

Factors Responsible For Atm Breakdown And Service Availability In Nigeria

E. O. Oladipe¹

Department of Computer Science, Federal University
Lokoja, Nigeria
ebenezer.oladipo-phd@pg.fulokoja.edu.ng

S. E. Adewumi²

Department of Computer Science, Federal University
Lokoja, Nigeria
sunday.adewumi@fulokoja.edu.ng

Yahaya N. Yusuf³

Department of Computer Science, Confluence
University of Science and Technology Osara, Kogi
State, Nigeria
yahayanurudeenyy@custech.edu.ng

Godwin Sani⁴

Department of Computer Science, Federal University
Lokoja, Nigeria
godwin.sani@fulokoja.edu.ng

Ahmed Kharimah Bimbola⁵

Department of Computer Science, Confluence
University of Science and Technology Osara, Kogi
State, Nigeria
ahmedkb@custech.edu.ng

Abstract—Automated Teller Machines (ATMs) are essential for providing convenient banking services in Nigeria. However, various challenges ranging from power supply, internet services, security, unfitted notes, and inadequate technical support frequently compromise operational efficiency and availability. Customers' ever-increasing challenges prompted the use of Google Forms to engage ATM custodians in Banks and ATM engineers from various vendors to assess factors responsible for ATM downtimes and suggest appropriate solutions. Refurbished spare parts, unfitted notes, lack of custodian technical know-how, and Interswitch interruption were deduced as some of the responsible factors. The findings suggest that while certain brands dominate the market, ATM downtime is a widespread issue influenced by multiple factors, including hardware failures, power outages, poor network connectivity, and security threats. By implementing the recommended measures, banks and ATM custodians can significantly improve the operational efficiency of ATMs, reduce service interruptions, and enhance customer satisfaction. The findings underscore the need for upgraded hardware, better maintenance practices, improved power backup systems, and enhanced network infrastructure to ensure reliable ATM services. Addressing these issues is vital for improving service delivery and ensuring that ATMs remain operational for customers. By tackling these underlying issues, stakeholders can improve ATM reliability, boost customer satisfaction, and enhance broader

financial inclusion. Further research is necessary to evaluate the effectiveness of these strategies and explore innovative solutions to optimize ATM operations in the country's evolving banking landscape.

Keywords—ATM; Downtimes; Service availability; Bank; Nigeria

1. INTRODUCTION

Automated Teller Machines (ATMs) are vital components of Nigeria's banking infrastructure, providing convenient access to financial services for millions of individuals across the country. However, the operational efficiency and service availability of ATMs are frequently hampered by various factors, leading to downtimes and disruptions in service delivery. This review aims to synthesize existing research and scholarly discourse on the factors responsible for ATM downtimes and service availability in Nigeria.

An automated teller machine is an electronic unattended banking outlet, that allows customers to complete banking basic transactions without a direct branch interaction or a branch representative or teller. The machine is usually connected to a data system and related equipment and activated by a bank customer to obtain cash withdrawals and other banking services. It consists of computers with a keypad and screen to perform operations and access bank accounts provided through networking, a host processor, and a bank computer to verify data

(Sharma and Rathore, 2012). An automatic teller machine (ATM) allows customers to conduct their banking transactions non-stop. It is widely accepted that the first ATM was put into use by Barclays Bank in its Enfield Town branch in north London, United Kingdom, on 27 June 1967, by the Scottish scientist John Shepherd-Barron (Hossain *et al.*, 2015). Some advantages of using ATMs are accessibility, freedom of banking at all times, and the absence of waiting lines. Leblanc (1990). Kumbhar (2011) found that cost-effectiveness, ease of use, and responsiveness have significantly influenced overall customers' satisfaction with ATM services. Customer dissatisfaction is associated with frequent interruptions and downtimes of ATMs. Parvin and Hossain (2010) conducted a study on the satisfaction of debit card users in Bangladesh, their study concluded that generally, users of debit cards are satisfied, except in cases related to network services. Therefore, this review is aimed at assessing various factors responsible for the breakdown of ATMs in Nigeria and suggesting attainable approaches needed to improve the reliability of ATMs services in Nigeria

