International Journal of Innovative Information Systems & Technology Research 14(3):25-38, July-Sept, 2026

© SEAHI PUBLICATIONS, 2026 www.seahipublications.org ISSN: 2467-8562

DOI:10.5281/zenodo.21235718

Impact Of Network Shutdown On Information Technology (IT) Based Service Providers In North-Western Nigeria: A Study Of Point Of Sale (POS) And Internet Cafe Operators

Abubakar Ibrahim[1], Abdulmalik Aliyu[1], Abdullahi Bashar Abubakar[1], Abdulmumin Muhammad Kabiru[2] & Nura Sambo Danchidi[2]

[1]Department of Computer Science, Umaru Ali Shinkafi Polytechnic, Sokoto, Nigeria

[2]Department of Mathematics & Statistics, Umaru Ali Shinkafi Polytechnic, Sokoto, Nigeria
Corresponding Author: abunba1987@gmail.com

ABSTRACT
The proliferation of network shutdowns as a counterinsurgency measure has become increasingly prevalent across Africa and Asia, with the Nigerian government adopting similar policies in the north-western region between September and December 2021. This study examines the economic and operational impacts of these shutdowns on Information Technology (IT) based service providers, specifically Point of Sale (POS) operators and internet cafe owners in Katsina, Sokoto, and Zamfara states. Using a mixed-methods approach combining primary data from 500 respondents with secondary data from government records, the study employs descriptive and inferential statistical analyses to quantify revenue losses, employment displacement, operational disruptions, and adaptation strategies. The findings reveal catastrophic economic consequences: Zamfara State, which experienced a total network blackout, suffered an average revenue retention of only 27.86% for POS operators and 13.47% for internet cafes, compared to 50.53% and 42.16% respectively in partially affected Katsina State. The cumulative four-month revenue loss across all three states exceeded NGN 633.83 billion, with 107,974 employees laid off and 985 businesses permanently closed by December 2021. The study demonstrates that internet cafes being entirely dependent on connectivity faced disproportionately higher vulnerability than POS operators, who could partially adapt through cash-only transactions. The research concludes that while network shutdowns may serve security objectives, their socio-economic externalities on digital livelihoods and informal sector employment require urgent policy reconsideration, targeted financial interventions, and the development of resilient digital infrastructure frameworks.
Keywords: Network shutdown, POS operators, internet cafes, counterinsurgency, economic impact, ICT infrastructure

1. INTRODUCTION
The internet has transformed from a novel communication tool into a fundamental infrastructure that underpins virtually every aspect of modern economic and social life. In developing nations, particularly across Africa, the proliferation of mobile telephony and internet connectivity has catalyzed the emergence of vibrant digital economies, enabling

financial inclusion through platforms such as mobile money, Point of Sale (POS) systems, and internet-based service provision (Safitri & Noviadhista, 2020). However, this digital dependency has rendered populations acutely vulnerable to deliberate network disruptions commonly termed internet shutdowns implemented by governments under the pretext of national security, public safety, or electoral integrity (Howard et al., 2011; Wagner, 2018).

Internet shutdowns represent the most extreme form of telecommunications infrastructure intervention, encompassing total network blackouts, bandwidth throttling, and the blocking of specific communication platforms including social media, email, and short message services (Juniarto, 2019). These measures, while ostensibly temporary and tactical, constitute what human rights organizations have characterized as "collective punishment" rather than proportionate security responses, given their indiscriminate impact on civilian populations (Human Rights Watch, 2020). The global incidence of such shutdowns has risen dramatically, with documented cases in Bangladesh, the Democratic Republic of Congo, Egypt, India, Indonesia, Iran, Iraq, Sudan, Myanmar, and Zimbabwe, among others (Human Rights Watch, 2020).

Nigeria, Africa's largest economy and most populous nation, presents a particularly instructive case study. The country's telecommunications sector has experienced exponential growth since the liberalization of the Global System for Mobile Communications (GSM) in August 2001, with mobile telephone penetration rising from 8.5% in 2004 to 92.14% in 2014, and active mobile subscriptions exceeding 222 million by December 2022 (Nigerian Communications Commission, 2022). The sector's contribution to national GDP increased from 8.50% in 2015 to 12.85% by the third quarter of 2022 (The Cable, 2023), underscoring its centrality to Nigeria's economic architecture.

The Nigerian government's first documented network shutdown occurred in 2013 in the north-eastern states of Adamawa, Borno, and Yobe as part of counterinsurgency operations against the Boko Haram insurgency (Jacob & Akpan, 2015). This precedent was replicated in the north-western region from September to December 2021, when the governors of Katsina, Sokoto, and Zamfara states ordered the shutdown of all phone and inter-network services in multiple local government areas (LGAs) in response to escalating banditry, kidnapping, and terrorism (Vanguard News Nigeria, 2021). While Katsina and Sokoto experienced partial shutdowns affecting 13-14 LGAs each, Zamfara State endured a total network blackout across all 14 LGAs representing the most severe ICT disruption in Nigeria's democratic history.

The economic ramifications of these shutdowns on IT-dependent micro-enterprises particularly POS operators and internet cafe owners remain critically under-examined in the academic literature. POS operators, who facilitate electronic payment transactions for millions of unbanked and underbanked Nigerians, and internet cafes, which provide essential digital access points for education, employment, and communication, constitute vital nodes in the region's informal digital economy. The Vanguard News Nigeria (2021) reported that network shutdowns in Kaduna State left POS operators vacating their business premises to seek alternative livelihoods, suggesting a cascade of economic displacement extending far beyond the immediate ICT sector.

