THE ADOPTION OF AUTOMATED TELLER MACHINES (ATMS) IN PROVIDING BANKING SERVICES IN NIGERIA: A BLESSING OR A CURSE?

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ABSTRACT
his paper explores the adoption of Automated Teller Machines (ATMs) in the Nigerian banking sector, offering a critical analysis of their benefits, structural limitations, and impact on financial inclusion and customer trust. Drawing on scholarly research, policy documents, and financial infrastructure studies, the paper assesses the operational, social, and regulatory dimensions of ATM use in Nigeria. Even though ATMs have greatly increased service accessibility and eased banking hall traffic, there are still significant obstacles due to ongoing infrastructure flaws, fraud vulnerabilities, and uneven rural deployment. In order to guarantee that ATM deployment fulfils its developmental promise in Nigeria's quickly digitising economy, the paper makes the case for a systemic reorientation that includes regulatory enforcement, infrastructure investment, and inclusive design.

Keywords: ATM, Nigeria, Financial Infrastructure, Digital Banking, Fraud, Financial Inclusion, Customer Experience

1. Introduction

The integration of self-service technologies into banking operations has reshaped financial service delivery across the developing world. Growing demands for efficiency, convenience, and 24-hour access to banking services led to the introduction of Automated Teller Machines (ATMs) in Nigeria in 1989. With services like cash withdrawal, balance enquiries, deposits, interbank transfers, and bill payments, they have grown to be essential to the nation's banking ecosystem over the past thirty years, particularly in urban and semi-urban areas.

ATMs are frequently portrayed as an inclusive tool that allows customers to access banking services without relying on branch infrastructure or face-to-face interactions with employees. However, the effectiveness of ATMs in fulfilling this role is far from universal. While their

adoption has grown, concerns about service reliability, fraud, machine downtime, and exclusion of vulnerable populations persist (Ayo & Babajide, 2019; Obasi &Ilechukwu, 2023).

Several studies have looked at the operational performance (Ezenkwu& Chijioke, 2020), user satisfaction (Akinyemi & Adegbite, 2021), and security vulnerabilities (Ajibade, 2022) of ATMs. However, much of the literature treats these dimensions in isolation. A systemic and critical examination that integrates user experience, infrastructure, fraud, and regulatory policy within a single framework remains scarce.

This paper aims to address that gap by evaluating ATM adoption in Nigeria through an integrative lens. It looks at the evolution of deployment, its role in banking modernisation, and the ongoing technical and structural challenges that jeopardise its functionality and developmental promise. It also aligns these discussions with post-pandemic realities and emerging alternatives such as agent banking and mobile money, which increasingly compete with ATMs in the digital financial landscape.

2. Methods

This study employs a qualitative, interpretive design that combines secondary data from various scholarly and institutional sources. The analysis is based on thematic content analysis of academic literature, regulatory frameworks, and financial infrastructure reports from 2009 to 2024. The emphasis is on both pre- and post-COVID-19 developments, given their significant impact on digital banking infrastructure and user behaviour.

Data Sources and Search Platforms

The following academic and institutional sources were accessed:

i. **Scopus** – for peer-reviewed journal articles on digital finance and service technology

ii. **ScienceDirect** – for case studies and regional comparisons in ATM usage

iii. **ResearchGate** – for empirical articles and practitioner commentary

iv. **World Bank Open Knowledge Repository** – for financial inclusion data

v. **Nigerian Inter-Bank Settlement System (NIBSS)** – for fraud and transaction reports

vi. **Central Bank of Nigeria (CBN)** – for regulatory guidelines and financial inclusion strategy

vii. **International Finance Corporation (IFC)** – for global best practices in ATM and agent banking.

Methodological Summary

Component	Description
Design	Qualitative, exploratory
Time Frame	2009–2024
Data Sources	Peer-reviewed journals, policy documents, industry reports
Analytical Technique	Thematic content analysis
Key Dimensions Explored	ATM accessibility, performance, infrastructure, security, and regulation
Tools and Databases	Scopus, ScienceDirect, ResearchGate, World Bank, NIBSS, CBN

Source: Researcher, 2025.

