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Challenges of Inconsistent Power Supply on Polytechnic Administration in the North-West Geo-Political Zone, Nigeria

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Abstract

The study examined the Challenges of Inconsistent Power Supply on Polytechnic Administration in North-West Geo-Political Zone, Nigeria. The study was carried out to determine how unstable electricity supply affects administrative operations, financial management, coping strategies and ways to improve power supply to the polytechnic system. The population was 2865 which consisted of all administrative staff of the polytechnics under study and the sample size was 1052. A structure questionnaire was used as the instrument for data collection. The data collected were analyzed using mean statistics and chi-square. A descriptive survey research design was adopted for the study. The findings revealed that inconsistent power supply significantly delays administrative processes, disrupts the use of office equipment and ICT facilities, increases expenditure on generator fuel and maintenance, reduce staff productivity and morale and negatively affects service delivery for both staff and students. Based on the findings, the study concluded that stable and reliable power supply is essential for efficient institutional administration. The study therefore recommended that polytechnic management should invest in alternative power sources such as solar energy systems, ensure proper maintenance of electrical facilities and that government should improve national power infrastructure to support educational institutions.

Keywords: Inconsistent Power Supply, Polytechnic Administration, Administrative Staff.

1.Introduction

Electricity is crucial for socio-economic development and has positive impacts on quality of life and national development. However, despite the usefulness of electricity, the country is still being faced with electricity problem. This electricity problem has affected all sector of Nigerian economy including the polytechnic sector. In Nigeria and many developing countries, inconsistent power supply has been identified as a major constraint to institutional performance, affecting governance, service delivery and operational efficiency (Musa & Adamu, 2025).

Addeh (2020) opines that for many years, the Nigerian power sector has been in crisis with the average annual per capital power consumption being only 155 kWh, which is among the lowest in the world. Some studies suggested that self-generated power, mainly diesel or petrol generators should be around 6,000MW, while many Nigerians including administrators in the polytechnics have had to resort to burning candles and sometimes rechargeable lamps to get the tasks done. With this situation, Nigeria continue to grapple with actual transmitted power of between 4,000MW to 4,500 MW for its over 200 million population, on the contrary, a country like Brazil generates 100,000MW of grid base power for 210 million people and South Africa generates 40,000 mw for 50 million population (Addeh, 2020). There is hardly any polytechnic visited today especially in the North-West Zone, that is not either partly or wholly depended on generating sets to power its administrative blocks, libraries, laboratories and as expected, this

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exacts huge cost on the institutions meager resources.

Adequate power supply is important to the realization of polytechnic education objectives. The Polytechnic shall realized these objectives through quality intake of students, quality teaching and learning, research and development, high standards in the quality of facilities, staff welfare and development programs, provision of a more practical based curriculum relevant to the needs of the labour market, skills and competencies that contribute to national and local economic goals, access to training funds such as those provided by the Industrial Training Fund (ITF), Tertiary Education Trust Fund (Tetfund) (Ogunode & Ayoko, 2022). The availability of these objectives of Polytechnic education is dependent on the availability of human and material resources and one of the material resources is the power supply.

Electricity is a fundamental resource for administrative operations in educational institutions. The inconsistent electricity supply remains a persistent national problem in Nigeria and its effects are particularly severe for tertiary institutions. Polytechnics in the North-West zone – covering Kaduna, Kano, Katsina, Kebbi, Jigawa, Sokoto and Zamfara states – depend heavily on electricity for administrative operations, workshops, ICT services, manage academic records, research, power laboratories, facilitate online services, maintain lighting and campus safety and student welfare. However, the country's power sector has been characterized by persistent instability, under-generation, weak transmission networks, and frequent system collapses. These challenges are particularly severe in the North-West Zone, where institutions often experience prolonged blackouts due to infrastructural decay, vandalism and limited investment in energy systems (Musa & Adamu 2025; Reuters, 2024). These challenges impede institutional effectiveness, reduce productivity and limit long term development and innovation.

A major challenge documented in the literature is the increased operational cost associated with mitigating unreliable power supply. Studies show that most Nigerian Polytechnics rely on diesel or petrol generators as primary backup systems, resulting in high fuel expenditures, maintenance costs and generator replacement cycles (Musa & Adamu, 2025). These recurring costs divert funds from core academic functions, such as curriculum development, equipment procurement and infrastructural improvement.

Renewable energy case studies, such as the renewable-energy integration project at Hussaini Adamu Federal Polytechnic in Jigawa State, demonstrate that institutions often seek alternative power solutions to reduce these high costs. However, the initial capital investment required for solar installations limits widespread adoption (Abubakar, Idris, & Kazaure, 2024). Unstable power supply disrupts administrative workflows, including student registration, record management, email communication and payroll processing. ICT-dependent operations are frequently interrupted, leading to delays and inefficiencies. In academic departments, power outages compromise lecture delivery, practical sessions and engineering/technical workshops activities that require stable electricity for equipment and digital tools. Content analysis of tertiary institutions in Nigeria note that administrative productivity decreases significantly in periods of prolong outages, affecting institutional planning and service delivery (Olayemi & Musa, 2024). Examinations and online system operations such as CBT systems are especially vulnerable to sudden power loss.