2 LITERATURE

In Nigeria, outdated hardware and software are significant contributors to ATM downtimes. Many banks still operate older ATMs that struggle to handle modern software updates and increased transaction volumes (Adeleke *et al.*, 2023; Ibrahim and Yusuf, 2022). Furthermore, poor maintenance practices exacerbate these issues, leading to frequent downtimes (Chukwu and Nwosu, 2021). One of the major challenges facing ATM operations is the availability of hardware, technical failures, software glitches, low-grade spare parts, and network connectivity problems, which contribute to ATM downtimes. ATM equipment maintenance and timely resolution of technical faults are vital to ensure uninterrupted service. Power outages and voltage fluctuations often damage ATM hardware or disrupt network connectivity, making the machines unavailable for long periods (Okeke *et al.*, 2023; Uba and Ezeh, 2022). This issue is particularly severe in rural areas where backup power solutions like generators may not always be reliable. Nwankwo and Ekpenyong, (2023), found disruptions ATM's operation during the time of salary payments, and this in turn interrupts cash withdrawers on the ATM. Connectivity issues are compounded by the high demand for ATM services in areas with limited banking infrastructure (Ogunyemi and Afolabi, 2022). Banks sometimes struggle to replenish ATMs

promptly, especially during holidays and weekends. The lack of prompt replacement of cash at ATMs usually results in temporary out-of-service errors (Adegoke and Ojo, 2023). Additionally, the improper handling of cash, such as using mutilated notes leads to cash jams and downtimes in the ATM (Olawale and Adeniyi, 2023). Criminal activities targeting ATMs, such as card skimming, cash trapping, and robbery, pose significant security threats and disrupt service availability in Nigeria. Such criminal activities not only disrupt ATM services but also require significant downtime for repairs and security upgrades (Obi and Umeh, 2022). Banks are continually investing in security measures, but the threat remains a significant cause of downtimes (Ogundipe and Fashola, 2021). In Nigeria, environmental conditions such as extreme heat, dust, and humidity can negatively affect ATM performance, particularly for machines located outdoors. These factors lead to overheating, dust accumulation, and moisture can contribute to ATM breakdown (Bello *et al.*, 2023). Banks often face challenges in getting timely technical support, which further exacerbates the availability problem (Adebayo and Olufemi, 2022). Affum, (2022). In this paper, they found out that Interswitch is prone to technical problems, such as password threats, ID thefts, network failure, and disputed transactions.

3 METHODOLOGY

In this study, a structured questionnaire was designed to gather insights into the downtimes of ATMs. ATM custodians from Seven banks (United Bank of Africa, Guaranty Trust Company, First Bank, First City Monument Bank, Access Bank, Unity Bank, and Lotus Bank) were selected to gather information. Also, feedback from ATM engineers on four major ATM brands (WINCOR, NCR, HYOSUNG, AND GRG) was gathered. The questionnaire consisted of 17 close-ended questions and 1 open-ended question. The questionnaire was distributed online via email to a randomly selected sample from 50 custodians and 8 Engineers a total of 48 responses were received from ATM custodians and all 8 ATM Engineers responded, representing a 93.1% response rate.

Selected custodians supported a total number of 105 ATMs. Table 1 shows the equivalent number of ATM brands supported by the custodians and Figure 1 shows the ATM brand pictures.



Fig 1: ATM BRANDS

Table 1: ATM supported by the custodian

ATM Brand	Equivalent Number (out of 105)	Percentage (%)
WINCOR	65	61.90%
NCR	10	9.50%
HYOSUNG	5	4.80%
GRG	25	23.80%
TOTAL	105	100%

The downtime frequency was also obtained and the responses are shown in Table 2 below.