3. Literature Review

3.1 Evolution of ATM Usage in Nigeria

The first ATM in Nigeria, installed by the now-defunct Societe Generale Bank in 1989, was a novelty. Its slow adoption was initially constrained by a lack of awareness, scepticism, and infrastructural limitations. However, by the early 2000s, ATM deployment had begun to accelerate, owing to banking sector reforms, increased urbanisation, and the Central Bank of Nigeria's push for digital banking.

Nigeria currently has over 18,000 operational ATMs, the majority of which are concentrated in major urban areas (CBN, 2023). The machines process millions of transactions per day, serving both individual customers and small businesses. In addition to standard cash services, newer ATMs now offer balance updates, interbank transfers, and mobile top-ups, indicating their evolution into multifunctional platforms.

Despite these advances, ATM deployment patterns are heavily skewed. While Lagos, Abuja, and Port Harcourt enjoy a high density of machines, rural and peri-urban regions remain underserved. This lopsided distribution highlights the commercial logic that drives deployment decisions, which frequently conflicts with broader inclusion objectives (Adepoju & Alhassan, 2021).

3.2 ATM Adoption and Digital Financial Inclusion

The proliferation of ATMs in Nigeria has historically aimed to improve financial inclusion. However, the actual outcomes are mixed. While ATMs have increased physical access to financial services, their uneven distribution reflects existing socioeconomic inequalities. Studies, such as those by Olaoye *et al.* (2022), indicate that many rural areas still lack ATM infrastructure. This raises questions about the sustainability of ATMs as tools for inclusive finance, especially given the rapid and cost-effective expansion of mobile banking and agent networks.

The post-COVID-19 period has shifted this debate further. Agent banking now covers over 70% of local governments in Nigeria, while the growth of ATMs has stagnated due to expenditure and maintenance costs (IFC, 2023). Consequently, ATMs may be transitioning from being primary access points to complementary ones.

3.3 Challenges of ATM functionalities in Nigeria

3.3.1 User Experience, Service Performance, and Trust

Customer satisfaction with ATMs remains high when machines function reliably. However, service inconsistencies continue to undermine trust. According to Akinyemi and Adegbite (2021), satisfaction with ATMs is strongly linked to machine uptime, receipt issuance, and the withdrawal success rate. Ajibade (2022) reports that service unreliability, such as card capture or false debits, contributes significantly to user anxiety and bank-switching behaviour, particularly among low-income users.

3.3.2 Infrastructure and Technological Limitations

ATMs require consistent electricity, robust network connectivity, and physical maintenance. These requirements are often unreliable in Nigeria, particularly in the North-East and North-Central regions. Bada *et al.* (2021) found that 64% of ATM-related complaints between 2018 and 2020 were due to infrastructure-induced downtime. Furthermore, modern features of ATMs, such as deposit acceptance and biometric authentication, are not widely available, limiting their functionality compared to global counterparts.

3.3.3 Fraud and Cybersecurity Concerns

ATM-related fraud in Nigeria has become increasingly sophisticated, reflecting trends in the broader digital financial ecosystem. Early forms of ATM fraud involved basic card theft or physical tampering, but modern schemes now utilise social engineering, malware, advanced card cloning, and insider collusion. These evolving threats have put Nigerian financial institutions under constant pressure, particularly in a regulatory environment where proactive risk management is inconsistent.

Obasi and Ilechukwu (2023) note that many financial institutions continue to take a reactive approach to ATM fraud, often responding only after customer complaints or major breaches occur. Uba and Eze (2022) highlight that a significant number of ATMs in Nigeria operate on outdated or unsupported operating systems, such as legacy versions of Microsoft Windows, making them particularly vulnerable to malware attacks and remote access. In some cases, criminal syndicates can override ATM protocols, forcing machines to dispense cash or capture sensitive user data.