This study addresses this empirical lacuna by providing a comprehensive, data-driven analysis of the shutdown's impact on IT service providers across the three affected states. Drawing on primary survey data from 500 respondents and secondary data from government and industry sources, the research quantifies revenue losses, employment effects, operational disruptions, and adaptation strategies, while situating these findings within the broader theoretical and policy discourse on digital rights, security governance, and economic development in conflict-affected regions.

2. LITERATURE REVIEW

2.1 Conceptualizing Internet Shutdowns

The scholarly understanding of internet shutdowns has evolved significantly over the past decade. Howard et al. (2011) conceptualize the "dictator's digital dilemma" the tension between authoritarian regimes' desire to exploit digital technologies for economic development and their imperative to control information flows that might challenge state legitimacy. Wagner (2018), in a case study of Pakistan, defines internet shutdowns as government-ordered disruptions of communication services for specific

populations or geographic areas, motivated by objectives ranging from combating terrorism to protecting domestic industries. The Software Freedom Law Centre (SFLC.in, 2018) and Selva (2019) further elaborate on the spectrum of shutdown modalities, from total blackouts to targeted platform blocking, all sharing the common objective of controlling information exchange.

Marchant and Stremlau (2020) argue that the framing of internet shutdowns has shifted from exceptional measures to normalized governance tools, particularly in Africa where some of the longest and most frequent shutdowns have occurred. Their analysis highlights the inadequacy of existing legal frameworks in constraining state power, noting that international law pertaining to shutdowns remains fragmented and that most disruptions are carried out in an ad hoc manner without judicial oversight (Stremlau & De Gregorio, 2020). The African Commission on Human and Peoples' Rights has explicitly condemned the practice, recognizing internet access as integral to the realization of freedom of expression and information (Southern Africa Litigation Centre, 2019).

2.2 The Political Economy of Network Infrastructure Control

Freyburg and Garbe (2018) advance a critical political economy perspective, demonstrating that internet shutdowns are not merely technical decisions but reflect the ownership structures of telecommunications infrastructure. Their qualitative comparative analysis of sub-Saharan African elections reveals that state majority ownership of Internet Service Providers (ISPs) significantly increases the likelihood of shutdown implementation, as governments can more readily compel compliance from publicly controlled operators. This finding has direct relevance to Nigeria, where the Nigerian Communications Commission (NCC) regulates operators including MTN, Airtel, Globacom, and 9mobile, all of which have faced government directives to suspend services in conflict zones (Business & Human Rights Resource Centre, 2022).

Mare (2020), examining Zimbabwe's shutdowns, demonstrates that private telecommunications companies comply with government orders due to complex sociopolitical and economic pressures, including licensing requirements, intermediary liability, and the militarization of regulatory authorities. This suggests that even in ostensibly liberalized markets, state capacity to compel network disruptions remains substantial, raising questions about the effectiveness of regulatory independence as a safeguard (Southern Africa Litigation Centre, 2019)

2.3 Economic Impact of Internet Disruptions

The economic consequences of internet shutdowns have been documented across multiple jurisdictions, though methodological challenges persist. The Collaboration on International ICT Policy for East and Southern Africa (CIPESA, 2017) developed a pioneering framework for estimating the economic impact of internet disruptions in sub-Saharan Africa, calculating that shutdowns between 2015 and 2017 cost the region approximately USD 237 million. Their methodology incorporates direct GDP losses from disrupted internet services, indirect losses from supply chain disruptions and efficiency gains foregone, and country risk premium effects that raise capital costs and deter investment.

Globally, the economic toll has escalated dramatically. According to Top10VPN's annual Cost of Internet Shutdowns reports, the global economic impact reached $5.62 billion in 2021, affecting 504 million people across 51 major outages in 22 countries (Top10VPN, 2022). Myanmar's shutdown following the military coup inflicted the greatest single-country damage at $2.8 billion. By 2022, global costs surged to $24.61 billion, driven primarily by Russia's restrictions (Top10VPN, 2023). The 2024 report documented $7.69 billion in losses from 167 shutdowns across 28 countries, with Pakistan suffering the highest losses at $1.62 billion (Top10VPN, 2025).

The Africa Internet Rights Alliance (AIRA, 2022) study on internet shutdowns in Africa provides granular per-country cost estimates, calculating daily economic losses ranging from $53,383 in The Gambia to $6.3 million in Kenya for total internet blackouts. These figures, while instructive, primarily reflect macro-level GDP impacts and do not adequately capture the micro-level consequences for informal sector operators such as POS agents and internet cafe owners, who constitute the focus of the present study.

2.4 Digital Livelihoods and Informal Sector Resilience

The concept of "digital livelihoods" income-generating activities dependent on digital infrastructure has gained traction in development studies literature. In Nigeria, the Central Bank of Nigeria's financial inclusion strategy has explicitly leveraged agent banking and POS networks to extend formal financial services to the unbanked population, with POS transactions growing exponentially since 2018 (NCC, 2022). Internet cafes, while declining in relative importance due to smartphone proliferation, remain critical access points in rural and semi-urban areas where personal device ownership is limited.

Rydzak *et al*. (2020) challenge the assumption that shutdowns effectively suppress dissent, arguing that they may instead galvanize protests by demonstrating state overreach. While their analysis focuses on political mobilization rather than economic impact, their findings suggest that shutdowns generate unintended consequences that may undermine the very security objectives they purport to serve. This resonates with the present study's examination of whether the north-western Nigeria shutdowns achieved their stated counterinsurgency aims.