1.2 Statement of the Problem

Despite the importance of stable electricity to administrative effectiveness, polytechnics in the North-West in Nigeria continue to experience serious power supply challenges. Frequent power outages disrupt ICT-based administrative systems, delay processing of academic records, and negatively affect staff productivity.

Studies have also indicated that the high cost of alternative power generation places additional financial burden on the institutions which have resulted into diversion of funds that could otherwise be used for staff development and infrastructure improvement. In Northern Nigeria, where power supply challenges are more pronounced, these problems are further compounded. This situation raises concerns about the overall efficiency and effectiveness of polytechnic administration.

Also, several studies have highlighted the role of

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electricity in institutional efficiency and productivity. However, limited research exists on how electricity challenges affect administrative systems specifically in the polytechnics in the North-West Geo-Political Zone of Nigeria. This study fills that gap by focusing on administrative impact and coping mechanisms.

1.3 Objectives of the Study

The following objectives were formulated:

(1) Identify how inconsistent power supply affects administrative operations of the Polytechnics in North-West Geo-Political Zone, Nigeria.
(2) Assess the financial implications of alternative power sources in the Polytechnics in North-West Geo-Political Zone, Nigeria.
(3) Examine coping strategies adopted by the Polytechnic administration in North-West Geo-Political Zone, Nigeria.
(4) Find out ways to improve power supply reliability in the Polytechnics in North-West Geo-Political Zone, Nigeria.

1.4 Research Questions

The following research questions guided the study:

(1) How does inconsistent power supply affect the administrative operations of the Polytechnics in North-West Geo-Political Zone, Nigeria?
(2) What are the financial implications associated with using alternative sources of power in the Polytechnics in North-West Geo-Political Zone, Nigeria?
(3) What strategies do administrators use to cope with power outages in the Polytechnics in North-West Geo-Political Zone, Nigeria?
(4) What are the ways to improve power supply reliability in the Polytechnics in North-West Geo-Political Zone, Nigeria?

1.5 Research Hypotheses

The following null hypotheses were generated and to be tested at 0.05 level of significance.

H_{O1} There is no significant relationship between power supply and administrative operations of the Polytechnics in North-West Geo-Political Zone, Nigeria.
H_{O2} There is no significant relationship between financial implications and alternative sources of power in the Polytechnics in North-West Geo-Political Zone, Nigeria. .
H_{O3} There is no significant relationship between coping strategies and Polytechnic administration in the Polytechnics in North-West Geo-Political Zone, Nigeria.
H_{O4} There is no significant relationship between power supply reliability and Polytechnic administration in North-West Geo-Political Zone, Nigeria.

2.1 Literature Review

Inconsistent power supply is defined as the frequent interruption, fluctuation, and unreliability of electricity delivered to end users. According to World Bank (2021), inconsistent power supply refers to frequent interruptions, low availability, and lack of reliability in electricity provision. In the Nigerian context, it is associated with systemic issues in generation, transmission and distribution by entities such as the distribution companies, weak infrastructure, fuel shortages and policy weaknesses (Yahaya & Lawan, 2016). In educational institutions, this manifests as blackouts, low voltage, and unpredictable power outages that hinder administrative and academic functions. Also, electricity is a fundamental infrastructure that supports digital recording keeping, communication systems, financial operations, and e-governance platforms on higher education institutions. When power supply is unstable, institutions experience frequent disruptions in administrative workflows, leading to inefficiencies and delays (Owolabi, Bello, Olatunji & Jayeoba, 2024) In Nigeria's North-West Zone, these problems are often compounded by vandalism of power infrastructure, poor maintenance, and limited investment in alternative energy.

Power supply refers to the availability and delivery of electricity to run institutional activities. In Nigeria, electricity is generated centrally and transmitted through the national grid. However, the system is characterized by instability, low generation capacity, inadequate transmission infrastructure and frequent system collapse. For polytechnics – institutions that emphasize technical and vocational education – stable

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electricity is vital for administrative systems, ICT platforms, workshops, laboratories, lighting, institutional security and online records (Amahi & Odigili, 2021). The power sector's inability to deliver reliable electricity creates operational inefficiencies that ripple through institutional systems (Ogunode & Ayoko, 2022). This unstable supply imposes significant burden on polytechnics in the North-West Zone that depend on uninterrupted power to function efficiently. Studies by Okonkwo (2019) and Adebayo (2020) emphasize the importance of uninterrupted power in supporting administrative and academic processes.

2.2 Polytechnic Administration

Polytechnic administration refers to the organizational and managerial activities carried out to ensure effective functioning of Polytechnics. These include academic planning, record management, finance and budgeting ICT operations, research support, student services, and general institutional governance. Effective administration relies heavily on functional infrastructure, especially reliable electricity.

A central administrative challenge caused by inconsistent power supply is disruption of information technology (ICT) systems that support management functions. Studies indicate that unstable electricity contributes significantly to delays in processing student records, electronic communications, digital storage and information retrieval systems (Amahi & Odigili, 2021; Okorie & Ezeh, 2018).