The financial cost of ATM fraud in Nigeria is considerable. According to the Nigerian Inter-Bank Settlement System (NIBSS, 2022), the banking sector lost ₦3.5 billion (approximately USD 4.5 million) to ATM-related fraud in 2021 alone. This figure represents a significant portion of total

electronic fraud losses and likely under-represents the true cost due to underreporting and inefficiencies in fraud documentation.

Moreover, the impact of these losses is not solely financial. Victims often report feelings of helplessness and a diminished trust in banking institutions, especially when remediation is delayed or unclear. Such sentiments are particularly pronounced among low-income customers, who may have limited digital literacy or previous negative experiences with the banking system. Ajibade (2022) notes that some affected individuals revert to cash-only transactions or informal savings groups (e.g., ajo, esusu), undermining the objectives of formal financial inclusion.
Equally concerning is the strain that fraud places on institutional credibility and risk management systems. Banks must allocate increasing resources to fraud investigations, legal mediation, and insurance liabilities. Although these hidden costs may not always be reflected in loss figures, they can negatively affect operating budgets, interest spreads, and customer onboarding.

Additionally, the lack of real-time fraud analytics and adaptive cybersecurity frameworks across many Nigerian banks leaves ATM systems poorly defended. Unlike leading institutions in South Africa or Kenya, where machine learning-based anomaly detection systems are standard, Nigerian banks often rely on batch reporting and manual fraud escalation protocols (World Bank, 2022). This time lag not only lessens the effectiveness of incident response but also increases vulnerability to coordinated attacks.

In summary, ATM fraud in Nigeria is a multifaceted issue that requires urgent attention to enhance security and restore trust among users.

3.3.4 Downtime Caused by Power and Network Instability

One of the most persistent challenges is service disruption due to erratic electricity supply and unreliable network connectivity. In many parts of the country, particularly the North East and rural South-South. ATMs frequently go offline due to prolonged power outages or failed satellite communications. According to Bada *et al.* (2021), infrastructural failures cause more than 60% of ATM service disruptions, with power outages being the most common cause. In areas where banks must rely on diesel generators or solar backup systems, operational costs rise, discouraging regular maintenance and lowering machine availability.

This reality not only jeopardises the dependability of ATM services but also contributes to customer discontent. Users in less-developed areas are frequently forced to travel long distances to access financial services due to a non-functional ATM, negating the convenience that ATMs are intended to provide.

3.3.5 Geographical Disparity in Machine Deployment

ATM installations in Nigeria exhibit a pronounced urban bias. Banks typically place machines in high-income, densely populated areas where customer traffic justifies the investment. Rural communities and low-income peri-urban areas, on the other hand, continue to receive inadequate

services. Adepoju and Alhassan (2021) argue that this disparity stems from the commercial orientation of banking operations, which prioritises return on investment over financial inclusion.

This skewed distribution directly contradicts national policies aimed at increasing banking access. It also establishes a two-tiered system, with financial services readily available in cities but inaccessible or inconsistent in rural Nigeria. As a result, millions of people who rely on cash transactions but are not close to digital access points are further excluded from financial opportunities.

3.3.6 Exclusionary Interface Design

Many ATMs in Nigeria are not designed with inclusivity in mind. Visually impaired users, elderly customers, and semi-literate people frequently struggle with machine interfaces that lack Braille support, audio guidance, or multilingual capabilities. According to Ajibade (2022), ATM interfaces assume a level of literacy and technological familiarity that many people do not have.
Moreover, language barriers remain a concern. Despite Nigeria's linguistic diversity, most ATMs only offer English instructions. The lack of indigenous language support makes it difficult for users in rural and non-English-speaking areas to operate machines confidently, frequently resulting in errors, transaction failures, or a refusal to use the service at all.

This lack of inclusive design contradicts global trends in financial accessibility, where ATMs are increasingly outfitted with adaptive technologies to serve differently abled populations. It reflects a larger oversight in policy and design thinking, in which digital tools are deployed without adequate consideration for diverse user needs.