Table 2: Responses to ATM downtime frequency

Category	Equivalent Number (1-50)	Percentage (%)
TOO FREQUENT	12	24%
AVERAGE	18	36%
RARE	12	24%
VERY RARE	6	12%
Mostly sensor issues, hidden, vendor-accessible	2	4%

Individual responses to the ATM breakdown factors were also collated and they are represented in Table 3

Table 3: ATM breakdown factor

Factors	Count	Percentage (%)
Brand of ATM	7	33.30%
Engineers Expertise	8	38.10%
Cash Physical Properties	11	52.40%
Type of Cash Denominations	6	28.60%
End Users Knowledge	7	33.30%
Traffic on ATM	11	52.40%
Seasons (Festive Periods)	8	38.10%
ATM Location	4	19%
Power Source and Stability	5	23.80%
Spare Parts (New, Refurbished)	15	71.40%
Vendor Operational Policy	3	14.30%
Age of the ATM	11	52.40%
Bank Network	3	14.30%
Inter-Switch Policy	1	4.80%

Data analysis was conducted using an Excel sheet. Pie charts and bar charts were obtained for output clarity.

4 RESULTS

There are four major ATM brands: WINCOR, NCR, HYOSUNG, AND GRG. From Table 1 a pie chart was generated which showed 61.9% of ATMs are Wincor, while GRG has 23.8% and NCR and HYOSUNG have 9.5% and 4.8% respectively.

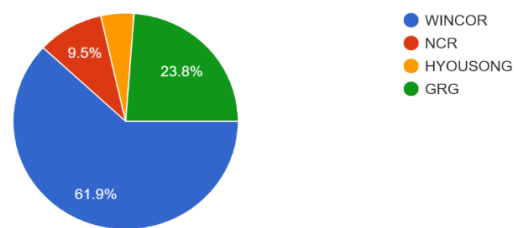


Fig 2: Percentage of ATM Types supported by custodian

Breakdown frequency was also obtained and analyzed. From Table 2, a pie chart was drawn as shown in Figure 2 which reveals how frequently each brand of supported ATM break-down and experienced service interruption.

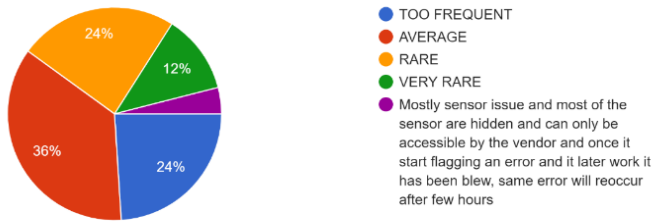


Fig 3: Frequency of ATM break-down

Responses from the ATM custodians and ATM Engineers shown in Table 3 as regards the factors that are responsible for the ATM downtime are represented in the bar chart of Figure 4.

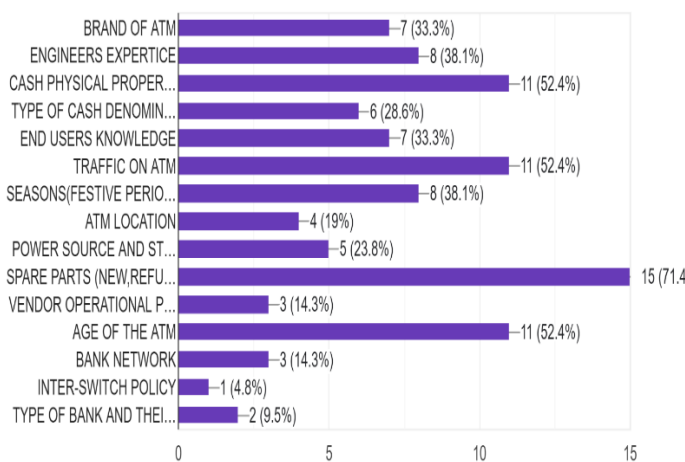


Fig 4: Percentage Response for ATM Service Interruption Factors

4 DISCUSSION

From the result, the research highlighted the complexities involved in maintaining a high level of ATM availability in Nigeria. The findings suggest that while certain brands dominate the market, ATM downtime is a widespread issue influenced by multiple factors, including hardware failures, power outages, poor network connectivity, and security threats. By implementing the recommended measures, banks and ATM custodians can significantly improve the operational efficiency of ATMs, reduce service interruptions, and enhance customer satisfaction.

The frequency of ATM breakdowns, service interruptions, and the causes behind them were explored, revealing both technical and non-technical reasons for ATM downtime.

