

APPRAISING TECHNICAL HITCHES IN CBT EXAMINATIONS: INSIGHTS FROM THE UTME

^{*1}Tose E. Oziegbe, ²Asemewalen O. Nelson

¹Computer Science Department, Delta State University, Abraka, Nigeria

²Department of Computer Science, Federal College of Education, Katsina, Nigeria

*Corresponding Author Email Address: toseoziegbe@gmail.com

ABSTRACT

The change from paper-and-pencil tests (PPT) to computer-based tests (CBT) was implemented to reduce costs, improve objectivity, increase speed and enhance security during large-scale examination administration. In Nigeria, the Joint Admissions and Matriculation Board (JAMB) adopted CBT for the Unified Tertiary Matriculation Examination (UTME) to reduce examination malpractice, standardize scoring and accelerate result release. Despite these intended improvements, the administration of the UTME CBT has been disrupted most of the time by technical hitches, including power failures, server and network outages, biometric verification failures, software glitches, and hardware malfunctions. These recurring limitations have raised serious concerns about the feasibility of conducting reliable and valid examinations, most notably during the 2025 UTME crisis. This paper presents a systematic review of literature on the nature, causes, and consequences of technical hitches in CBT examinations, using the UTME as a case study. Studies published between 2018 and 2026 were properly analyzed; the review identified a lack of recent infrastructure, unreliable electricity supply, lagging administrative management and software failure as causes of technical hitches in UTME. It also examined the psychological well-being of candidates, their access to information and communication technologies (ICT), and how these factors affect their scores. Low digital literacy among candidates and insufficient system testing before examination day are also crucial issues that need to be resolved. The paper concludes by recommending infrastructural upgrades, mandatory pre-examination system audits, and structured stakeholder training as necessary conditions for providing effective throughput.

Keywords: Computer-Based Testing (CBT), Unified Tertiary Matriculation Examination (UTME), Joint Admissions and Matriculation Board (JAMB), Technical Hitches.

INTRODUCTION

Examination systems have undergone significant transformation worldwide over the past two decades, shifting from conventional paper-and-pencil tests (PPT) to computer-based tests (CBT). This shift was due to improved information and communication technology (ICT), an increasing number of candidates, and the desire of examination bodies to reduce the burden of malpractice involved with PPT administration (Tose *et al.*, 2026). In Nigeria, the adoption of CBT has followed a trajectory, particularly within the context of tertiary admission screening. The aim has been to enhance scoring accuracy, security of test sheets, and turnaround time for processing results. The transition is not limited to a single examination body; professional and regulatory bodies have also embraced CBT for licensing and certification examinations.

However, CBT has been used mostly by universities and other tertiary institutions to conduct their entrance examinations because the number of candidates involved is massive and high stakes are attached to the outcomes.

The Joint Admissions and Matriculation Board (JAMB) is the body responsible for organizing entrance examinations into tertiary institutions in Nigeria, through the Unified Tertiary Matriculation Examination (UTME). JAMB piloted CBT on a limited scale before extending it to a larger population of candidates, and by the mid-2010s, it had made CBT the sole mode of UTME administration nationwide (Bernard, 2023). The rationale for this transition rested on several pillars: a crucial need to reduce the incidence of examination malpractice associated with paper-based formats, such as question paper leakage and impersonation. Furthermore, achieving faster and more objective scoring through automated marking was urgent. Lastly, standardizing the administration of examinations across thousands of accredited centres nationwide was critical.

Despite anticipated efficiency gains, the administration of the UTME CBT in Nigeria has repeatedly been marred by technical challenges. There have been several reports of power outages during live examination sessions; biometric devices have failed during verification processes, delaying or denying entry to eligible candidates. Also, server or network crashes have terminated candidates' sessions, and software errors have incorrectly displayed tests during UTME administration (Bernard, 2023). These disruptions are not only inconvenient; they undermine the fairness, validity and credibility of examination processes. This is critical, since access to higher education for millions of Nigerian youths annually is determined by the efficiency of CBT procedures. The persistence of these technical hitches suggests they are caused by failures in human, hardware and software structures rather than by unknown incidents.

This review is justified on three grounds. From the standpoint of students welfare, technical hitches expose candidates to unnecessary psychological stress, loss of testing time, and emotional trauma because they may re-sit examinations they already made extensive preparations for (Tose *et al.*, 2026). Second, from the standpoint of examination validity, unresolved technical disruptions threaten the psychometric integrity of UTME scores, since candidates who experience hitches may not have their true ability accurately measured (Olaleye *et al.*, 2026). Third, from a national development standpoint, the UTME is a gatekeeping instrument for access to tertiary education; systemic failures in its administration therefore carry implications for equity, national workforce development, and public confidence in key national institutions. This paper aims to:

- i. Identify the types of technical hitches reported in the literature on CBT and UTME examinations.