3.3.7 Prolonged Dispute Resolution and Transaction Errors

Another major issue is the time it takes to resolve transaction-related disputes, especially failed withdrawals, card retention, and double debits. Customers often wait days or even weeks for funds to be reversed after a failed transaction. According to NIBSS (2022), ATM complaints account for nearly 30% of all electronic banking disputes in Nigeria, with average resolution times exceeding the industry's recommended five-day timeline.

These delays erode customer trust and can have serious consequences for low-income users who depend on timely access to funds for daily survival. The issue is exacerbated by inadequate communication channels between banks and customers, a lack of real-time monitoring systems, and bureaucratic complaint procedures that discourage follow-up.

3.3.8 Inconsistent Regulatory Compliance

Although the Central Bank of Nigeria has issued clear operational and security guidelines for ATM deployment, including CCTV monitoring, daily cash balancing, biometric verification, and machine servicing intervals, compliance varies greatly between institutions. Tier-1 banks typically maintain higher standards, but smaller financial institutions and third-party ATM providers frequently fall short due to limited resources, inadequate oversight, or negligence (Agwu, 2022). This discrepancy has multiple repercussions. Users in lower-tier service areas are exposed to

higher risks of fraud and poor service quality. Furthermore, it creates uneven standards across the industry, making it difficult for regulators to enforce uniform best practices. \

Synthesis

Collectively, these operational and structural challenges reveal systemic weaknesses in both technological planning and regulatory enforcement. They reveal a contradiction between ATMs' strategic potential as financial modernisation tools and their practical application on the ground. If left unaddressed, these deficiencies threaten to marginalise the very populations that digital banking infrastructure is meant to empower.

A holistic response must therefore go beyond technical fixes and incorporate inclusive design principles, enforceable regulatory standards, rural infrastructure development, and robust customer support mechanisms. Only through such systemic interventions can ATMs truly serve as instruments of inclusive finance in Nigeria.

Regulatory Landscape and Institutional Gaps

Over the past two decades, the Central Bank of Nigeria (CBN) has introduced a series of policies aimed at governing the deployment, operation, and security of Automated Teller Machines (ATMs). Notable among these are the 2014 Guidelines on Electronic Payment Channel Operations, which establish standards for service availability, customer authentication, encryption, and dispute resolution. More frameworks, such as those for biometric verification and fraud incident reporting, have been created to improve transaction integrity, customer protection, and regulatory oversight initiatives, forming a comprehensive regulatory architecture that positions ATMs as both service enablers and security-sensitive infrastructure in Nigeria's growing digital banking ecosystem.

Despite this well-articulated policy environment, compliance across the banking sector has remained inconsistent and, in many cases, superficial. While larger commercial banks with strong infrastructure and technical teams generally follow CBN standards, many mid-tier and microfinance banks, as well as independent ATM deployers, fall short in critical areas such as biometric integration, video surveillance, software patching, and encrypted communications (Agwu, 2022). This uneven compliance has serious implications for the dependability, inclusivity, and security of ATM services, especially in areas where these machines serve as the primary or sole source of financial access.

One of the primary reasons for this non-compliance is cost. Upgrading ATM hardware and software to meet biometric and encryption standards requires significant capital investment. Many smaller institutions have limited financial resources and are often unable or unwilling to invest in compliance infrastructure. As Uba and Eze (2022) observe, banks with marginal profits may view such investments as low-priority, especially when weighed against immediate operational needs like liquidity management or credit risk mitigation.

In addition to financial constraints, technical capacity deficits further undermine compliance. Many banks lack in-house expertise in digital security, fraud analytics, or biometric systems

integration. This leads to over-reliance on third-party technology vendors, whose services may not always align with local regulatory expectations. The outsourcing of critical security operations dilutes institutional accountability and slows the pace of compliance, particularly in fast-evolving threat environments where rapid response is essential.