Hardware and Software Failures are critical, with outdated machines frequently malfunctioning due to compatibility issues with newer software updates. These older ATMs struggle to cope with higher transaction volumes, leading to more breakdowns. Coupled with **poor maintenance practices**, the performance of such machines further deteriorates, prolonging downtime.

Power supply issues are another significant contributor, with Nigeria's unreliable power grid posing challenges for uninterrupted ATM service. Frequent power outages and voltage fluctuations can damage ATM hardware, particularly in rural areas where backup power sources, like generators and solar inverters, are less dependable.

Additionally, **network connectivity** remains a serious concern. ATMs rely on stable internet connections to process transactions, and disruptions in telecommunications infrastructure can cause transaction failures. This is particularly evident during peak periods, such as the end of the month or holidays, when usage spikes due to salary disbursements, causing network congestion and slow transaction times.

Cash management challenges also contribute to ATM downtime, particularly during weekends or holidays. Poor cash stocking practices can lead to machines running out of money, while mishandling cash can cause blockages in the machine, further disrupting service.

Security concerns present another layer of complexity, with ATMs vulnerable to theft, vandalism, and card skimming. Such incidents lead to significant downtime as machines are repaired and security systems upgraded. This problem is exacerbated in locations with poor security infrastructure.

Lastly, **environmental factors** such as extreme heat, dust, and humidity, along with **geopolitical instability**, also impact ATM performance. ATMs placed outdoors are more susceptible to these environmental challenges, which can cause internal damage, increasing the likelihood of malfunctions.

The findings underscore the need for **upgraded hardware, better maintenance practices, improved power backup systems, and enhanced network infrastructure** to ensure reliable ATM services. Addressing these issues is vital for improving service delivery and ensuring that ATMs remain operational for customers.

5 RECOMMENDATIONS

We recommend that the custodians pay attention to the following recommendations

1. **Hardware and Software Failures:** ATM malfunctions are largely caused by outdated hardware and software. Older ATMs, which

have trouble keeping up with new software updates and higher transaction volumes, are still in use by many banks. In addition, inadequate maintenance procedures worsen these problems and result in frequent outages. ATM malfunctions can be caused by a variety of issues, including low-quality replacement parts, software bugs, technical malfunctions, availability of hardware, and issues with network connectivity. Maintaining ATM hardware and promptly resolving technical issues are essential to guarantee continuous operation.

2. **The age or duration of usage of the ATMs.** ATM breakdowns are more likely to occur when the machines are used for extended periods and when worn-out parts are used. Older ATMs break down more frequently because they are harder to maintain and replacement parts are also harder to come by as the parts have experienced more wear and tear.
3. **Rate of Usage of ATMs:** A greater number of ATMs may result from fewer bank branches if the frequency of digital transactions rises. Higher transaction volumes subject machines to more frequent wear and tear, which also compromises the machine's functionality. Higher customer-to-bank ratio locations may also see more consumption. Hence, overworked ATMs may encounter more frequent technological malfunctions. This can involve communication problems with the central servers of banks, card reader malfunctions, and system breakdowns.
4. **Power Supply Issues:** ATMs need steady electricity to operate, and power outages can cause downtime and have an impact on service availability. Nigeria frequently suffers from power outages and irregular electrical supply, which has a significant negative influence on ATM operations. Voltage fluctuations and power outages frequently harm ATM hardware or interfere with network connectivity, rendering the devices inoperable for extended periods. This problem is especially serious in rural locations where solar inverters and generators are not always dependable backup power sources.
5. **Network Connectivity Problems:** Through a network connection, ATMs can communicate with financial systems. Originally, these connections used private networks with proprietary network protocols, but these days,

standard network protocols and the Internet are more frequently used. ATMs therefore require network connectivity to operate. Transaction failures can be caused by slow internet speeds, poor network connectivity to ATMs, and disruptions in the telecommunications infrastructure, particularly during busy times like the holidays or near the end of the month when more people are using ATMs because most civil servants are getting paid at that time.