- ii. To examine the underlying causes of these technical hitches.
- iii. To assess the effects of technical hitches on candidates, institutions, and the examination body.
- iv. To review measures and solutions proposed or implemented to resolve technical hitches.
- v. To identify gaps in the administration of CBT for future research.

The focus of this review is on technical hitches associated with computer-based testing. UTME and its associated post-UTME screening exercises in Nigeria were referenced, drawing on recent published studies. Most of the literature addressed CBT and UTME issues indirectly rather than through direct empirical measurement of technical hitches.

MATERIALS AND METHODS

Review Design

This study adopted a systematic literature review (SLR) to provide a transparent, replicable, and protocol-driven process for identifying, screening, and synthesizing literature relevant to the five objectives outlined in section 1.5. The review process was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page *et al.*, 2021), which organized the review into distinct stages of identification, screening, eligibility assessment and inclusion. Adopting this staged, criterion-based procedure, in place of an unstructured narrative synthesis, improved the transparency, replicability and traceability of the evidence base from which this paper's findings were drawn. Nonetheless, the heterogeneity of the reviewed studies in terms of design, focus and outcome measures still required a predominantly thematic (rather than statistical, meta-analytic) approach to synthesizing the extracted data.

Search Strategy

Literature for the review was identified through systematic searches of Google Scholar, ResearchGate, African Journals Online (AJOL), and institutional repositories. Search strings combined the keywords "Computer Based Testing", "UTME", "Post-UTME", "technical hitch", "technical glitch", "examination malpractice", "digital divide", and "CBT Nigeria" using Boolean operators, for example ("Computer Based Testing" OR "CBT") AND ("UTME" OR "Post-UTME") AND ("technical hitch" OR "technical glitch" OR "digital divide"). The search was restricted to studies concerned with the Nigerian examination context, published in English, and dated between 2018 and 2026 to capture the most recent phase of CBT/UTME administration in the country.

Eligibility Criteria

Studies were included if they: (i) were published between 2018 and 2026; (ii) were reported in English; (iii) examined some aspect of CBT/UTME or Post-UTME administration, performance, security, technology acceptance, or public perception with a plausible link to technical hitches; and (iv) were accessible in full text through the databases searched. Studies were excluded if they: (i) focused entirely on subject-matter pedagogy unrelated to testing mode; (ii) addressed examination systems outside the Nigerian context without comparative relevance to UTME/CBT; (iii) were non-peer-reviewed opinion pieces lacking empirical or conceptual analysis; or (iv) were duplicate reports of the same dataset or study.

Study Selection Process

The study selection process followed the PRISMA identification, screening, eligibility and inclusion sequence. The initial search across the four sources returned 187 records. After 41 duplicate records were removed, 146 records remained for title and abstract screening. Screening at this stage excluded 98 records that were unrelated to CBT/UTME administration or technical hitches, such as studies concerned solely with curriculum content or subject pedagogy, leaving 48 records for full-text assessment. Full-text review excluded a further 32 records: 18 had no clear or plausible link to technical hitches, 7 addressed non-Nigerian examination contexts without comparative value, 4 had full texts that were inaccessible through the databases searched, and 3 were not reported in English. A total of 16 studies met all eligibility criteria and were retained for data extraction and thematic synthesis, forming the evidence base summarized in Tables 1 and 2 of the literature review section.

Data Extraction and Synthesis

Data were extracted from each of the 16 included studies using a standardized extraction framework. Table 1 organized the studies by author/year, objective, methodology, key findings, and identified technical challenges, addressing objectives one to three of this review (section 1.5). Table 2 reanalyzes the same set of studies: specifically the types of hitches or issues identified, their reported frequency, effect on candidates performance, and solutions recommended by the authors; thereby addressing objectives three and four. Extracted data were then thematically synthesized, following the systematic review's protocol-driven structure, into the thematic sections presented in section 4 (types, causes, effects, solutions, and gaps) and further interrogated in the discussion in section 5.

Quality Appraisal

Each included study was appraised using a simple checklist assessing: the clarity of its stated objectives, the appropriateness of its research design to those objectives, and its relevance; whether direct or indirect, to technical hitches in CBT/UTME administration. Given the limited number of studies that addressed technical hitches directly, no study was excluded from the review on quality grounds alone. Rather, the appraisal was used to determine the weight given to each study's claims during synthesis, with studies that examined technical hitches directly and explicitly (for example, Bernard, 2023; Abdulkareem *et al.*, 2023; Ayena *et al.*, 2025; Bassey *et al.*, 2020; Enyenihi *et al.*, 2018; and Olaleye *et al.*, 2026) given greater interpretive weight than those in which the link to technical hitches was inferential.

