, and Model Fit We assessed measurement validity and reliability before testing the structural model. We evaluated convergent validity using factor loadings, Average Variance Extracted, and Composite Reliability. We retained items with factor loadings above 0.70. We set the threshold for Average Variance Extracted at 0.50 and Composite Reliability at 0.70. We assessed discriminant validity using the Heterotrait Monotrait ratio and the Fornell Larcker criterion. We evaluated model fit using multiple indices. These indices included the Standardized Root Mean Square Residual, Coefficient of Determination, and Stone Geisser predictability. We considered the model robust when these indices met established thresholds (Hair et al., 2019).

Qualitative Data Analysis

We analyzed the qualitative transcripts using thematic analysis. We followed the six-phase approach described by Braun and Clarke (2006). This systematic process identified recurring patterns regarding governance failures and interagency coordination.

Mixed Methods Integration

We integrated the two datasets during interpretation. We used connect and embed strategies (Creswell & Plano Clark, 2018). We created a joint display table to map qualitative themes directly against quantitative path coefficients. This visual integration demonstrated how specific governance failures explained the statistical variance in implementation success.

Results and Mixed Methods Integration

Quantitative Findings

The quantitative phase established the baseline relationships between the Technology-Organization-Environment (TOE) factors, governance mechanisms, and implementation success ($N = 247$). Descriptive statistics indicated a moderate overall level of digital health policy implementation success (Mean = 3.2, SD = 0.8).

The Structural Equation Modeling (SEM) analysis confirmed that non-technological factors were the primary drivers of implementation outcomes. Organizational readiness emerged as the strongest positive predictor of implementation success ($\beta = 0.42$, $p < 0.01$), followed closely by policy implementation clarity ($\beta = 0.37$, $p < 0.05$). Crucially, the mediation analysis supported Hypothesis 4, demonstrating that perceived governance mechanisms (coordination, engagement, and incentives) significantly mediated the relationship between TOE factors and implementation success. Furthermore, the moderation analysis supported Hypothesis 3, revealing that environmental instability (resource scarcity and security challenges) negatively moderated the relationship between organizational readiness and implementation success. While these statistical pathways confirm the importance of organizational and governance structures, they do not explain how or why these mechanisms fail in practice, necessitating the qualitative phase.

Qualitative Explanations and Refinements

The qualitative phase was designed to explain the quantitative pathways and explore the lived realities of governance failures. Thematic analysis revealed four core themes that provided deeper explanatory power for the statistical model.

Theme 1: The Governance Gap in Organizational Readiness

Quantitative data showed high organizational readiness scores, yet implementation remained moderate. Qualitative data explained this apparent contradiction. Participants revealed that while hospitals possessed the technical capacity and leadership mandates (readiness), formal governance structures to enforce coordination were absent. As one IT director noted, "We have the computers and the trained staff, but there is no official committee with the authority to force the clinical and

administrative departments to share data." This refines the quantitative finding by showing that readiness without formalized governance authority leads to siloed operations.

Theme 2: Misaligned Incentives as a Barrier to Policy Clarity

The strong quantitative link between policy clarity and success was explained qualitatively by the pervasive theme of misaligned incentives. Staff acknowledged that policies were clear on paper, but daily workflows were driven by informal incentives. Participants reported that performance evaluations did not reward digital system usage, and troubleshooting was viewed as an unpaid burden. This qualitative insight explains why policy clarity alone is insufficient; it must be coupled with structural accountability mechanisms to alter staff behavior.

Theme 3: Environmental Instability as a Governance Multiplier

The quantitative model identified environmental instability as a negative moderator. The qualitative findings refined this statistical relationship by identifying the precise mechanism of this moderation. Participants described how security challenges and resource scarcity did not just slow down implementation; they actively multiplied existing governance weaknesses. For example, power outages were manageable in well-coordinated settings, but in Gombe State, the lack of a centralized governance protocol for emergency IT support meant that minor environmental disruptions caused prolonged system downtime.

Mixed Methods Integration

To achieve true methodological integration, we employed a connect and embed strategy using a joint display. Table 1 maps the quantitative statistical findings directly to the qualitative explanatory themes, demonstrating how the qualitative data moves beyond parallel reporting to provide theoretical refinement.