6. **Cash management/Cash stocking challenges:** currency stocking concerns, or delays in replacing currency, have been noted in Nigeria, where recent cashless regulations have increased ATM usage. Ineffective cash management techniques also affect ATM functionality, such as incorrect cash loading. To satisfy consumer demand and guarantee service availability, there must be enough cash on hand and notes that fit ATMs. Especially on weekends and holidays, banks may find it difficult to swiftly restock ATMs. Customers will be greatly inconvenienced when this happens and the machines run out of money. Furthermore, utilizing damaged notes or other inappropriate cash handling practices can cause cash bottlenecks and ATM malfunctions.
7. **Security Concerns:** ATMs are susceptible to theft, physical attacks, and vandalism, particularly in places with low security or high crime rates. In Nigeria, criminal activities that target ATMs—like robbery, cash trapping, and card skimming—pose serious security risks and interfere with the provision of services. Such illegal activity not only interferes with ATM operations but also necessitates lengthy downtime for maintenance and security enhancements. Despite ongoing investments in security measures, banks nevertheless experience major disruptions due to the threat.
8. **Environmental Factors/Geopolitical Instability:** Extreme heat, dust, and humidity are some of the environmental factors that might significantly impact ATM performance in Nigeria, especially for those machines that are outside. These elements cause moisture damage, dust buildup, and overheating, all of which increase the likelihood of malfunctions. Political upheaval, civil unrest, and security issues in specific regions of Nigeria can hinder ATM operations. Temporary shutdown, restricted access to ATM services, and elevated security threats for ATM facilities are all possible outcomes of instability.

9. **Inadequate Maintenance and Support Services:** Prolonged ATM downtimes in Nigeria can also be caused by key concerns such as delayed repair services and irregular maintenance. The need for ATM services has grown, outpacing both the supply of maintenance staff and the rate at which repairs can be completed. ATM failures may occur more frequently and last longer as a result of this latency. Banks frequently struggle to receive technical support on time, which makes the availability issue worse.
10. **Limited availability of skilled technicians:** Sufficient personnel development training is necessary to guarantee the dependability and accessibility of ATM services. The availability of ATM services is significantly influenced by the technical staff's proficiency in operating and maintaining ATMs. There aren't many businesses in Nigeria that employ skilled professionals who are familiar with installing and maintaining ATMs. Furthermore, the majority of bank employees who look after ATMs are temporary employees who are not educated in ATM operations.
11. **Location and Poor Infrastructure:** ATMs are positioned not only outside or within bank buildings, but also in off-site places including supermarket stores, airports, shopping centers, petrol stations, eateries, and any other area that is frequently visited by a significant number of people. When compared to bank premises, the availability of ATM maintenance and cash stocking services is restricted in offsite sites. The availability and breakdown of ATM services are influenced by the surrounding population, civilization, and security. The usage of ATMs in remote locations raises security issues. ATM accessibility and upkeep are impacted by poor infrastructure, which includes poor road networks, telephone coverage, and environmental factors. It might be difficult to properly construct and maintain ATMs in remote areas since they frequently lack the necessary infrastructure.
12. **Customer/User knowledge:** One of the key variables driving the efficient usage of ATM service is consumers' tech literacy. Many people lack sufficient understanding about using ATMs; those who are older and less educated avoid using them out of fear of security risks and the intricacies required. The usage of ATMs in Nigerian local communities has a significant disadvantage.
13. **Banks and ATM vendor regulatory policies:** Regulatory requirements and compliance standards set by regulatory authorities influence ATM operations. Banks must adhere to regulatory guidelines related to security, accessibility, and operational standards, which may impact ATM deployment and service availability. In addition, ATM vendor maintenance policies such as quarterly maintenance, 24-hour default fault call resolution by engineers, weekend services, holiday call attendance, and remote support services are some of the factors that affect the availability of ATM service delivery. In Nigeria, some ATM vendors do not adhere to these policies.
14. **Interbank transactions/ Interswitch challenge.** People can withdraw and deposit money from ATMs that are not owned by the bank where they have an account or the nation in which their account is held because the majority of ATMs are linked to interbank networks via Interswitch position software. Certain banks let their ATM cards be used exclusively to prohibit users who are not their clients; in other instances, this applies to all users. In addition, Interswitch is vulnerable to network outages, password hacking, identity theft, security lapses, contested transactions, increased service expenses, and other issues. Furthermore, if you are not a direct customer of theirs, several banks have daily limits on the number of transactions and the maximum amount you can withdraw or send.