CONCEPTUAL AND THEORETICAL FRAMEWORK

Definition of Key Terms

Computer-based testing (CBT) refers to the use of computer systems for administering examinations instead of printed question papers. It entails questions and several optional answers, candidate choice capture, and automated scoring (Okoro *et al.*, 2026). In the context of this review, a technical hitch is any unplanned disruption arising from hardware, software, network, power, or biometric infrastructure that interrupts or delays the normal conduct of computer-based examinations. The Unified Tertiary Matriculation Examination (UTME) is a standard examination for admission to tertiary institutions in Nigeria, administered by JAMB. At the same time, post-UTME refers to

supplementary screening examinations conducted by individual institutions following the UTME (Dogo *et al.*, 2019). Examination malpractice is any dishonest or fraudulent act, such as impersonation, collusion, or the leakage of test materials, intended to help candidates gain an unmerited advantage in an examination illegally. Digital divide describes the gap between individuals or groups who have ready access to digital technologies and those who do not; a gap that is highly relevant to candidates sitting for CBT examinations from rural or low-resource backgrounds.

Theoretical

Three theoretical lenses help to frame why technical hitches occur and persist in CBT-UTME administration. The technology acceptance model (TAM) suggests that a user's willingness to engage effectively with a technology depends on perceived usefulness and perceived ease of use. Candidates who are not exposed to CBT interfaces are more likely to experience errors, anxiety or lower performance, which may be attributed to "technical" problems, even when the system itself functions correctly (Ayena *et al.*, 2025). The diffusion of innovation (DOI) theory explains that when an innovation is developed, such as CBT, it does not spread evenly across a population and geography; early and urban adopters typically acquire greater advancements and skills than late or rural adopters (Bernard, 2023). This unequal state helps to explain the disproportionate incidence of hitch-related disadvantage reported among rural and low-income candidates in the reviewed literature. Systems reliability theory, drawn from engineering and information systems research, holds that any complex operational system is only as reliable as its weakest interacting component. This holds whether that component is electrical power supply, network bandwidth, server capacity, biometric hardware, or human operator competence. When applied to UTME CBT, this perspective suggests that technical hitches involve large, diverse, distributed and multiple components. Furthermore, these systems operate across thousands of centres with varying levels of infrastructure quality, so technical hurdles are not due to any single point of failure (Bernard, 2023).

Evolution of CBT in Nigeria and UTME Adoption

The change to CBT by JAMB was an attempt to address examination malpractice and administrative inefficiency observed in the paper-based UTME for decades. Ogunniran *et al.*, (2019), in a comparative analysis of the Chinese Gaokao and the Nigerian WASSCE/UTME, situate this transition within a broader international context, noting that Nigeria's testing infrastructure remains comparatively less mature than that of countries with longer-established computerized assessment systems. This comparative underdevelopment of testing infrastructure is presented in the literature as a foundational condition that

predisposes the Nigerian CBT ecosystem to recurring technical difficulties.

At the institutional level, the adoption of CBT has extended beyond the UTME itself into post-UTME screening exercises conducted by individual universities, as illustrated by Enyenihi *et al.*, (2018) in "the development of a web-based timetabling application for the University of Uyo's post-UTME administration". Such efforts in software development at the institutional level reflect the broader diffusion of CBT-related technology within the Nigerian tertiary admissions pipeline. It illustrates that logistical and scheduling software, not solely the testing engine itself, forms part of the technical ecosystem that generates hitches.

Types of Technical Hitches Reported

The reviewed literature identified several categories of technical hitches. Those involving power and network failures are common, as Nigeria lacks a stable electricity supply and dependable internet access in many areas, especially rural environments (Abdulkareem *et al.*, 2023; Ayena *et al.*, 2025). Although few of the reviewed studies explicitly identified power failure as a critical challenge, Abdulkareem *et al.*, (2023) identified unreliable ICT infrastructure as a serious concern that leads to unequal CBT performance. Problems involving biometrics and verification were researched by Bernard (2023). He studied the security architecture of UTME and discovered that authentication and verification failures were technical and procedural issues that always occurred. Software hitches were illustrated by Bassey *et al.*, (2020); they discovered that the software developed to handle automated permutation of item order and options, intended to resolve malpractice; instead introduced measurable variations in candidate performance. Item and content processing hitches were suggested by Oladejo *et al.*, (2026); they worked on "automated detection of metaphorical language in UTME English passages". This pointed to the growing and potentially fallible role of natural language processing tools in handling test content. Finally, the effects of mode of administration, distinct from outright system failure but still a technical characteristic of CBT delivery, were demonstrated by Okoro *et al.*, (2026). They compared CBT and paper-based Mathematics test forms, finding that the delivery mode itself, which encompasses screen reading, on-screen navigation, and timing, influenced item statistics.

Causes of Technical Hitches

Across the literature, the causes of technical hitches cluster into three broad groups. Infrastructural causes dominate the discussion encompassing inadequate ICT centres, poor internet penetration, and epileptic power supply. All of these are most acute in rural and semi-urban locations, as reflected by Ayena *et al.*, (2025). They found that rural candidates report markedly higher CBT-related anxiety linked to unfamiliarity with computer-based testing.