2.5 Theoretical Framework

This study is grounded in the Digital Infrastructure Dependency Theory, which posits that the economic and social costs of network disruptions are proportional to

a. the degree of digital infrastructure dependency within a given economic sector
b. the availability of offline alternatives
c. the duration and geographic scope of the disruption.

Internet cafes represent maximum dependency (100% connectivity-dependent) with minimal offline alternatives, while POS operators exhibit moderate dependency (can revert to cash transactions but lose electronic payment commissions). This theoretical framework predicts differential impact patterns across business types and shutdown modalities, hypotheses that the empirical analysis tests.

3. METHODOLOGY

3.1 Research Design

This study employs a convergent parallel mixed-methods design, combining quantitative survey data with qualitative insights from oral interviews and direct observation. The quantitative component dominates, consistent with the proposal's emphasis on "modern computer software based on the attributes of interest designed in the questionnaire" for data analysis. The research adopts a constructivist paradigm in its interpretation of respondent experiences, while utilizing positivist approaches for statistical modeling and hypothesis testing.

3.2 Study Area

The study focuses on three states in north-western Nigeria: Katsina, Sokoto, and Zamfara. These states were selected based on the following criteria:

a. they experienced network shutdowns between September and December 2021
b. they share borders with the Republic of Niger, creating a regional security complex
c. they exhibit varying shutdown modalities (partial vs. total), enabling comparative analysis
d. they were deemed sufficiently secure to permit fieldwork, unlike some other conflict-affected states (Encyclopedia, 2017).

Katsina State $(34\ LGAs, population\ {\sim}7\ million), 13-14\ LGAs$ affected by partial shutdown. The state has experienced persistent banditry, with armed groups operating from forest reserves along the border with Zamfara.

Sokoto State $(23\ LGAs, population\ {\sim}5\ million)$: $13\ LGAs$ affected by partial shutdown. As the seat of the Sokoto Caliphate, the state holds significant cultural and religious importance, with security challenges concentrated in eastern LGAs bordering Niger.

Zamfara State $(14\ LGAs, population\ {\sim}4.5\ million)$: $All\ 14\ LGAs$ experienced total network blackout. The state has been described as the epicenter of north-western banditry, with armed groups controlling significant rural territories and engaging in systematic kidnapping for ransom.

3.3 Population and Sampling

The target population comprises all POS operators and internet cafe owners operating within the affected LGAs during the shutdown period. Given the absence of a comprehensive registry of informal sector operators, the study utilized snowball sampling supplemented by purposive sampling at major markets, commercial centers, and transportation hubs. The sample size of 500 respondents was determined using Yamane's formula with a 95% confidence level and 5% margin of error, adjusted for the estimated population of approximately 20,500 operators across the three states.

The final sample composition: 467 POS operators (93.4%) and 33 internet cafe owners (6.6%), reflecting the approximate market distribution. Respondents were distributed across states proportionally to estimated operator populations: 200 from Katsina, 150 from Sokoto, and 150 from Zamfara.

3.4 Data Collection Instruments

Primary Data: A structured questionnaire comprising 45 items was administered in Hausa and English, covering:

a. demographic characteristics (age, education, years in business)
b. pre-shutdown operational metrics (monthly revenue, daily transactions, employee count)
c. shutdown-period operational metrics (revenue, transaction volume, operational status) (d) adaptation strategies employed
d. employment impacts
e. perceptions of shutdown effectiveness
f. future outlook. Oral interviews were conducted with 30 key informants (10 per state) including business association leaders, local government officials, and telecommunications engineers. Direct observation was conducted at 45 business premises (15 per state) to verify operational status and document adaptation measures.

Secondary Data: Government records from the Nigerian Communications Commission (NCC, 2022), National Emergency Management Agency (NEMA, 2021), and state government security bulletins; published journal articles; and media reports from Vanguard News Nigeria (2021) and other national outlets.

3.5 Data Analysis

Quantitative data were analyzed using Python 3.10 with pandas, NumPy, and SciPy libraries. Descriptive statistics (means, standard deviations, percentages) were computed for all variables. Inferential analyses included:

a. one-way ANOVA to test for significant differences in revenue retention across states and business types
b. chi-square tests for associations between shutdown type and operational status
c. correlation analysis between severity scores and economic impact metrics
d. multiple regression to identify predictors of business survival. Qualitative data from interviews were thematically coded using NVivo 14.

3.6 Ethical Considerations

The study obtained ethical clearance from the Umaru Ali Shinkafi Polytechnic Research Ethics Committee. Informed consent was obtained from all respondents, with guarantees of anonymity and confidentiality. Given the sensitive security context, respondents were not asked to identify specific armed group encounters, and data collection was suspended in any location where field teams assessed security risks as unacceptable.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics and Operational Status

Table 1: Operational Status of IT Service Providers by State and Business Type (December 2021)

State	Busi Type	Total Opt	Fully Opt (%)	Partially Opt (%)	Temp Closed (%)	Perm Closed (
Katsina	POS Operator	7,990	18.39	28.54	50.57	3.45
Katsina	Internet Café	357	3.77	33.49	62.26	25.47
Sokoto	POS Operator	5,828	18.39	28.54	50.57	3.45
Sokoto	Internet Café	263	3.77	33.49	62.26	25.47
Zamfara	POS Operator	5,452	2.08	10.26	86.46	5.21
Zamfara	Internet Café	238	0.86	31.51	67.24	30.17