According to Odigili (2017), the adoption of ICT in Nigerian polytechnic administration is constrained mainly by electricity reliability. The study found that frequent outages significantly disrupt enrolment management system, email communication, and digital record keeping. This limits administrative responsiveness and reduces capacity for effective decision making.

Similarly, Okorie and Ezeh (2018) argue that administrative systems are less resilient in institutions with unstable power supplies, as staff cannot rely on electronic tools for data management or reporting. The use of ICT is very essential in the admission office, bursary or academic affairs division and once there is power failures it forces staff to revert to manual systems that are slower and more error-prone. Institutional administrators spend considerable time engaging in contingency planning, fuel procurement, generator servicing and rescheduling activities around outages. This reactive planning reduces time available for long term strategic development. Literature highlights that many Polytechnics lack sustainable energy master plans, instead of relying on short term coping mechanisms (Olayemi & Musa, 2024).

2.3 Overview of Power Supply Challenges in Nigeria

Nigeria's power sector has long been characterized by insufficient generation, distribution bottlenecks, and systemic failures. Report show that the national grid experience multiple collapses annually due to aging transmission lines, inadequate maintenance, and poor load management (Reuters, 2024). Northern regions, including the North-West Zone, are particularly vulnerable because of the long distances between generation sources and distribution points, making the network prone to disruptions

These structural issues ultimately affect the Polytechnics that rely on grid stability for their daily operations. This provides context for understanding the specific challenges faced by Polytechnics in the region.

2.4 Theoretical Framework

2.4.1 Systems Theory

Systems theory, originally proposed by Bertalanffy (1968), views an organization as a system composed of interrelated and interdependent components working together to achieve common goals. In this context, a polytechnic is an open system that depends on inputs (e;g. electricity, funding, human resources) to produce outputs (administrative efficiency, academic services, institutional performances).

Electricity serves as a critical infrastructural input. When power supply is inconsistent, it disrupts other subsystems such as ICT operations, communication systems and records management. According to systems theory, failure in one subsystem affects the entire organizational system. Therefore, unstable electricity supply creates systemic inefficiencies that hinder effective polytechnic administration. Also, Hassan (2009) sees a system theory as a collection of

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interdependent but interrelated parts that function together. A disruption in one subsystem affects the entire system. Applied to Polytechnic administration, electricity serves as a fundamental input that enables other subsystems – administration, academics, ICT, research, and student welfare – to function. When power supply becomes inconsistent, all components of institutional operations are disrupted, reducing overall effectiveness.

2.4.2 Resource Dependence Theory

Resource Dependence Theory, developed by Pfeffer and Salancik (1978), posits that organizations depend on external resources for survival and effectiveness. Institutions must secure and manage these resources to maintain operational stability.

Polytechnics rely heavily on externally supplied electricity from national grid systems. When this external resource is unreliable, institutions experience operational uncertainty and reduced administrative control. RDT explains why polytechnics invest in alternative energy sources (e.g., generators, solar systems) to reduce dependency and mitigate environmental uncertainty.

The theory highlights that unstable power supply creates vulnerability, financial strain, and strategic management challenges for polytechnic administration. RDT helps explain why polytechnics must frequently divert resources to secure alternative power sources.

2.4.3 Administrative Theory

Administrative Theory was developed by Henri Fayol in 1916 and focuses on principles that guide effective organizational management and administrative efficiency (Fayol, 1949). The theory emphasizes the importance of planning, organizing, coordinating, directing, and controlling organizational activities to achieve institutional goals.

According to Fayol (1949), effective administration requires proper management of resources, including human resources, infrastructure, and financial resources. Administrative theory also stresses the importance of coordination between different departments within an organization to ensure efficient service delivery (Shafritz, Ott, & Jang, 2016).

In the context of polytechnic administration, institutional managers such as rectors, registrars, and departmental heads are responsible for coordinating academic and administrative activities. These responsibilities require stable infrastructural support, including electricity supply when electricity supply becomes inconsistent, administrators face significant challenges in carrying out their management functions.

For instance, unstable power supply can affect planning and scheduling of academic activities, delay administrative decision-making processes, and disrupt communication systems within the institution. It may also force administrators to allocate additional funds for generators fuel and maintenance, thereby affecting institutional financial planning.

Administrative theory therefore provides a useful framework for understanding how infrastructural challenges such as unreliable electricity supply can hinder the effective implementation of administrative functions within polytechnic institutions. By applying administrative theory, this study examines how polytechnic administrators respond to the challenges of inconsistent power supply and how such challenges affect institutional management and service delivery.

2.5 Effects of Inconsistent Power Supply on Polytechnic Administration

2.5.1 Financial and Operational Burdens

Inconsistent electricity increases operational costs for polytechnics. Without reliable grid power, institutions depend heavily on diesel generators, inverters and alternative energy sources, which represent a substantial financial burden (Okorie & Ezeh, 2018). Literature consistently shows that Polytechnics incur high operational costs due to reliance on generators and backup systems (Musa & Adamu, 2025). Significant portions of institutional budgets are spent on diesel, maintenance of generators, and repair of power related damages. Renewable energy options, though more sustainable, require heavy initial investment that many institutions cannot afford (Abubakar, Idris, & Kazaure, 2024). These financial constraints limit spending on core academic and infrastructural development. The diversion of budgetary resources to energy needs weakens institutional capacity for planning, infrastructure growth. And service delivery.