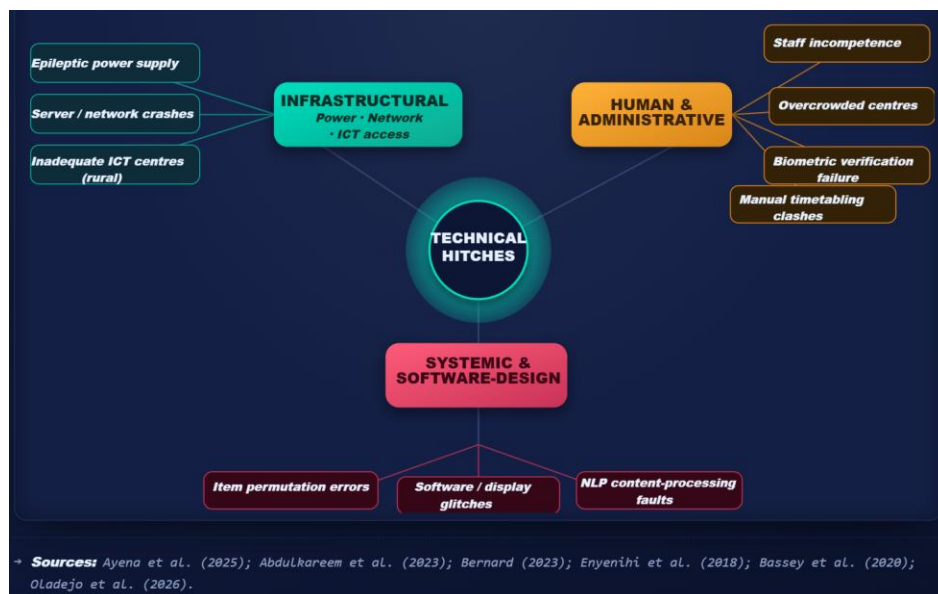


Figure 1: Root Causes of Technical Glitches

Human causes include incompetence among staffs or personnel who are unable to operate and troubleshoot CBT systems effectively, too many candidates in examination centres which strain available hardware, and inadequate maintenance regimes for computers and biometric devices. Enyenihi *et al.*, (2018) identified manual, inefficient timetable creation as a source of scheduling clashes resulting from administrative errors. Hitches caused by errors in software design include failures of CBT systems and the platforms used to test them (Bassey *et al.*, 2020). It also involves the generation of inconsistent outputs by content processing tools, regardless of normal power supply and hardware execution (Oladejo *et al.*, 2026).

Effects and Consequences of Technical Hitches

Effects on Candidates

Exam candidates are usually anxious and under pressure, and experience psychological stress when their test sessions are disrupted by system issues, especially those with less computer exposure (Ayana *et al.*, 2025). Loss of testing time, low performance or exam failure, and wasted transportation and accommodation costs are challenges faced by most prospective students (Bernard, 2023; Olaleye *et al.*, 2026). Those from rural areas and low-income backgrounds are disproportionately disadvantaged due to inadequately managed technical conditions (Abdulkareem *et al.*, 2023).

Effects on Examination Integrity and Public Trust

Technical hitches reduce the confidence and trust people have in examination processes. Bernard (2023) studied the security of UTME administration and found that many people saw procedural errors as opportunities to impersonate and manipulate results. Furthermore, the possibility of selecting truly successful candidates where CBT process has been compromised, is not certain. Olaleye *et al.*, (2026) analyzed the overall reaction to the 2025 UTME and public dissatisfaction on social media platforms. The major concerns people had stemmed from irregular examination conditions and system failures, showing that technical hitches could rapidly precipitate a national crisis of public confidence.

Effects on Institutional and Administrative Burden

For JAMB and participating institutions, technical hitches generate substantial administrative burden, including the need to reschedule affected sittings, manage litigation or complaints from aggrieved candidates, and undertake damage control in the face of reputational harm. Scheduling challenges were identified by Enyenihi *et al.*, (2018) at the institutional level, mirroring these challenges on a smaller scale. Coordination difficulties that JAMB faces nationally in rescheduling disrupted sittings across thousands of centres were observed, each with its own logistical constraints (Enyenihi *et al.*, 2018).