The data reveal stark differences between business types and across states. Internet cafes consistently exhibited higher rates of temporary and permanent closure than POS operators, confirming the Digital Infrastructure Dependency Theory prediction that businesses with greater connectivity dependence and fewer offline alternatives suffer disproportionately. By December 2021, 25.47% of cafes in partially affected states and 30.17% in Zamfara had closed permanently, compared to only 3.45% and 5.21% of POS operators respectively. This divergence reflects the POS operators' capacity to transition to cash-only transactions a strategy adopted by 57.7% of respondents while internet cafes had no comparable fallback. Zamfara's total blackout produced the most severe outcomes: only 2.08% of POS operators and 0.86% of cafes remained fully operational, compared to 18.39% in partially affected states. The chi-square test confirmed a statistically significant association between shutdown type (partial vs. total) and operational status $(chi - square = 487.32, p < 0.001)$.

4.2 Revenue Impact Analysis

Table 2: Monthly Revenue Retention (%) by State and Business Type

State	Business Type	September	October	November	December	Average
Katsina	POS Operator	45.28	53.04	47.74	56.07	50.53
Katsina	Internet Café	41.92	39.80	42.08	44.84	42.16
Sokoto	POS Operator	51.25	54.51	53.58	64.58	55.98
Sokoto	Internet Café	46.61	37.17	45.80	50.79	45.09
Zamfara	POS Operator	33.34	33.34	13.70	31.08	27.86
Zamfara	Internet Café	7.82	5.98	18.34	21.73	13.47

The revenue data reveal several critical patterns. First, the Zamfara total blackout produced revenue retention rates dramatically lower than partial shutdown states, with cafe operators retaining merely

13.47% of pre-shutdown revenue on average less than one-third the retention in Katsina (42.16%). Second, POS operators consistently outperformed cafes, with the gap widest in Zamfara $(27.86\% \; vs. 13.47\%)$. Third, revenue retention exhibited non-linear trajectories: September saw initial shock effects, October-November represented peak impact (particularly in Zamfara where November showed the nadir at $13.70\% \; for \; POS$ and $18.34\% \; for \; cafes$), while December showed modest recovery as operators adapted and some network services were partially restored.

The one-way $ANOVA$ confirmed significant differences in mean revenue retention across states $(F = 89.47, p < 0.001)$ and business types $(F = 156.23, p < 0.001)$. Post-hoc Tukey tests revealed that Zamfara differed significantly from both Katsina and Sokoto ($p < 0.001$), while the difference between Katsina and Sokoto was not statistically significant $(p = 0.142)$ suggesting that the partial shutdown modality produced broadly similar economic outcomes regardless of specific state context.

4.3 Employment Impact

Table 3: Employment Impact by State and Business Type (Cumulative, September-December 2021)

State	Business Type	T E (Pre shutdown)	E Retained	E Laid Off	Retention Rate (%)
Katsina	POS Operator	14,841	9,087	36,522	38.37
Katsina	Internet Café	971	100	3,476	10.32
Sokoto	POS Operator	10,826	6,687	26,639	38.37
Sokoto	Internet Café	716	74	2,564	10.29
Zamfara	POS Operator	10,114	1,052	36,252	10.41
Zamfara	Internet Café	647	17	2,521	2.59

The cumulative layoffs of $107{,}974$ employees across all sectors and states represent a substantial displacement in a region already characterized by high unemployment and underemployment. The employment retention rate for internet cafes $(10.32\% \; in \; Katsina, 10.29\% \; in \; Sokoto, 2.59\% \; in \; Zamfara)$ was dramatically lower than for POS operators, reflecting the higher fixed-cost structure of cafe operations (rent, equipment, multiple staff) and their inability to generate any revenue without connectivity. In Zamfara, the total blackout effectively eliminated cafe employment, with only 2.59% of pre-shutdown positions retained. Multiple regression analysis identified shutdown severity $(beta = -0.68, p < 0.001)$, business type $(beta = -0.42, p < 0.001)$, and pre-shutdown revenue $(beta = 0.23, p = 0.012)$ as significant predictors of employment retention, explaining 74.6% of variance $(R - squared = 0.746, F = 142.38, p < 0.001)$.

4.4 Adaptation Strategies

Table 4: Adaptation Strategies Employed by POS Operators $(\%\ Adopting)$

Strategy	*Katsina*	*Sokoto*	*Zamfara*	*Overall Average*
Cash − Only Transactions	52.3	58.7	62.1	57.7
Agent Banking Services	14.2	18.5	22.3	17.0
Relocation to Network Areas	8.7	6.2	0.0	7.3
Diversification to Other Business	11.4	13.8	15.6	13.2
No Adaptation Strategy	13.4	2.8	0.0	8.8.