Table 1: Joint Display of Mixed Methods Integration

Quantitative Finding (QUAN)	Qualitative Explanation (QUAL)	Integrated Insight and Theoretical Refinement
Organizational readiness strongly predicts success ($\beta = 0.42$), yet overall success remains moderate.	Readiness exists technically, but lacks formal governance authority to enforce cross-departmental data sharing.	Refinement: Technical readiness is a necessary but insufficient condition. It must be activated by formalized

Quantitative Finding (QUAN)	Qualitative Explanation (QUAL)	Integrated Insight and Theoretical Refinement
		governance authority to prevent siloed operations.
Policy clarity predicts success ($\beta = 0.37$).	Policies are clear on paper, but daily workflows are dictated by misaligned incentives and lack of performance rewards.	Complementarity: Policy clarity must be structurally coupled with accountability and incentive mechanisms to drive actual behavioral change among staff.
Environmental instability negatively moderates the TOE-implementation relationship.	Resource scarcity and insecurity amplify the impact of weak governance, causing prolonged system downtime due to absent emergency protocols.	Theoretical Extension: Environmental instability acts as a "governance multiplier," specifically degrading interdepartmental coordination during crises.

This integrated analysis demonstrates that the qualitative data does not merely repeat the quantitative results. Instead, it explains the underlying mechanisms of the statistical relationships and refines the theoretical model by detailing exactly how governance failures manifest in a fragile, resource-constrained setting.

Discussion and Theoretical Implications

Interpretation of Findings

The quantitative and qualitative findings converge. They confirm that digital health policy implementation is fundamentally a governance challenge. Organizational readiness and policy clarity predict success. These results challenge technology focused views in current literature. They align with studies stressing the organizational context in technology adoption. The moderate overall implementation success reflects the governance failures identified in the qualitative phase. Weak coordination and misaligned incentives create a systemic drag on technological potential. Environmental instability negatively moderates the implementation process. This contextualizes the challenge by showing how fragile settings multiply existing governance weaknesses.

Theoretical Implications

This paper makes three key theoretical contributions. First, it conceptualizes digital health implementation as a governance practice. The study places implementation as an ongoing process of negotiation and resource alignment. This framing offers a robust analytical lens to examine fragmentation in low- and middle-income countries. Second, the findings extend the TOE framework. The study empirically demonstrates the mediating role of governance mechanisms. It shows how contextual factors translate into implementation outcomes through governance structures. Third, the research contributes to the literature on fragile settings. It provides empirical evidence on how environmental instability exacerbates internal governance deficits. This emphasizes the need for adaptive governance mechanisms rather than assuming a stable operating environment.

Practical and Policy Implications

Practical Implications

The findings provide actionable insights for hospital administrators in Gombe State. Hospital administrations must redirect focus from technology acquisition to internal governance. Administrators should appoint a senior clinician as a digital health focal point. This focal point must have protected time to enforce interdepartmental data sharing. The lack of stakeholder engagement requires structured protocols. IT vendors must complete a mandatory workflow shadowing period before system deployment. This ensures systems align with clinical workflows and addresses misaligned incentives.

Policy Implications

The study provides critical evidence to refine the National Digital Health Strategy at the subnational level. The strategy must recognize digital health implementation as a governance challenge. It must embody mechanisms that enforce interagency coordination at the state level. Good governance is a prerequisite for achieving health outcomes in fragile settings. The State Ministry of Health must use the strategy to enforce a common coordination framework for all development partners. This prevents a proliferation of siloed systems and ensures long term sustainability.

Conclusion and Recommendations

Conclusion

Implementing digital health policy in Gombe State is inherently a governance challenge. The mixed methods findings show that weak coordination and misaligned incentives undermine implementation efforts. This research extends the TOE framework by testing governance as a mediating mechanism. It informs a critical lens on persistent fragmentation in fragile settings.

Strengthening governance mechanisms is the most important intervention to improve digital health outcomes in the region.

Limitations and Future Research

The study has specific limitations. The cross-sectional nature of the quantitative data limits causal claims. The SEM model suggests directionality but cannot detail the dynamic nature of policy implementation over time. Future research must employ longitudinal designs to track governance evolution. Comparing different states in Nigeria would offer a wider perspective on political and environmental variations.

Recommendations

The findings yield specific and feasible recommendations for resource constrained settings.

- i. **Policy Translation:** The State Ministry of Health must translate the national strategy into a single page operational charter. This charter must explicitly define data sharing mandates for all hospital departments.
- ii. **Lean Governance Structures:** Hospitals must appoint an existing senior clinician as a digital health focal point. This focal point requires four hours of protected administrative time weekly to resolve interdepartmental data disputes.
- iii. **Workflow Integration:** IT vendors must complete a mandatory two-week clinical shadowing period before deploying new systems. This ensures the technology supports actual clinical workflows rather than adding administrative burden.
- iv. **Targeted Incentives:** Hospital management must integrate digital system usage into existing monthly performance reviews. Staff achieving high adoption rates should receive priority access to continuing medical education funding.

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