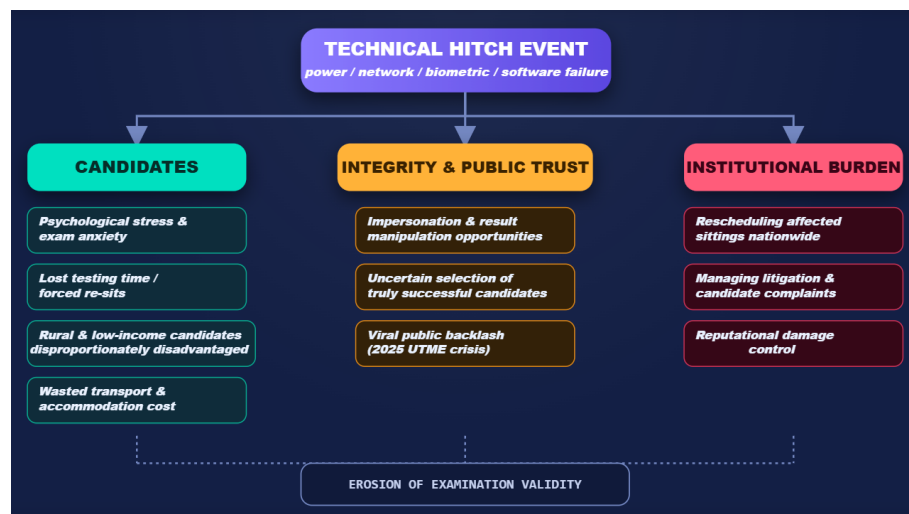


Figure 2: Cascading Effect of Technical Hitch

Table 1: Meta-Analysis of Reviewed Studies on Technical Hitches in CBT/UTME Examinations

Author(s) / Year	Objective	Methodology	Key Findings	Identified Technical Challenges
Dogo et al. (2019)	Examined whether UTME and PUTME scores are good predictors of students' academic performance at Kaduna State University.	Correlational/ex-post-facto design.	Academic performance based on UTME and PUTME scores showed limited and mixed predictive value.	Some admission tools for computing scores that relied on CBT delivery already carried measurement error from the testing process itself.
Nweze (2026)	Investigated average UTME and Post-UTME Chemistry scores as predictors of achievement in Biochemistry, Industrial Chemistry and Electrical/Electronic courses in Enugu State.	Predictive correlational design using archival CBT-based UTME/PUTME Chemistry scores and course grades.	Chemistry entry scores had varying predictive strength across the three disciplines.	Technical disruptions during the CBT Chemistry paper distorted scores used as predictors, without isolating them as specific variables.
Ayena et al., (2025)	Measured the test anxiety levels of Post-UTME candidates from different rural and urban social backgrounds when exposed to Computer-Based Testing.	Comparative survey design using a valid anxiety scale administered to rural and urban CBT candidates.	Urban candidates showed lower CBT anxiety than rural candidates because they had prior exposure to computers.	Most rural candidates are not familiar with computers and CBT interfaces (a technical/skill hitch). This results in serious anxiety among them.
Ibrahim et al. (2024)	Compared psychometric properties (difficulty, discrimination) of UTME and Post-UTME science items at Bayero University, Kano.	Item Response Theory/Classical Test Theory analysis of item banks from both CBT-delivered examinations.	Items differed in quality between UTME and Post-UTME; some items were flagged as poorly discriminating.	Item malfunctions or display errors within the CBT platform affect item performance statistics.
Bernard (2023)	Explored the weaknesses of security tools used for UTME administration—proposed measures to curb forgeries and improve transparency.	Conceptual/analytical review of existing UTME security architecture and malpractice cases.	Identified loopholes such as impersonation and the manipulation of results, and recommended better digital verification systems.	System security lapses and authentication failures undermine the credibility of CBT processes.
Ilogho (2023)	Assessed UTME and Post-UTME scores as predictors of first-year performance among Education students at Adekunle Ajasin University.	Correlational design that compared CBT-based entry scores with first-year GPA.	Entry scores showed a modest positive relationship with first-year academic performance.	Technical hitches were not isolated, but distortions in the accuracy of CBT scores led to less valid predictions.