The challenges are compounded by weak supervisory enforcement. Although the CBN conducts periodic compliance audits and guidelines, field inspections are infrequent, and penalties for noncompliance are inconsistent and ineffective. This has created a regulatory environment where partial compliance is tolerated, and non-compliant institutions operate with minimal risk of significant sanction. Furthermore, logistical constraints and a lack of coordination between CBN branches and local financial operators impede policy implementation at the regional level, particularly in rural or underserved areas.

Regulatory fragmentation also plays a role. Nigeria's financial sector is overseen by multiple institutions, including the CBN, Nigeria Deposit Insurance Corporation (NDIC), and the National Information Technology Development Agency (NITDA). The overlapping jurisdiction and occasional lack of synchronisation between these agencies lead to confusion, policy fatigue, and bureaucratic inertia among banks already struggling with compliance demands. This environment diminishes the effectiveness of even well-intentioned regulations, as institutions are left to navigate a web of often contradictory expectations.

Finally, macroeconomic volatility and shifting institutional priorities both influence compliance behaviour. With the Nigerian economy facing inflationary pressure, exchange rate instability, and rising operating costs, many banks have been forced to reprioritise their investment strategies. In such cases, digital security upgrades, staff training, and machine modernisation are frequently put off in favour of short-term performance metrics. This trade-off, while understandable from a business continuity perspective, ultimately exposes both the institution and its customers to greater long-term risks.

In contrast, international benchmarks reveal more proactive and integrated regulatory environments. Banks in South Africa and Kenya have implemented real-time fraud detection systems powered by machine learning, centralised risk management dashboards, and unified compliance reporting platforms, all of which are largely absent in Nigeria (World Bank, 2022). These systems not only improve fraud response but also ensure continuous adaptation to emerging threats, thereby enhancing user trust and infrastructure resilience.

To close these gaps, Nigeria's regulatory enforcement must move beyond directive issuance to include structured incentives, capacity-building programmes for smaller institutions, and a more streamlined compliance ecosystem. Clearer delineation of institutional responsibilities, digital infrastructure subsidies, and phased compliance roadmaps could all help to improve overall adherence while not overburdening underfunded banks. Without such interventions, the country risks perpetuating a fragmented digital infrastructure landscape in which ATM systems continue to operate below their potential, both as access enablers and as secure financial service platforms.

3.4 Economic Implications and the Future of ATMs

Automated Teller Machines (ATMs) play a pivotal role in maintaining liquidity and operational efficiency within Nigeria's retail and banking sectors. At the most basic level, ATMs facilitate real-time cash access for individuals and businesses, thereby supporting the fluidity of daily economic transactions. This function is especially important in Nigeria, where over 60% of retail transactions are still made in cash (CBN, 2022). ATMs reduce the operational strain on physical banking infrastructure by extending access to banking services beyond traditional branch hours, allowing banks to serve larger populations without increasing staffing or expanding into new locations.

The economic value of ATM services is particularly evident in payroll and SME operations. In regions like Lagos, Abuja, and Kano, employers frequently rely on ATMs to disburse salaries to employees who do not possess smartphones or digital literacy for mobile banking. ATMs contribute to the maintenance of productivity cycles and consumer purchasing behaviour by providing 24-hour access to wages. Similarly, for micro-entrepreneurs and market traders who may not have access to sophisticated point-of-sale (POS) systems, ATMs provide dependable sources of working capital, allowing for inventory restocking and cash payments for transportation and supplies. According to a study conducted by Ayo and Babajide (2019), more than 48% of small business owners in urban Nigeria use ATMs at least three times per week for business cash withdrawals.

Moreover, ATMs contribute indirectly to financial documentation and credit access. Transaction records generated through ATM usage can support customer creditworthiness assessments, especially in banks that integrate ATM data into account profiling algorithms. This function helps bridge the gap between informal financial practices and formal lending institutions, thereby contributing to Nigeria's broader financial inclusion agenda.