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2.5.2 Disruption of Administrative Processes

Administrative officers rely on electricity to operate ICT systems used for registration, student records, payroll, communication, and examination processing. Frequent outages delay these processes, leading to poor service delivery and reduced productivity. Online services such as admissions portals, biometrics, CBT examinations and email systems are often disrupted, forcing administrators to resort to manual processes that are slower and more error-prone (Abubakar, Idris, & Kazaure, 2024).

2.5.3 Impact on Teaching, Learning and Workshops

Polytechnics, especially those with technical and engineering programs, require stable electricity for practical sessions, machinery, power tools, and laboratory equipment. Unstable power leads to cancelled practical, incomplete laboratory work, and shortened lecture times. This reduces the quality of training students receive and may affect their readiness for industry demands (Olayemi & Musa, 2024).

2.5.4 Equipment Damage and Data Loss

Frequent power fluctuations result in damage to ICT equipment, laboratory instruments, and sensitive administrative machines. Poorly protected systems are prone to data loss during sudden outages, creating additional workload for staff tasked with recovery or reconstruction of records. Abubakar. Idris and Kazaure (2024) noted that polytechnic workshops and laboratories suffer frequent breakdowns due to poor power quality.

2.5.5 Impact on Accreditation and Quality Assurance

National regulatory bodies require functional laboratories and ICT based systems for program accreditation. Institutions with unstable electricity struggle to maintain these requirements. This negatively affects accreditation scores and may lead to denial or suspension of programs (Olayemi & Musa, 2025).

2.5.6 Staff and Student Welfare

Electricity is essential for hostel lighting, water pumps, fans, ICT access and security system. Unstable power compromises these services, leading to discomfort, safety tasks, and decreased morale among students and staff. Media reports link power outages to campus protests and increased frustration among campus communities (Punch, 2024).

2.5.7 Staff Productivity, Morale and Work Environment

Several scholars observe that inconsistent power supply contributes to low staff productivity and morale (Okorie & Ezeh, 2018; Johnson et al, 2020). Without stable electricity, office functions are frequently interrupted, forcing staff to work longer hours or revert to manual systems. Johnson et al (2019) argue that laboratory and administrative routine are constrained by poor infrastructural support. Administrators often spend additional time compensating for electricity failures, which adversely affects their productivity levels and capacity to meet deadlines.

2.5.8 Institutional Reputation and Stakeholder Confidence

The efficiency of polytechnic administration influences stakeholder confidence (students, parents, employers, regulatory bodies). When administrative process suffers as a result of power instability – such as delays in results release, fee payment systems, or record access – it undermines confidence in institutional governance (Okorie & Ezeh, 2018). Studies suggest that repeated disruptions may negatively affect institutional reputation and competiveness, as stakeholders perceive the institution as poorly managed or technologically backward (Adebayo & Afolabi, 2017).

2.5.9 Strategic and Policy Implications

The persistent problem of power scarcity in educational institutions calls for strategic interventions at the national and institutional level – such as alternative energy solutions (solar, generators), emergency planning and policy reforms to secure reliable power infrastructure. Ogunode and Ndayebom (2023) emphasize policy reform and investment as critical to addressing systemic challenges.

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2.5.10 Regional Context: Northern Nigeria and Power Challenges

While most research on Nigerian tertiary institutions focuses on centralized samples, several studies highlight that Northern Geo-Political Zones including the North West – experience deeper electricity challenges than other regions (World Bank, 2021; & Eniola & Olajuyin, 2022). This contextual insight suggests that power supply issues may be more acute for polytechnics in that region, amplifying administrative challenges. Although direct empirical research linking power supply to administration specially in Northern Nigerian polytechnics is limited, the broader energy infrastructure literature provides important contextual grounding (Yahaya & Lawan 2016; Eniola & Olajuyin, 2022).