Author(s) / Year	Objective	Methodology	Key Findings	Identified Technical Challenges
Dan et al., (2023)	Investigated UTME scores as predictors of CGPA among tertiary students in Akwa Ibom and Cross River States.	Ex-post-facto correlational analysis of archival UTME (CBT) scores and CGPA records.	A significant but modest relationship was found between UTME scores and CGPA.	Inconsistencies in CBT score generation (e.g., server or scoring glitches) were hidden factors that limited predictive power.
Abdulkareem et al. (2023)	Studied the outcome of the digital divide on the performance of students in CBT_ UTME.	Quantitative survey and performance analysis, comparing candidates with different levels of digital access or literacy.	Candidates with limited exposure to computers or the internet had less success in the CBT format.	Unfair access to computers, electricity, and internet facilities led to major technical hitches that affected equal CBT outcomes.
Kehinde (2020)	Examined how the screening outcomes of Post UTME were related to the academic performance of students in their first year.	Correlational study using Post-UTME (CBT) scores and academic records from first year.	A positive but moderate relationship was found between screening scores and performance.	Delivery issues with CBT affect screening scores obtained indirectly.
Bassey et al. (2020)	Studied the effect of permutating UTME multiple-choice item order or options on the performance of candidates in English and Mathematics.	Quasi-experimental comparison of performance across different random CBT item sets.	Random item arrangements produced different candidates' performance, which was measurable across test versions.	Permutation errors in software items were technical CBT concerns that presented various disadvantages for some candidates.
Ogunniran et al. (2019)	Compared higher education entrance examinations in China (Gaokao) and Nigeria (WASSCE/UTME).	Comparative analysis of examination structures, modes of delivery and their outcomes.	Nigeria has a CBT system that is less mature compared to China's testing infrastructure.	Less efficient testing facilities in Nigeria contribute to CBT technical hitches.
Enyenihi et al. (2018)	Developed a web application for managing the University of Uyo's Post-UTME examination timetable.	Software engineering and system development approach.	The proposed web application improved the efficiency of scheduling Post-UTME timetables.	Poor scheduling and logistics software promoted technical hitches.
Oladejo et al. (2026)	Developed an NLP model for detecting and interpreting metaphor in UTME Use of English passages.	Computational linguistics approach; NLP model design, training and evaluation on UTME text passages.	Identified metaphorical language within UTME reading passages with reasonable accuracy.	The growing reliance on automated tools in UTME content processing introduces new categories of technical risks if such systems fail.
Okoro et al. (2026)	Investigated psychometric equivalence between CBT and paper-based versions of UTME Mathematics.	Comparative psychometric analysis of CBT and paper-based Mathematics test forms.	The mode of administration (CBT vs. paper) affected certain item statistics.	CBT delivery mode itself (screen reading, navigation, timing) introduced technical/administration effects absent in paper-based testing.
Olaleye et al. (2026)	Applied appraisal theory to analyse public comments on the controversial 2025 UTME on Facebook and Nairaland.	Qualitative discussion and appraisal analysis of social media comments.	Public sentiment was strongly dissatisfied due to irregular examination conditions and system failures.	Technical hitches (e.g., mass failure results, system errors) were a central grievance in the 2025 UTME crisis.
Mohammed et al. (2024)	Examined how UTME and PUTME scores were valid for predicting academic achievement of teacher trainees in their second year.	Correlational and predictive validity design using CBT-based entry scores and later academic records.	UTME/PUTME scores showed moderate predictive validity for later achievement.	CBT delivery inconsistency weakens predictive reliability of entry scores in the long term.

Table 2: Hitches Associated with UTME/Post-UTME Examinations in Nigeria

Author/Year	Type of Hitch/Issue	Frequency	Effect on Candidates' Performance	Recommended Solution
Dogo et al. (2019).	Weak prediction of valid UTME/PUTME scores	Recurrent across cohorts (KASU)	Scores show limited correlation with later CGPA, raising doubts about their use as the major criteria for admission.	Combine UTME/PUTME with other assessment tools (interviews, secondary school records) for admission decisions.
Nweze (2026)	Predictive strength of Chemistry UTME/PUTME scores across disciplines was not consistent.	Varied by programme (Biochemistry, Industrial Chemistry, Electrical/Electronic)	Chemistry scores predicted achievement in different ways depending on the programme being considered.	Develop subject- and programme-specific weighting of UTME/PUTME scores.
Ayena et al. (2025).	Test anxiety linked to CBT exposure	High among candidates from low-income areas; lower among urban candidates	Increased anxiety reduced performance for candidates who were not familiar with computer-based testing	Provide CBT practice sessions, mostly for rural candidates, before the exam
Ibrahim et al. (2024).	Inconsistent psychometric quality between UTME and Post-UTME items	Moderate, observed across several science subjects	Poorly calibrated items distort true ability measurement, affecting fairness of scores	Review items and pilot-testing protocols before deployment
Bernard (2023)	Examination malpractice, impersonation and certificate forgery	Recurring nationwide	Compromises integrity of results; unqualified candidates gain admission over genuine candidates.	Strengthen biometric verification and adopt digital authentication of candidate records.
Ilogho (2023)	Weak prediction of first-year performance from UTME and Post-UTME scores.	Observed among Education students (AAUA)	Scores do not reliably forecast academic success in the first year.	Review and adjust the weighting given to UTME/Post-UTME scores relative to other predictors.
Dan et al., (2023)	Limited ability to predict valid CGPA from UTME scores.	Recorded across institutions in Akwa Ibom and Cross River States	Modest relationship between UTME scores and CGPA lowers confidence in scores as a sole selection criterion	Use UTME scores, continuous assessment and other institutional metrics.
Abdulkareem et al. (2023).	Digital divide (unequal access to computers/ICT)	High in rural and low-income areas	Candidates with low digital access or literacy perform below expectations.	Expand ICT infrastructure and digital literacy training before exams in rural communities.
Kehinde (2020)	Uncertain relationship between screening outcomes and later performance	General, across cohorts in their first year.	Screening results do not always align with future academic performance	Evaluate the design and weighting of Post-UTME screening instruments again and again.
Bassey et al. (2020).	Item/option permutation altering perceived difficulty	Occurs in every CBT sitting where items/options are randomised	Variation in item order may create unequal difficulty experiences across candidates	Pilot-test permuted item versions for statistical equivalence before use