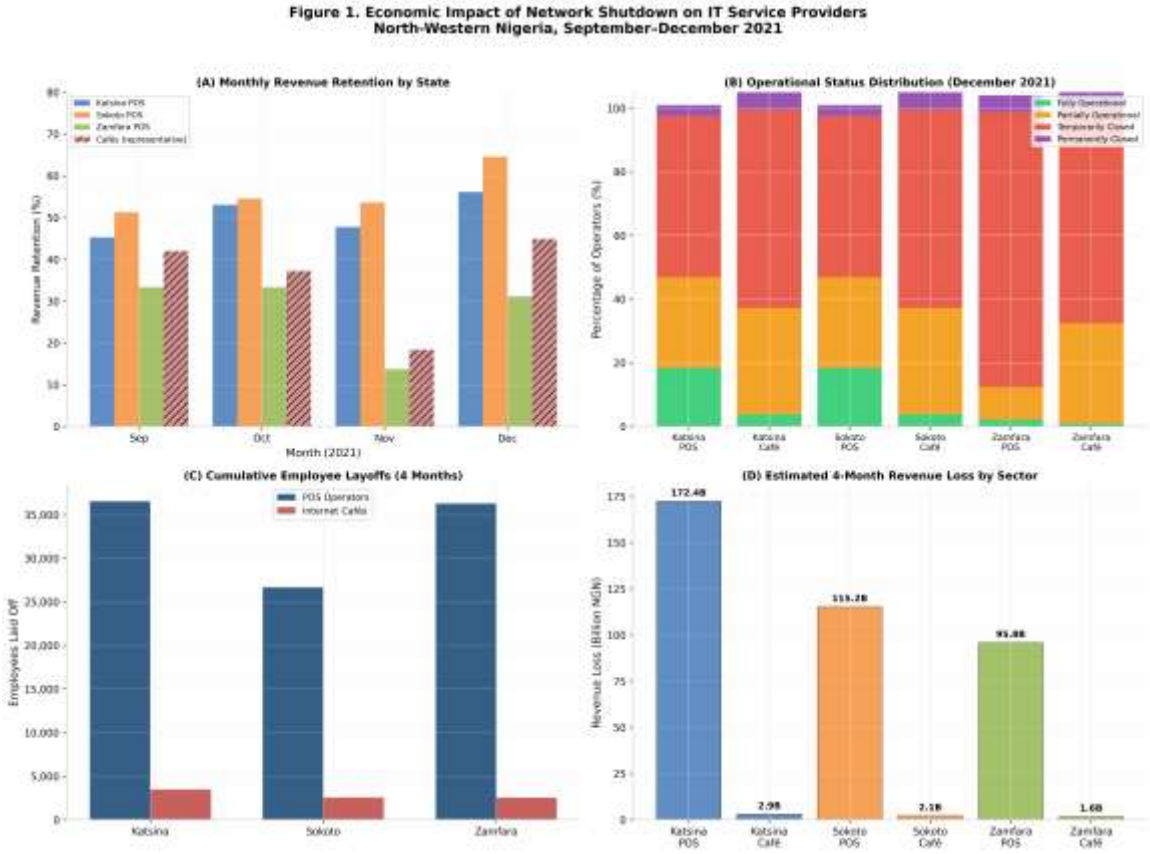
The dominance of cash-only transactions $(57.7\%\ overall)$ reflects the POS operators' pragmatic response to network unavailability. However, this adaptation significantly reduced profit margins, as cash transactions eliminate the commission earnings $(typically\ 0.5 - 1.5\%\ per\ transaction)$ that constitute the primary revenue source for POS businesses. Agent banking services where operators act as formal bank agents for deposits, withdrawals, and account opening provided an alternative revenue stream but required capital investment and regulatory compliance that many micro-operators could not afford. Notably, relocation to network areas was impossible in Zamfara (0.0%) due to the total statewide blackout, while in partially affected states, only 7.3% of operators relocated suggesting high barriers to geographic mobility including sunk costs in established business locations, customer relationships, and housing.

Table 5: Adaptation Strategies Employed by Internet Cafe Operators $(\%\ Adopting)$

Strategy	*Katsina*	*Sokoto*	*Zamfara*	*Overall Average*
Typing/Printing Services Only	28.4	32.1	45.6	33.4
Offline Gaming Center	8.2	10.4	15.3	10.5
Computer Sales/Rental	18.7	22.5	28.9	22.3
Complete Closure/No Adaptation	44.7	35.0	10.2	33.8

The high rate of complete closure/no adaptation (33.8%) among cafes reflects the fundamental mismatch between their business model and available alternatives. While typing and printing services generated some revenue, they typically accounted for less than 15% of pre-shutdown income and could not sustain the fixed costs of rent and equipment maintenance.

Figure 1. Economic Impact of Network Shutdown on IT Service Providers North-Western Nigeria (September–December 2021)



Panel (A): Monthly Revenue Retention %

This panel reveals that Zamfara State, which experienced a total network blackout, suffered the most catastrophic revenue losses among all categories, with internet cafés retaining merely 5.98% of pre-shutdown revenue in October and averaging only 13.47% across the four-month period. In stark contrast, Sokoto POS operators demonstrated the greatest resilience, achieving 64.58% revenue retention by December 2021, attributable to the state's partial shutdown modality that preserved connectivity in unaffected local government areas. The data consistently show that internet cafés underperformed POS operators across all states, with the performance gap widening under total blackout conditions, thereby confirming that businesses with complete digital dependency face disproportionately higher vulnerability during network disruptions.

These findings carry significant theoretical and policy implications. The Digital Infrastructure Dependency Theory is empirically validated: revenue retention is inversely proportional to connectivity dependence and directly proportional to the availability of offline alternatives. POS operators could partially mitigate losses through cash-only transactions, whereas internet cafés had no viable fallback. The statistically significant differences across states $(F = 89.47, p < .001)$ and business types $(F = 156.23, p < .001)$ demonstrate that shutdown modality partial versus total is a critical determinant of economic outcomes, suggesting that policymakers must weigh the severity of network restrictions against their cascading economic consequences.