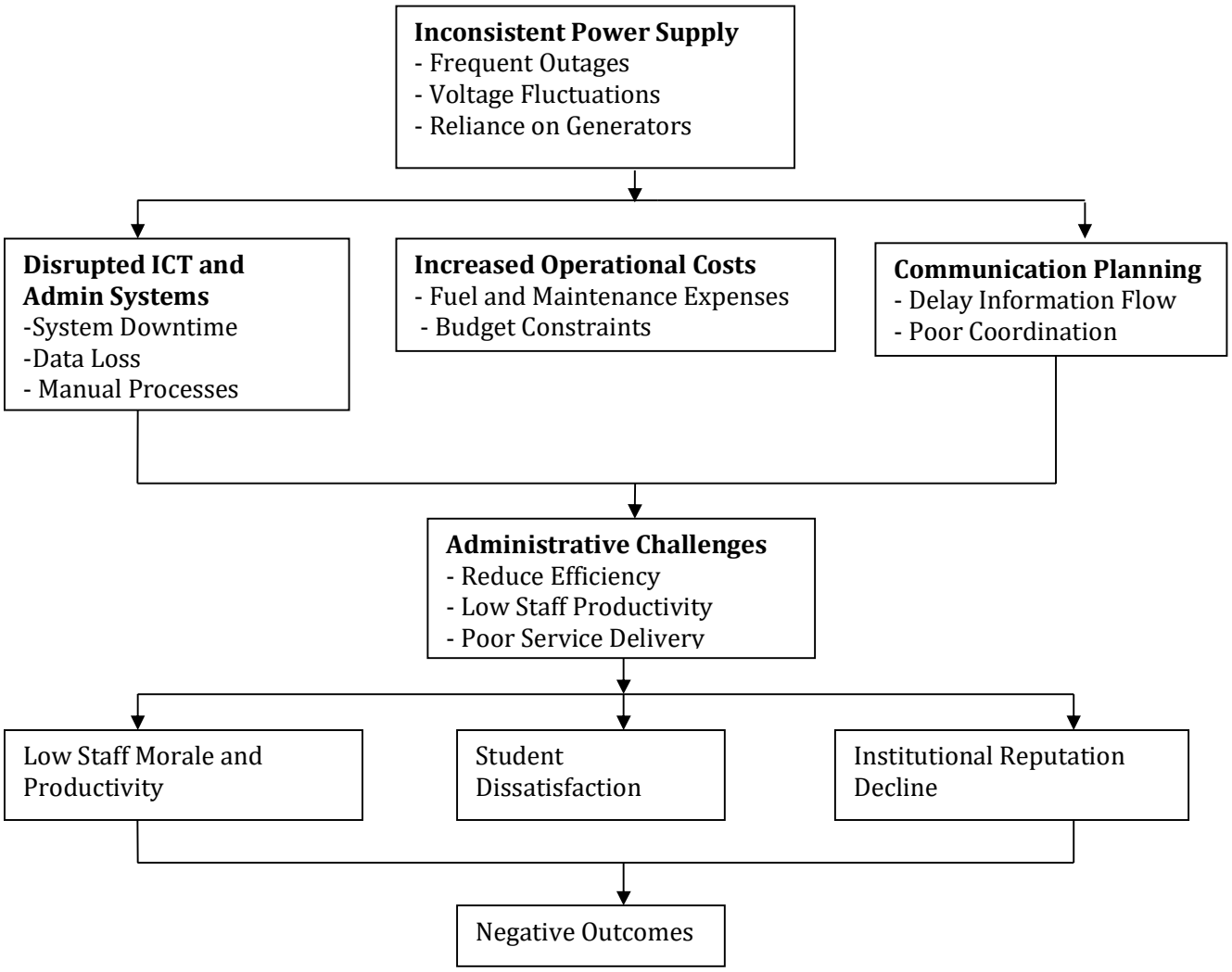

Figure 1: Outcome of Inconsistent Power Supply
Source: Field work (2026)

2.6 Mitigation Strategies Adopted by Polytechnics

2.6.1 Diesel and Petrol Generators

Generators remain the primary backup solution for most Polytechnics. Although effective in the short terms, they are expensive to maintain, polluting, and unsustainable in the long term (Musa, & Adamu, 2025).

2.6.2 Solar Photovoltaic Systems

Case studies show that solar power combined

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with battery storage is a promising solution for reducing dependency on the grid (Abubakar, Idris & Kazaure, 2024). However, implementation is limited by high capital costs and inadequate technical expertise.

2.6.3 Energy Audits and Load Prioritization

Some Polytechnics conduct energy audits to prioritize essential services such as ICT centers, administrative offices and laboratories (Abubakar, Idris & Kazaure, 2024). This helps manage limited power more efficiently.

2.7 Empirical Review

Several studies have examined the effects of unstable electricity on educational institutions in Nigeria. Ogunode and Ndayebom (2023) examined the challenges affecting the digitalization of tertiary education management in Nigeria. They found that unstable electricity supply, inadequate digital facilities, poor funding, and high maintenance costs hinder the effective implementation of digital administrative systems in tertiary institutions. The researchers emphasized that unreliable electricity supply limits the effective use of ICT for institutional administration. Also, Olayemi and Musa (2024) found that administrative efficiency declines significantly during prolonged outages, resulting in delays and loss of productivity.

Furthermore, Offor and Nwaru (2024) investigated the challenges facing university education in Nigeria using a descriptive survey design. Their findings revealed that infrastructural deficiencies, including irregular power supply, significantly affect the effectiveness of tertiary education management and institutional development. The study recommended increased government investment in infrastructure and power supply to improve educational administration and institutional performance. Abubakar, Idris and Kazaure (2024) demonstrated through a case study that renewable energy integration improves workshop reliability and reduces generator dependency. Media reports from Punch (2024) and analytical reports by Reuters (2024) further confirm that the North-West Zone experiences persistent power disruptions due to grid instability and vandalism of transmission infrastructure.