However, the economic sustainability of ATM networks is increasingly uncertain, particularly in light of the rapid growth of mobile wallets, agent banking networks, and digital-only financial service providers. These emerging channels are often more agile, cost-effective, and scalable than ATM infrastructure. Unlike ATMs, which require physical installation, security personnel, and maintenance, mobile wallets and agency banking make use of existing mobile networks and local human infrastructure, resulting in significant cost savings. According to the IFC (2023), the number of agent banking locations in Nigeria increased from less than 100,000 to over 1.4 million between 2019 and 2022, while ATM installations increased by less than 10% during the same period.

In rural and peri-urban communities, agent banking has emerged as a viable alternative to ATMs. For example, in states like Niger and Ebonyi, where ATM coverage is limited, banking agents provide cash-in/cash-out services, account opening, and even microloans, frequently in collaboration with fintech such as OPay and Moniepoint. These services not only meet essential banking needs but also foster local employment, thereby contributing to both financial and

economic inclusion. The success of agency banking in these regions has raised questions about the scalability and long-term relevance of ATM infrastructure in low-density areas.

Furthermore, the COVID-19 pandemic has accelerated the transition to cashless and contactless transactions, reducing reliance on physical cash channels. Between 2020 and 2023, the volume of mobile money transactions in Nigeria rose by over 300%, surpassing ₦18 trillion in value by Q4 of 2023 (NIBSS, 2023). As smartphone penetration increases and consumer familiarity with digital platforms improves, the ATM's role as a core access point to financial services is being redefined. Nevertheless, ATMs remain economically and functionally indispensable in specific contexts. They continue to be critical in sectors with strong cash dependencies, such as agriculture, construction, and informal retail. In these sectors, digital payment infrastructure is often underdeveloped, and transaction volumes or trust levels may not justify a transition to fully digital models. In addition, certain demographic groups, such as elderly citizens, low-literacy users, and those without smartphones, rely on ATMs as their primary or sole means of banking interaction. Removing or deprioritising ATM services in such a context, risks deepening digital exclusion and alienating vulnerable populations.

Given these dynamics, the future of ATMs in Nigeria is best envisioned not as obsolete but as evolving. Rather than serving as standalone financial portals, ATMs are increasingly being integrated into a hybrid service ecosystem, supplementing mobile channels, integrating with agent networks, and improving multi-channel banking strategies. For example, First Bank of Nigeria and Access Bank have begun to deploy smart ATMs capable of accepting deposits, providing mini-statements, and integrating biometric authentication; functions that bring ATM services closer to full-service digital banking.

In conclusion, while ATMs may lose importance in Nigeria's financial architecture, their residual economic utility, contextual relevance, and infrastructural embeddedness indicate that they will continue to be an essential, if redefined, part of the banking landscape. Policymakers and financial institutions should pursue modernisation strategies that improve ATM functionality, reduce costs, and align deployment with actual economic usage patterns in Nigeria's various regions.

3.5 Innovation

ATM deployment in Nigeria has evolved beyond traditional cash dispensing to include biometric integration, multifunctionality, and interoperability with mobile banking. These innovations are reshaping how customers interact with financial services, particularly as digital-first channels expand.

A leading development is the introduction of biometric-enabled ATMs, which allow users to perform transactions using their Bank Verification Number (BVN) and fingerprint, eliminating the need for debit cards. GTBank and Union Bank of Nigeria have integrated biometric functions into select ATM terminals to enhance security and support users who frequently misplace cards or lack

digital literacy. These innovations align with CBN's push for biometric banking identity as a means of curbing fraud and expanding inclusion.

Smart ATMs, which provide more than just withdrawals and balance checks, have also emerged. Access Bank, for instance, has introduced terminals capable of cash deposits, bill payments, and cardless withdrawals through codes generated from mobile apps or USSD interfaces. Similarly, First Bank of Nigeria has deployed machines that support mini-statements, PIN resets, and airtime top-ups, allowing customers to conduct a broader range of transactions without requiring branch assistance.