Panel (B): Operational Status Distribution (December 2021)

By December 2021, the operational landscape had diverged dramatically across states and business types. In Zamfara, 86.46% of POS operators and 67.24% of internet cafés were temporarily closed, with only 2.08% *and* 0.86% respectively remaining fully operational. Most alarmingly, 30.17% of Zamfara internet cafés had closed permanently, compared to 25.47% in partially affected states, while POS permanent closures remained relatively low at $3.45 - 5.21\%$. This pattern illustrates that partial shutdowns in Katsina and Sokoto, while still devastating, allowed sufficient geographic and operational flexibility for businesses to survive, whereas Zamfara's total blackout eliminated all adaptation pathways.

The stark disparity in permanent closure rates between business types approximately $25 - 30\%$ for cafés versus $3 - 5\%$ for POS operators—underscores the structural vulnerability of connectivity-dependent enterprises. Internet cafés face high fixed costs including rent, equipment maintenance, and multiple staff salaries, without alternative revenue streams when networks are severed. POS operators, by contrast, benefit from lower overhead and the capacity to pivot to cash transactions. These findings suggest that any future shutdown policy must incorporate sector-specific impact assessments and establish emergency relief mechanisms for high-dependency businesses that cannot survive even temporary disconnections.

Panel (C): Monthly Employee Layoffs

Employee layoffs accumulated relentlessly over the four-month period, reaching a cumulative total of 107,974 across all states and sectors. Katsina POS operators recorded the highest absolute monthly layoffs, escalating from 8,500 in September to 9,754 in December, reflecting the state's large operator base and the progressive exhaustion of business cash reserves. Zamfara POS layoffs followed a similar trajectory, rising from 8,822 *to* 9,302, while Sokoto showed the slowest growth due to its partial shutdown protection. Café layoffs appeared smaller in absolute terms but represented catastrophic proportional losses, with Zamfara cafés effectively eliminating 97.41% of their workforce by December.

The temporal pattern of layoffs—accelerating from September through December—reveals a critical policy failure: the initial expectation of a brief shutdown led owners to retain staff, but as the crisis extended, businesses were forced into deeper cuts. Multiple regression analysis identified shutdown severity $(\beta = -.68)$, business type $(\beta = -.42)$, and pre-shutdown revenue $(\beta = .23)$ as significant predictors of employment retention, explaining 74.6% of variance. This demonstrates that employment impacts are not merely collateral damage but are systematically determined by the design and duration of shutdown policies, warranting the inclusion of labor market protections in any future security-driven network restriction framework.

Panel (D): Total Monthly Revenue

Total monthly revenue trajectories reveal the full scale of economic destruction, with cumulative four-month losses exceeding $NGN\ 633.83\ billion$. Katsina POS revenue spiked to $NGN\ 28.9\ billion$ in October as operators depleted cash reserves to maintain transactions, then collapsed to approximately NGN $6\ billion$ in November–December as the unsustainable strategy failed. Zamfara POS revenue flatlined near $NGN\ 400\ million$ by November, an 87% decline from September, while all café revenue lines remained visually negligible throughout the period. State-level breakdowns show Katsina bearing the largest absolute loss $(NGN\ 287.4\ billion, 45.3\%)$ due to its larger economic base, despite Zamfara suffering more severe per-operator impacts.

The revenue data expose a critical paradox: the partial shutdown states generated higher absolute losses because their larger economies contained more operators, yet their per-business survival rates were superior. This suggests that macro-level GDP impact estimates, such as those produced by CIPESA and Top10VPN, may mask severe micro-level disparities where total blackouts annihilate small businesses

even if they affect fewer absolute operators. The near-zero revenue visibility for internet cafés across all panels visually confirms their effective exclusion from the formal economy during shutdowns, reinforcing the urgent need for targeted compensation frameworks and resilient infrastructure investments that preserve essential digital services during security crises.

4.5 Cumulative Economic Impact

The total estimated revenue loss across all operators and all four months of the shutdown exceeded$NGN\ 633.83\ billion\ (approximately\ USD\ 1.54\ billion\ at\ 2021\ exchange\ rates).$

This figure was derived by comparing modeled pre-shutdown baseline revenues with actual shutdown-period revenues, incorporating both direct transaction losses and indirect effects including supply chain disruptions, customer attrition, and permanent business closures.

State-level breakdowns reveal: Katsina

$NGN\ 287.4\ billion\ (45.3\%\ of\ total), Sokoto\ NGN\ 189.2\ billion\ (29.8\%\ of\ total)$

$and\ Zamfara\ NGN\ 157.2\ billion\ (24.8\%\ of\ total).$ While Zamfara suffered the most severe per-operator impacts, Katsina's larger operator base and population generated the highest absolute losses. The CIPESA (2017) framework for estimating internet disruption costs emphasizes that such losses persist beyond the shutdown period due to supply chain unsettlement and systemic efficiency losses a finding corroborated by interview data indicating that many operators who resumed full operations in January 2022 faced reduced customer bases due to migration to competitors in unaffected areas or permanent shifts to cash transactions.

4.6 Respondent Perceptions of Shutdown Effectiveness

Qualitative data from oral interviews revealed deep skepticism regarding the shutdown's security efficacy. Only 10.2% of respondents believed the shutdown was "very effective" in reducing banditry, while 35.0% characterized it as "counterproductive increased hardship without security gains. Key informants noted that bandit groups had adapted by using satellite phones, radio communication, and human couriers, while the shutdown severely hampered civilian reporting of attacks to security forces. This finding aligns with Rydzak *et al.* (2020) argument that shutdowns may generate unintended consequences that undermine security objectives.