Author/Year	Type of Hitch/Issue	Frequency	Effect on Candidates' Performance	Recommended Solution
Ogunniran et al. (2019)	Structural/design mismatches between UTME and other national entrance exams (e.g., Gaokao)	Systemic, by exam design	Structural differences affect comparability and may disadvantage candidates relative to other systems.	Benchmark UTME design against best practices from other national examination systems
Enyenihi et al. (2018).	Manual/inefficient exam timetabling causing clashes	Common with large candidate volumes	Timetable clashes and logistical confusion can cause missed or disrupted exam sessions.	Adopt automated web-based timetabling systems for Post-UTME examinations.
Oladejo et al. (2026).	Ambiguous/figurative (metaphorical) language in Use of English passages	Recurring across Use of English test items	Candidates may misinterpret metaphorical language, lowering scores independent of actual language ability.	Apply NLP-based review tools to detect and simplify problematic figurative language during item development.
Okoro et al. (2026).	Mode effect between CBT and paper-based Mathematics tests	Moderate, varies by item type	Score inconsistencies arise depending on whether candidates sit CBT or paper-based versions.	Ensure rigorous psychometric equating between CBT and paper-based test forms.
Olaleye et al. (2026).	Public backlash over irregularities/errors in the 2025 UTME	Widespread, viral on social media (Facebook/Nairaland)	Erodes public trust in the examination body and causes distress among affected candidates	Improve transparency, timely communication, and swift correction of result errors
Mohammed et al. (2024)	Limited predictive validity of UTME/PUTME on second-year achievement of teacher trainees	Observed at Prince Abubakar Audu University	Scores show inconsistent long-term predictive value for teacher trainees' academic achievement.	Incorporate additional predictors (e.g., practical teaching aptitude tests) alongside UTME/PUTME scores.

Measures and Solutions Proposed to Resolve Technical Hitches

In direct response to the fourth objective of this review, the literature converged on solutions that clustered into three broad strategies. The first strategy concerned technologies and infrastructure including biometric and digital or blockchain-based verification systems, to close security loopholes (Bernard, 2023). Also, the expansion of ICT infrastructure along with digital literacy training conducted before examinations in rural communities, reduced the digital divide (Abdulkareem *et al.*, 2023). The second strategy dealt with procedures and administration that included the learning of CBT and practice sessions for candidates, mostly those from rural backgrounds (Ayena *et al.*, 2025); and the use of timetabling systems which were web-based and automated, to reduce the scheduling clashes that arose from manual processes of administration (Enyenihi *et al.*, 2018). The third strategy was psychometric and concerned with design; it involved reviewing items and testing the necessary protocols before deployment

(Ibrahim *et al.*, 2024). Furthermore, pilot testing of permuted item versions was conducted to ensure that their statistics were equal (Bassey *et al.*, 2020). The application of natural language processing tools to identify and simplify unclear figurative language in item development (Oladejo *et al.*, 2026), and rigorous equating of psychometric values between CBT and paper-based test forms were considered (Okoro *et al.*, 2026). A recommendation based on the moderate validation reported for UTME and Post-UTME scores (Dogo *et al.*, 2019; Ilogho, 2023; Dan *et al.*, 2023; Mohammed *et al.*, 2024) is that these scores should not be used as the only criterion for admission, but other assessment tools should also be combined. Improved transparency and timely public communication regarding examination irregularities are also recommended to protect public trust (Olaleye *et al.*, 2026).

Gaps in the Literature and Directions for Future Research

Consistent with the fifth objective of this review, the literature search and synthesis process described in section 2 revealed

several gaps in the existing body of work on technical hitches in CBT/UTME administration. First, very few of the included studies directly and quantitatively measured the incidence, frequency, or duration of specific technical hitches, such as power outages or server downtime, during live sittings (Ayena *et al.*, 2025; Dogo *et al.*, 2019). Second, comparative research examining hitch rates across different categories of CBT centres; for instance, centres owned by universities versus privately accredited centres, was not identified within the reviewed literature. Third, although individual studies proposed solutions addressing specific infrastructural, human, or systemic points of failure (Bernard, 2023; Abdulkareem *et al.*, 2023; Enyenihi *et al.*, 2018; Ibrahim *et al.*, 2024; Bassey *et al.*, 2020), none proposed or evaluated an *integrated framework* combining these solutions. These gaps identified systematically through the review protocol, inform the recommendations for future research.

DISCUSSION

Meta-Analysis of Reviewed Studies

Table 1 organized several studies by objective, methodology, key findings and identified technical challenges. A clear pattern was seen: only a minority of the studies, notably Ayena *et al.*, (2025), Bernard (2023), Abdulkareem *et al.*, (2023), Bassey *et al.*, (2020), Enyenihi *et al.*, (2018), and Olaleye *et al.* (2026), addressed technical hitches directly and explicitly. The remaining studies, such as those by Dogo *et al.*, (2019), Nweze (2026), Ilogho (2023), Dan *et al.*, (2023), Kehinde (2020) and Mohammed *et al.* (2024), engaged with technical hitches indirectly; they acknowledged that any distortion in CBT-based score generation weakens predictive relationships and yield unexpected outcomes. However, technical hitches in Nigerian CBT examinations have been studied more often as a background threat to validity than as a primary object of empirical inquiry. This has left the direct measurement of hitch frequency, severity, and cause comparatively under-researched.