6 CONCLUSIONS

Addressing these factors requires a coordinated effort from financial institutions, regulatory bodies, government agencies, and other stakeholders. Strategies to improve ATM service availability in Nigeria may include investing in reliable power backup systems such as solar panels of DC-powered inverters especially in remote areas, or off-site locations., implementing robust security measures, optimizing cash management processes, enhancing infrastructure development, strengthening regulatory oversight, regular training of field service engineers to meet technical challenges, and promoting public awareness and cooperation in safeguarding ATM facilities. ATM vendors should ensure the supply of authentic hardware spare parts. Low-grade spare parts tend to result in an incessant breakdown of ATMs.

REFERENCES

- [1] Adegoke, A., & Ojo, T. (2023). Cash management practices and ATM downtime in Nigerian banks. *Journal of Banking & Finance Research*, 22(4), 201-219.
- [2] Adeleke, T., Johnson, O., and Musa, A. (2023). Analysis of ATM service downtime in Nigeria's banking sector. *Journal of Financial Services Technology*, 15(2), 45-62.
- [3] Affum M.Q. (2022). Exploring the use of automated teller machine (ATM) services of Agricultural Development Bank (ADB), Kasoa Branch (2022). *International Journal of Computing, Programming and Database Management 2022*; 3(1): 123-131
- [4] Bello, F., Afolayan, S., and Ibe, K. (2023). Environmental impact on ATM reliability: Evidence from Nigeria. *African Journal of Business Technology*, 18(2), 75-89.
- [5] Chukwu, D., and Nwosu, P. (2021). Maintenance practices and ATM availability in Nigeria. *International Journal of Banking Studies*, 17(3), 209-223.
- [6] Hossain M.S., Russel A.H. and Robidas L.C. (2015). Analysis of Factors Affecting the Customer's Satisfaction with reference to ATM Services in Dhaka City IOSR Journal of Business and Management (IOSR-JBM) e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 17, Issue 11.Ver. I (Nov. 2015), PP 68-75 www.iosrjournals.org
- [7] Ibrahim, M., and Yusuf, Z. (2022). ATM hardware and software challenges in Nigeria: A technical assessment. *West African Journal of Computing*, 27(3), 145-159.
- [8] Kumbhar, V. M. (2011). *Factors Affecting on Customers' Satisfaction: An Empirical Investigation of ATM Service*. <https://www.researchgate.net/publication/215445516>
- [9] Leblanc, G. (1990) Customer Motivation: use and non-use of automated banking. *International Journal of Banking Market*, 8 (4), 12-20
- [10] Nwankwo, C., and Ekpenyong, D. (2023). Network infrastructure and ATM service availability: A case study in Nigeria. *Journal of Information Systems in Developing Countries*, 14(3), 100-115.
- [11] Obi, F., and Umeh, C. (2022). Security threats and ATM breakdown: The Nigerian experience. *Journal of Financial Security Management*, 13(1), 56-71.
- [12] Ogundipe, L., and Fashola, K. (2021). The impact of vandalism on ATM service delivery in Nigeria. *Nigerian Journal of Economic Security*, 7(4), 92-104.
- [13] Okeke, I., Ajayi, B., & Eze, C. (2023). Power supply challenges and their impact on ATM operations in Nigeria. *Energy and Banking Review*, 11(1), 88-102.
- [14] Sharma N. and Rathore V. S. (2015) Analysis of Different Vulnerabilities in Auto Teller Machine Transactions Journal of Global Research in Computer Science REVIEW ARTICLE Available Online at www.jgrcs.info
- [15] Uba, G., and Ezech, N. (2022). Exploring the effects of unstable power on ATMs in Nigeria. *Journal of Energy Economics in Developing Nations*, 9(2), 133-148.