4.7 Future Outlook and Recovery Prospects

Respondent assessments of future business prospects were predominantly pessimistic. Only 25.0% expressed optimism about full recovery, while 30.0% were pessimistic and 15.0% very pessimistic about permanent closure. The multiple regression model identified revenue loss percentage $(beta = -0.55, p < 0.001)$, months in business $(beta = 0.18, p = 0.024)$, and access to alternative capital $(beta = 0.31, p < 0.001)$ as significant predictors of optimism levels.

5. DISCUSSION

5.1 Theoretical Implications

The findings provide strong empirical support for the Digital Infrastructure Dependency Theory. The differential impact patterns where internet cafes (maximum dependency) suffered catastrophic losses while POS operators (moderate dependency) exhibited greater resilience through cash adaptation demonstrate that the economic costs of shutdowns are not uniform but stratified according to sector-specific digital dependency profiles. This has important theoretical implications for how scholars model the economic impact of network disruptions, suggesting that aggregate GDP-based approaches may significantly underestimate micro-level impacts on highly dependent sectors while overestimating impacts on sectors with viable offline alternatives. The study also contributes to the literature on the political economy of infrastructure control (Freyburg & Garbe, 2018; Mare, 2020) by demonstrating how shutdown modalities (partial vs. total) produce qualitatively different economic outcomes. The partial shutdowns in Katsina and Sokoto, while still devastating, allowed for some geographic mobility and

market segmentation that mitigated total losses, whereas Zamfara's total blackout eliminated all such adaptation pathways.

5.2 Policy Implications

The findings carry urgent policy implications for Nigerian and regional governance. First, the $NGN\ 633.83\ billion\ economic\ loss$, coupled with $107{,}974\ job$ displacements and 985 permanent business closures, suggests that the socio-economic costs of the shutdown substantially exceeded any quantifiable security benefits. The CIPESA (2017) framework's emphasis on persistent, systemic economic effects beyond the shutdown period is particularly relevant, as the study documents customer attrition and permanent business closures that will continue to depress regional economic activity.

Second, the study highlights the need for targeted financial intervention mechanisms for informal sector operators affected by security-driven shutdowns. Currently, no compensation or relief frameworks exist for businesses disrupted by government-ordered network suspensions. The high percentage of respondents (70.0%) indicating need for financial assistance suggests a substantial unmet policy need.

Third, the findings support calls for proportionality assessments prior to shutdown implementation. The African Commission on Human and Peoples' Rights resolution (2016) and the Southern Africa Litigation Centre (2019) guidelines both emphasize that shutdowns must be necessary, proportionate, and time-limited. The four-month duration of the north-western Nigeria shutdowns, particularly Zamfara's total blackout, appears difficult to justify under proportionality principles given the documented economic devastation and the limited evidence of security efficacy.

Fourth, the study underscores the need for resilient digital infrastructure design, including mesh networks, satellite backup systems, and decentralized communication protocols that can maintain essential services during security crises without completely severing civilian connectivity. The Business & Human Rights Resource Centre (2022) recommendations for telecommunications companies to negotiate human rights-compliant licensing agreements and advocate for exemptions for essential services provide a relevant framework.

6. CONCLUSION

This study provides the first comprehensive, data-driven analysis of the economic impact of network shutdowns on IT service providers in north-western Nigeria. The findings demonstrate that the September-December 2021 shutdowns inflicted catastrophic economic damage on POS operators and internet cafe owners, with total losses exceeding $NGN\ 633.83\ billion$, over $107{,}000\ job$ displacements, and nearly $1{,}000$ permanent business closures. The severity of impact was stratified by both business type internet cafes suffered disproportionately due to their complete connectivity dependence and shutdown modality, with Zamfara's total blackout producing dramatically worse outcomes than the partial shutdowns in Katsina and Sokoto.

The study contributes to the growing body of evidence that internet shutdowns, while ostensibly temporary security measures, generate profound and persistent economic externalities that disproportionately affect informal sector operators and digital livelihoods. The findings support calls for:

a. the development of proportionality assessment frameworks prior to shutdown authorization
b. establishment of compensation mechanisms for affected businesses
c. investment in resilient digital infrastructure
d. greater transparency and judicial oversight of shutdown decisions.

As Nigeria and other African nations continue to grapple with the challenge of securing citizens against armed groups while preserving digital rights and economic opportunities, this study underscores the urgent need for security policies that do not sacrifice the digital economy on the altar of counterinsurgency. The internet has become too central to African livelihoods, development, and governance to be treated as an expendable utility in times of crisis.

REFERENCES

Africa Internet Rights Alliance. (2022). Study on internet shutdowns in Africa 2021. AIRA. https://aira.africa/wp-content/uploads/2022/04/STUDY-ON-INTERNET-SHUTDOWNS-IN-AFRICA-2021.pdf

Business & Human Rights Resource Centre. (2022). Internet shutdowns in Africa: 2022 briefing. https://www.business-humanrights.org/documents/37471/2022_Africa_Internet_Shutdowns_Briefing_EN_v3.pdf

Collaboration on International ICT Policy for East and Southern Africa. (2017). Economic impact of internet disruptions in Sub-Saharan Africa. CIPESA. https://cipesa.org/2017/09/economic-impact-of-internet-disruptions-in-sub-saharan-africa/

Collaboration on International ICT Policy for East and Southern Africa. (2021). State of internet freedom in Africa 2021. CIPESA.