Hitches, Frequency, Effects, and Solutions

Table 2 reorganizes the same evidence base by hitch type, frequency, effect on candidates' performance, and the solutions recommended by the authors. This re-analysis highlights that recommended solutions cluster around three strategies. To strengthen verification and security systems: Bernard (2023) called for biometric and blockchain-based authentication; Abdulkareem *et al.*, (2023) recommended ICT infrastructure expansion and pre-exam digital literacy training; Ibrahim *et al.*, (2024) called for rigorous item-review and pilot-testing protocols, and Bassey *et al.*, (2020) recommended pilot-testing permuted item versions for statistical equivalence. Frequency classifications in Table 2 further indicate that several hitch types, such as item permutation effects and disadvantages related to the digital divide, occur in every CBT sitting. These are mostly found in rural and low income areas, respectively, suggesting they are not isolated incidents but the result of failing structural systems.

Synthesis: Are Hitches Infrastructural, Human, or Systemic?

Table 1 and Table 2 show that technical hitches in the administration of UTME CBT cannot be attributed to a single cause but instead arise from the interaction among systems, infrastructure and human factors. Lacking infrastructure, particularly unreliable internet access and power supply, forms the foundational layer of risks negatively affecting candidates living in rural areas (Ayena *et al.*, 2025; Abdulkareem *et al.*, 2023). Human

and administrative factors such as staff competence, centre management and timetable scheduling practices determine whether infrastructural risks are effectively managed in practice (Enyenihi *et al.*, 2018). Systemic and software design factors such as permutation algorithms for items and automated content processing tools introduce a further, more subtle layer of technical risk that operates independently of reliable power or network access (Bassey *et al.*, 2020; Oladejo *et al.*, 2026). The interaction of these three layers, rather than any single layer in isolation, best explains the persistence and recurrence of technical hitches in UTME CBT administration despite over a decade of implementation experience.

Critical Evaluation of Current Mitigation Measures

Recommendations were made to enhance biometric systems (Bernard, 2023), improve infrastructure (Abdulkareem *et al.*, 2023), automate timetables (Enyenihi *et al.*, 2018), and efficiently test each software system before deployment (Ibrahim *et al.*, 2024; Bassey *et al.*, 2020). Each addressed a specific point of failure identified by its respective study. However, none of the reviewed works proposed a framework that combined solutions for infrastructural, human, and systemic causes into a single integrated system. Moreover, several recommendations, mostly those that called for the provision of improved ICT infrastructure in rural communities, require substantial and sustained capital investment. The persistence of public backlash, as evidenced by the 2025 UTME crisis documented by Olaleye *et al.*, (2026), suggests that the mitigation measures implemented to date have not yet produced a reliable system that satisfies public expectations.

Several gaps are apparent in the combined analysis of Tables 1 and 2. First, longitudinal research tracking whether infrastructural interventions such as the deployment of backup power systems at CBT centres have measurably reduced hitch frequency over time is largely absent. Second, comparative research examining hitch rates across different categories of CBT centres; for instance, centres owned by universities versus privately accredited centres, was not identified within the reviewed literature.

Conclusion and Recommendations

This review has examined the challenges of technical hitches in computer-based testing, using the UTME as a case study, against the backdrop of Nigeria's broader transition from paper-based to computer-based examination administration. The significance of the problem has a direct bearing on the welfare of millions of candidates, the psychometric validity of high-stakes national examinations, and public confidence in key gatekeeping institutions that offer tertiary education. The review's key insight is that technical hitches are not attributable to any single cause but emerge from the interaction of infrastructural deficits, human and administrative shortcomings, and systemic or software design weaknesses. This conclusion was supported by the meta-analysis of several studies summarized in Tables 1 and 2.

Based on the synthesis of the literature, the following recommendations are proposed. First, infrastructure upgrades should be a priority, including deploying reliable backup power systems and improving bandwidth across all accredited CBT centres. Also, rural and underserved locations, where the effects of the digital divide are most pronounced, should receive greater attention. Second, system audits and testing should be carried out regularly by every institution as a compulsory requirement before

examinations are scheduled, including hardware checks, network testing, and software validation. Third, structured training for staff and technicians should be expanded to ensure that centre personnel possess the competence to prevent, detect, and rapidly resolve technical faults as they arise. This would reduce the administrative and reputational burden currently borne by the examination body.

Future research should prioritize direct quantitative measurement of hitch incidence duration during live UTME sittings, longitudinal evaluation of the effectiveness of infrastructural interventions, comparative analysis of hitch rates across different categories of CBT centres, and investigation of the longer-term academic and psychological consequences of technical hitches on candidates who experience such disruptions. Conducting research in these areas would move the field beyond the largely inferential evidence base identified in this review toward more direct, secure and reliable computer-based test administration in Nigeria.

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