Abdullahi (2018) examined the relationship between infrastructure availability and staff productivity in Kano State Polytechnic and found that inadequate infrastructure significantly affected work efficiency. Similarly, Ibrahim, Alabi, Yusuf and Ishola (2020) reported that inconsistent power supply constrained effective ICT utilization in Nigerian polytechnics leading to delays in administrative costs and weakened institutional effectiveness across Nigerian tertiary institutions.

These empirical findings support the argument that inconsistent power supply remains a major obstacle to effective polytechnic administration in the North-West Zone, Nigeria.

Research Methodology

3.1 Research Design

The study adopts a descriptive survey design to investigate the challenges of inconsistent power supply on Polytechnic administration.

3.2 Population of the Study

The population consists of all administrative staff (non-teaching staff) in the seven selected Polytechnics in the North-West Zone. These polytechnics are Kaduna Polytechnic, Tudu-Wada, Kaduna State, Kano State Polytechnic, Kofar Gadon Kaya,Kano State, Hassan Usman Polytechnic, Km 8 Katsina-Dutsma Road, Katsina State, Kebbi State Polytechnic, Dakingari, Kebbi State, Jigawa State Polytechnic, Dutse, Jigawa State, Umaru Ali Shinkafi Polytechnic, Sokoto State, and Federal Polytechnic, Kaura-Namoda, Zamfara State.

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Table 1: Population Distribution

S/N	State	Name of Polytechnic	Administrative Staff	
1	Kaduna	Kaduna Polytechnic	1,315	297
2	Kano	Kano State Polytechnic	750	254
3	Katsina	Hassan Usman Polytechnic	50	44
4	Kebbi	Kebbi State Polytechnic	80	66
5	Jigawa	Jigawa State Polytechnic	140	103
6	Sokoto	Umaru Ali Shinkafi Polytechnic	120	92
7	Zamfara	Federal Polytechnic	410	196
	Total		**2,865**	**1052**

Source: Field work (2026)

3.3 Sample and Sampling Technique

Due to the large population of the study, a sample of 1052 administrative staff (non- teaching staff) was drawn from the seven Polytechnics using (Krejcie and Morgan, 1970).

Table 2: Sample Size Distribution

S/N	State	Name of Polytechnic	Administrative Staff
1	Kaduna	Kaduna Polytechnic	297
2	Kano	Kano State Polytechnic	254
3	Katsina	Hassan Usman Polytechnic	44
4	Kebbi	Kebbi State Polytechnic	66
5	Jigawa	Jigawa State Polytechnic	103
6	Sokoto	Umaru Ali Shinkafi Polytechnic	92
7	Zamfara	Federal Polytechnic	196
8	**Total**		**1052**

Source: Krejcie & Morgan (1970)

3.4 Instrumentation

A structure questionnaire was used to gather data. The instrument contains sections on respondent information, administrative operations, financial implications, coping strategies for inconsistent power supply and ways to improve power supply.

3.5 Reliability of the Instrument

A pilot test was conducted on Hussaini Adamu Federal Polytechnic in Jigawa State in order to ascertain its psychometric properties. In the reliability of the instrument, the Cronbach Alpha coefficient of 0.78 shows that good interrelationship among the items that formed the instrument, hence the positive correlation.

3.6 Administration of the Instrument

A total of 1052 questionnaires were administered to the respondents physically and electronically, while a total of 940 were collected back for data analysis.

3.7 Method of Data Analysis

The data collected were analyzed using descriptive and inferential statistics. The statistical techniques are summarized as follows:

1. Frequency counts and simple percentages were used to determine the data collected.
2. Simple percentages contingency coefficient value was used to analyze the data based on the research questions.

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3. Chi-Square test for independence was used to test the four null hypotheses in order to analyze the performances of the students based on the variables.
4. All the hypotheses were tested at 0.05 level of significance.

4.1 Results and Discussion of Findings

To answer the research questions, the data collected from the selected Polytechnics in the North-West Zone, Nigeria were computed and analyzed using

Descriptive statistics, specifically frequencies and percentages, mean and standard deviation to summarize the respondents' views on the Likert scale items and Chi-squared test is used to test the significant association between the variables.

4.2 Questionnaire Administration and Response Rate

A total of 1052 questionnaires were distributed proportionally across seven higher institutions: Kaduna Polytechnic, Kano State Polytechnic, Hassan Usman Polytechnic, Kebbi State Polytechnic, Jigawa State Polytechnic, Umaru Ali ShinkafiPolytechnic and Federal Polytechnic Kaura-Namoda. For this analysis, 940 questionnaires were properly completed and retrieved, representing 89.3% valid response rate. Which is deemed fit for survey research.

4.3 Reliability Analysis

Before interpreting the descriptive and inferential statistics, it is standard practice to test the internal consistency of the questionnaire using Cronbach's Alpha. An alpha value of 0.70 or higher is generally considered acceptable.