In efforts to support environmentally sustainable banking, some banks have begun piloting solar-powered ATMs in areas with erratic electricity. Heritage Bank and Jaiz Bank, for example, have installed standalone solar ATMs in semi-urban communities to reduce generator costs and ensure uninterrupted service during national grid outages. These solar-powered deployments not only reduce overheads but also facilitate rural ATM expansion without dependence on diesel logistics. Furthermore, ATMs are increasingly being positioned as nodes within agent banking ecosystems. UBA's Moni Agent network and Stanbic IBTC's @ease agent platform have experimented with integrating ATM services into high-traffic agent locations. These hybrid deployments allow agents to provide both human-assisted and machine-supported banking, particularly in underserved LGAs.

Despite these gains, widespread innovation remains constrained. Most banks have yet to implement real-time fraud analytics, machine learning, or remote monitoring dashboards, which are now standard in Kenya and India (World Bank, 2022). Wider systemic upgrades are limited by issues including expensive capital costs, contracts with legacy vendors, and a sluggish governmental response.

In summary, while banks like Access Bank, GTBank, First Bank, and Heritage Bank illustrate promising innovation in ATM deployment, sector-wide transformation is still nascent. Targeted support, cross-sector R&D investment, and regulatory mandates will be required to scale these innovations and reposition ATMs as intelligent, accessible, and secure banking tools in Nigeria's evolving digital economy.

4.1 Conclusion

Automated Teller Machines (ATMs) have undeniably served as a cornerstone in the evolution of Nigeria's retail banking sector. Since their inception, they have increased the financial services' temporal and spatial reach, decreased reliance on in-branch operations, and facilitated liquidity flows in the economy's cash-reliant sectors. Both practice and literature have established their role in fostering customer autonomy, lowering transactional friction, and promoting banking convenience.

However, the limitations of Nigeria's ATM infrastructure have become more noticeable as the country moves towards a more digital and decentralised financial ecosystem. Persistent and systemic issues have been brought to light by this study, such as service outages caused by

infrastructure, skewed deployment that favours urban areas, non-compliance with regulatory standards, growing fraud exposure, and exclusive interface design. These issues are not isolated technical anomalies but structural barriers that undermine the inclusiveness, security, and efficiency of ATM-based banking.

The willingness of the sector to pursue coordinated reforms will determine whether ATMs remain relevant in Nigeria's financial ecosystem, even though they are still very valuable, especially for users without smartphones, in areas with low digital penetration, and cash-intensive industries. These include integrating accessibility features into machine interfaces, enforcing cybersecurity standards, encouraging rural deployments, and updating ATM architecture with biometric and smart technologies. More importantly, these interventions must be underpinned by enforceable regulatory action, inter-agency collaboration, and real-time compliance monitoring.

This paper contributes to existing literature by offering a system-level assessment of ATM adoption in Nigeria, integrating user experience, infrastructure, economic utility, and policy dimensions. It highlights the interrelated structural forces that determine the long-term sustainability and equity of digital financial infrastructure, going beyond disjointed analyses of ATM benefits or user satisfaction.

In conclusion, if modernised, decentralised, and integrated into Nigeria's developing digital finance strategy, ATMs could serve as anchors of financial inclusion rather than just being considered as outdated instruments in a time when mobile banking is the norm. Their future will be more dependent on strong regulation, adaptive design frameworks that prioritise the needs of diverse and frequently marginalised users, and intentional integration with inclusive finance goals than it will be on technological innovation.

4.2 Recommendations

Based on the critical findings of this study, the following practical and implementable policy and operational recommendations are proposed to improve the functionality, inclusiveness, and sustainability of ATM infrastructure in Nigeria:

4.2.1 Mandate Biometric-Enabled and Smart ATM Infrastructure through Regulatory Deadlines

The Central Bank of Nigeria (CBN), in collaboration with the Nigeria Inter-Bank Settlement System (NIBSS), should issue a directive requiring all licensed commercial banks to upgrade at least 40% of their ATM fleets to biometric-enabled or deposit-capable smart machines within 24 months. This directive should include:

- Support for fingerprint and BVN (Bank Verification Number) integration
- Compatibility with contactless technology for digital wallets and mobile-linked cards
- Reporting requirements for upgrade status in quarterly compliance submissions

To reduce financial burdens on smaller institutions, the Bankers' Committee could establish a cost-sharing fund, financed through a fractional levy on interbank settlements, to subsidise machine upgrades.