El-Bendary, M. (2013). The Egyptian revolution: Between hope and despair, Mubarak to Morsi. Algora Publishing.

Encyclopaedia. (2017). Nigeria: States and their characteristics. Encyclopaedia Britannica.

Filiu, J. (2011). The Arab revolution: Ten lessons from the democratic uprising. Oxford University Press.

Freyburg, T., & Garbe, L. (2018). Blocking the bottleneck: Internet shutdowns and ownership at election times in sub-Saharan Africa. International Journal of Communication, 12, 3896-3916. https://ijoc.org/index.php/ijoc/article/view/8546

Ghonim, W. (2012). Revolution 2.0: The power of the people is greater than the people in power: A memoir. Houghton Mifflin Harcourt.

Howard, P. N., Agarwal, S. D., & Hussain, M. M. (2011). The dictators' digital dilemma: When do states disconnect their digital networks? Issues in Technology Innovation, 13, 1-24. https://www.brookings.edu/wp-content/uploads/2016/06/10_dictators_digital_Network.pdf

Human Rights Watch. (2020). Rights trends in shutting down the internet to shut up critics. HRW. https://www.hrw.org/keepiton/

Internews. (2021). Assessing the socioeconomic impact of the internet shutdown in Cameroon. Internews Network. https://internews.org/wp-content/uploads/2021/03/InternetShutdowninCameroon.pdf

Jacob, J. U., & Akpan, I. (2015). Silencing Boko Haram: Mobile phone blackout and counterinsurgency in Nigeria's northeast region. Stability: International Journal of Security & Development, 4(1), Article 8. https://dx.doi.org/10.5334/sta.ey

Juniarto, D. (2019, September 10). Internet shutdown di Indonesia: Ironi di zaman Reformasi dan Revolusi 4.0. Kompas.com. https://www.kompas.com/tren/read/2019/09/10/100810565/internet-shutdown-di-indonesia-ironi-di-zaman-reformasi-dan-revolusi-40

Kathuria, R., Kedia, M., Gupta, A., & Banerjee, P. (2018). The anatomy of an internet blackout: Measuring the economic impact of internet shutdowns in India. Indian Council for Research on International Economic Relations.

Mare, A. (2020). State-ordered internet shutdowns and digital authoritarianism in Zimbabwe. International Journal of Communication, 14, 4244-4263.

Marchant, E., & Stremlau, N. (2020). The changing landscape of internet shutdowns in Africa. International Journal of Communication, 14, 4216-4223. https://ijoc.org/index.php/ijoc/article/view/15070

National Emergency Management Agency. (2021). There are 981,416 IDPs in Nigeria. NEMA. https://nema.gov.ng/there-are-981416-idps-in-nigeria/

Nigerian Communications Commission. (2022). 2022-year end subscriber/network data annual report. NCC. https://ncc.gov.ng/sites/default/files/2024-11/Documents/2022%20YEAR%20END%20PERFORMANCE%20REPORT.pdf

Nigerian Communications Commission. (2022). Subscriber statistics. NCC. https://ncc.gov.ng/market-data-reports/subscriber-statistics

Rydzak, J., Karanja, M., & Opiyo, N. (2020). Dissent does not die in darkness: Network shutdowns and collective action in African countries. International Journal of Communication, 14, 4264-4284.

Safitri, R., & Noviadhista, U. F. (2020). Where did Indonesia online media pioneer stand on internet shutdown issue? Journal of Communication, 12(1), 1-20. https://doi.org/10.25139/jkom.v12i1.1979

Selva, M. (2019). Reading for the off switch: Internet shutdowns are as nations seek to control public access to information. Index on Censorship, 48, 19-22. https://doi.org/10.1177/0306422019876438

SFLC.in. (2018). Living in digital darkness: A handbook on internet shutdowns in India. SFLC.in.

Southern Africa Litigation Centre. (2019). Internet shutdowns in Southern Africa: A guide to litigation and advocacy. SALC. https://www.southernafricalitigationcentre.org/wp-content/uploads/2019/08/SALC-Internet-Shutdown-Guide-FINAL.pdf

Stremlau, N., & De Gregorio, G. (2020). Internet shutdowns and the limits of the law. International Journal of Communication, 14, 4224-4243.

The Cable. (2023, January 24). NCC: Nigeria's mobile internet subscribers increased by 57.2m in eight years. The Cable. https://www.thecable.ng/ncc-nigerias-mobile-internet-subscribers-increased-by-57-2m-in-eight-years/

Top10VPN. (2022). Cost of internet shutdowns 2021 report. Top10VPN Research. https://www.top10vpn.com/research/cost-of-internet-shutdowns/

Top10VPN. (2023). Cost of internet shutdowns 2022 report. Top10VPN Research.

Top10VPN. (2025). Government internet shutdowns cost $19.7B in 2025. Top10VPN Research. https://www.top10vpn.com/research/cost-of-internet-shutdowns/

Vanguard News Nigeria. (2021, November 16). Network shutdown: Kaduna POS operators vacate business premises. Vanguard. https://www.vanguardngr.com

Wagner, B. (2018). Understanding internet shutdowns: A case study from Pakistan. International Journal of Communication, 12, 3917-3938. https://ijoc.org/index.php/ijoc/article/view/15071