Table 3: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.942	.945	50

Source: Field Work (2026)

Table 4: Reliability Statistics by Section

Construct (Sections)	Cronbach's Alpha	N of Items
Section B: Administration Operation	.815	17
Section C: Financial Implication	.792	7
Section D: Coping Strategies for Inconsistent Power supply	.860	8
Section E: Ways to Improve Power Supply	.745	18

Source: Field Work (2026)

Interpretation: The overall Cronbach's Alpha is .942, indicating a high level of internal consistency for the instrument. All individual subsections also cleared the .70 threshold, confirming the data is highly reliable for further descriptive and inferential analysis.

Research Question 1: How does inconsistent power supply affect the administrative operations of the Polytechnics in North-West Geo-Political Zone, Nigeria?

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Table 5: Descriptive Analysis for Administrative Operations

SN	Statement	$\sum fx$	$\bar{X}$	SD
1	Inconsistent power supply disrupts daily administrative activities in the polytechnic.	3205	3.4	0.064
2	Power outages delay processing of students' records and documentation.	3115	3.3	0.058
3	Administrative efficiency is reduced due to frequent electricity failure.	3161	3.4	0.048
4	Staff productivity is negatively affected by irregular power supply.	3180	3.4	0.064
5	Online registration and result processing are often delayed due to power failure.	3175	3.4	0.060
6	Frequent power outages disrupt the use of computers and office equipment.	3240	3.4	0.052
7	Internet and communication services are often interrupted due to power failure.	3270	3.5	0.058
8	Power outages lead to loss of important administrative data.	3210	3.4	0.049
9	The effectiveness of e-administration systems is hindered by unstable power supply.	3212	3.4	0.055
10	Inconsistent power supply affects the use of computers and administrative software.	3150	3.4	0.054
11	Inconsistent power supply causes delays in service delivery to students and staff.	3100	3.3	0.054
12	Administrative decision making is affected by unreliable power supply.	3245	3.5	0.054
13	Administrative challenges are missed due to electricity failure	3230	3.4	0.054
14	Power outages create stress and dissatisfaction among administrative staff.	3222	3.4	0.057
15	Overall administrative performance is negatively impacted by inconsistent power supply.	3170	3.4	0.066
16	Office experience frequent power outages during working hours	3125	3.4	0.056
17	Staff morale is negatively affected by constant power interruption	3200	3.4	0.053

Source: Field Work (2026)

Research Question 2: What are the financial implications associated with using alternative sources of power in the Polytechnics in North-West Geo-Political Zone, Nigeria?

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Table 6: Descriptive Analysis of Alternative Sources of Power

SN	Statement	$\sum fx$	$\bar{X}$	SD
18	The polytechnic spends a significant amount on alternative power sources (e.g generators, fuel).	3050	3.2	0.053
19	Inconsistent power supply increases operational costs of the administration.	3340	3.6	0.065
20	Maintenance costs of electrical equipment increase due to power fluctuations.	3200	3.4	0.061
21	Inconsistent power supply reduces funds available for other development projects.	3325	3.5	0.054
22	Maintenance of alternative power sources increases administrative expenses.	3071	3.3	0.067
23	Budgetary planning is affected by frequent power related expenses.	3170	3.4	0.056
24	Repair of damaged electrical equipment increases operational costs.	3230	3.4	0.063

Source: Field Work (2026)

Research Question 3: What Strategies do administrators use to cope with power outages in the Polytechnics in North-West Geo-Political Zone, Nigeria?

Table 7: Descriptive Analysis of Power Outage Coping Strategies

SN	Statement	$\sum fx$	$\bar{X}$	SD
25	The installation of solar power systems can reduce the impact of inconsistent power supply on polytechnic administration.	3200	3.4	0.069
26	Regular maintenance of generators will improve the reliability of alternative power sources.	3350	3.6	0.063
27	Provision of inverters and backup power systems will help to enhance administrative efficiency.	3240	3.4	0.070
28	Adequate budget allocation for power infrastructure can help in coping with power supply challenges.	3200	3.4	0.064
29	Government intervention can significantly help in coping with electricity supply to polytechnic.	3250	3.5	0.057
30	Energy efficient equipment can reduce dependence on unstable public power supply.	3270	3.5	0.060
31	Proper power management policies will help in coping with administrative operations despite power challenges.	3230	3.4	0.064
32	Public-private partnerships can help in coping with power supply in the polytechnic.	3205	3.4	0.058

Source: Field Work (2026)

Research Question 4: What are the ways to improve power supply reliability in the Polytechnics in North-West Geo-Political Zone, Nigeria?

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Table 8: Descriptive Analysis of Improved Power Reliability Ways