4.2.2 Incentivise Rural ATM Deployment through Tiered Licensing and Tax Rebate Schemes

To address the urban-rural deployment imbalance, the CBN and the Ministry of Finance should introduce deployment-linked tax incentives and operational benefits. For example:

- Banks that install ATMs in LGAs (Local Government Areas) without prior coverage should receive tax credits or waivers on CBN licensing renewal fees.
- ATM deployments in rural areas should qualify banks for preferential access to Central Bank intervention funds (e.g., SME financing or FX allocation windows).
- The Nigeria Communications Commission (NCC) should partner with banks to ensure telecom infrastructure provisioning (broadband and VSAT) is bundled with ATM deployments in rural clusters.

The success of similar incentive models in Kenya and India supports the viability of this approach.

4.2.3 Enforce a Cybersecurity Compliance Framework with Penalty Enforcement

The Nigerian financial sector currently lacks uniform enforcement of ATM-related cybersecurity standards. To resolve this, the CBN should:

- Require all banks to implement real-time ATM fraud monitoring dashboards, integrated with NIBSS's fraud alert database, by Q4 2025
- Mandate minimum security protocols, including updated OS, end-to-end encryption, and anti-skimming technology for every machine.
- Institute graded penalties: a ₦5 million fine per unprotected ATM node identified during quarterly audits; repeat violations should trigger licence reviews.

Additionally, the CBN's e-Payment Fraud Committee should be empowered to conduct random compliance inspections using digital audit tools.

4.2.4 Enforce Inclusive Design Standards via ATM Certification Guidelines

To address exclusion due to poor interface design, the Standards Organisation of Nigeria (SON), in collaboration with the CBN, should develop and enforce a mandatory ATM Accessibility Certification for all new machines entering the Nigerian market. Key inclusivity features must include:

- Audio voice-guided menus with Nigerian English and one major local language (e.g., Yoruba, Hausa, or Igbo), switchable via keypad
- Braille instructions on keypad and entry panel
- Large-font screen options and high-contrast display modes

All ATM vendors and banks should be required to phase in compliant machines from 2025 forward, with public reporting of accessibility metrics in annual sustainability reports.

4.2.5 Standardise and digitise dispute resolution timelines and escalation protocols.

To restore user confidence, the CBN should amend its Consumer Protection Framework to require the following:

- All failed ATM transactions must be reversed within 72 hours, with automatic system logging and reference ID issuance to the customer via SMS or email
- Banks must maintain a visible ATM complaint portal at each branch and publish quarterly dispute resolution data
- A tiered penalty structure should apply: ₦50,000 per unresolved ATM complaint after 5 working days; ₦100,000 for delays exceeding 10 working days without formal escalation.

In support, the CBN Consumer Protection Department should launch a public dashboard that ranks banks based on their dispute resolution compliance rate, creating reputational incentives for better performance.

4.2.6 Cross-Cutting Strategy: Institutional Collaboration

All of the above actions require coordination among stakeholders, including:

- CBN: Regulatory enforcement, licensing incentives, cybersecurity monitoring
- NIBSS: Technical infrastructure for fraud detection and biometric verification
- SON: Accessibility compliance for imported and domestically deployed ATMs
- NCC: Rural connectivity enhancement for ATM support
- Commercial Banks: Implementation of standards, user training, customer support
- Civil Society: Monitoring and public awareness campaigns for accessibility and fraud response

These interventions, which use phased timelines, funding mechanisms, and real-time compliance tools, have the potential to transform Nigeria's ATM infrastructure into a more secure, inclusive, and economically sustainable channel within the country's larger digital financial ecosystem.

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