SN	Statement	$\sum fx$	$\bar{X}$	SD
33	The polytechnic should invest in upgrading electrical wiring and distribution systems.	3240	3.4	0.058
34	Installation of additional transformers would improve power stability.	3310	3.5	0.061
35	Regular maintenance of electrical facilities should be prioritized.	3335	3.5	0.060
36	Faulty electrical equipment should be replaced immediately to prevent outages.	3350	3.6	0.051
37	The polytechnic should install solar power systems to supplement electricity supply.	3230	3.4	0.061
38	Backup generators should be made available in administrative department.	3200	3.4	0.054
39	Renewable energy sources can reduce frequent power interruptions.	3270	3.5	0.058
40	Battery/inverter systems should be installed in offices to forestall power interruption.	3180	3.4	0.062
41	Energy conservation policies should be strictly enforced.	3330	3.5	0.061
42	Admin staff should be educated on efficient electricity usage.	3180	3.4	0.063
43	Energy efficient appliances should be used in the offices.	3210	3.4	0.059
44	Power usage should be monitored regularly to prevent overload.	3220	3.4	0.058
45	The polytechnic management should allocate more funds to power supply improvement.	3320	3.5	0.053
46	There should be a dedicated technical team to manage power issues.	3320	3.5	0.056
47	Collaboration with power distribution companies would improve supply reliability.	3225	3.4	0.062
48	A clear reporting system should be established for power related faults.	3270	3.5	0.058
49	There should be special budget for alternative power supply yearly in order to make the polytechnic to be energy self-dependence.	3200	3.4	0.058
50	The polytechnic should conduct periodic workshops on the management of power supply for administrative staff for proper utilization of energy supply.	3260	3.5	0.061

Source: Field Work (2026)

4.4 Chi-Square Analysis

(H_{01}): There is no significant relationship between power supply and administrative operations of the Polytechnics in North-West Geo-Political Zone, Nigeria.

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Table 9: Chi-Square Tests (power supply * administrative operations)

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.762[a]	19	.005
Likelihood Ratio	32.145	19	.009
Linear-by-Linear Association	22.89	1	.000
N of Valid Cases	940		

a. 2 cells (2.0%) have expected count less than 5. The minimum expected count is 3.45.

Source: Field Work (2026)

Interpretation: The Pearson Chi-Square test evaluated the relationship between inconsistent power supply and polytechnic administrative operations. The Chi-Square value is 34.762 with 19 degrees of freedom, yielding an asymptotic significance (p-value) of 0.005. Because p = .005 < 0.05, the null hypothesis (H_0) is rejected. This demonstrates a statistically significant relationship between electricity instability and the operational efficiency of polytechnic administrations in the North-West geo-political zone. Power interruptions directly determine operational delays and performance drops.

(H_{02}): There is no significant relationship between financial implications and alternative sources of power in the Polytechnics in North-West Geo-Political Zone, Nigeria.

Table 10: Chi-Square Tests (financial implications * alternative sources of power)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.686[a]	12	.005
Likelihood Ratio	18.053	12	.009
Linear-by-Linear Association	8.575	1	.000
N of Valid Cases	940		

a. 2 cells (8.0%) have expected count less than 5. The minimum expected count is 3.45.

Source: Field Work (2026)

Interpretation: The test evaluated the association between institutional financial implications and reliance on alternative power. The Pearson Chi-Square value is 18.686 with 12 degrees of freedom and a p-value of 0.005. Since p = 0.005 < 0.05, the null hypothesis (H_0) is rejected. This provides strong empirical evidence that using alternative energy sources (like generators, inverter, solar and fuel) has a statistically significant relationship with the financial burdens and budget distortions experienced by these institutions.

(H_{03}): There is no significant relationship between coping strategies and Polytechnic administration in the Polytechnics in North-West Geo-Political Zone, Nigeria.

Table 11: Chi-Square Tests (coping strategies * Polytechnic administration)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.498[a]	26	.005
Likelihood Ratio	30.407	26	.009
Linear-by-Linear Association	24.670	1	.000
N of Valid Cases	940		

a. 2 cells (8.0%) have expected count less than 5. The minimum expected count is 4.67.

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Source: Field Work (2026)

Interpretation: This test examined the link between adopted coping mechanisms and administrative outcomes. The Pearson Chi-Square value stands at 30.598 with 26 degrees of freedom and a p-value of 0.005. Because $p = 0.005 < 0.05$, the null hypothesis (H_0) is rejected. This indicates a statistically significant relationship, showing that the specific deployment of coping mechanisms (such as solar upgrades, inverter installations, or generator maintenance) directly affects the functional capacity of polytechnic administrations.

(H_{04}): There is no significant relationship between power supply reliability and Polytechnic administration in North-West Geo-Political Zone, Nigeria.

Table 12: Chi-Square Tests (power supply reliability * Polytechnic administration)

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.0/72[a]	36	.005
Likelihood Ratio	41.478	36	.009
Linear-by-Linear Association	28.586	1	.000
N of Valid Cases	940		

a. 2 cells (0%) have expected count less than 5. The minimum expected count is 8.

Source: Field Work (2026)

Interpretation: This test examined the association between long-term power reliability improvement paths and institutional administrative capacity. The Pearson Chi-Square value is 42.672 with 36 degrees of freedom and a p-value of 0.005. Since $p = 0.005 < 0.05$, the null hypothesis (H_0) is rejected. This establishes that structural measures to stabilize power (upgraded distribution, dedicated technical teams, and separate yearly power budgets) are significantly linked to sustaining stable polytechnic administration across the zone.

4.5 Discussion of Findings

This section cross-examines the empirical results extracted from the 940 valid respondents across the seven institutions with the core research questions driving the study.

4.5.1 Impact of Inconsistent Power Supply on Administrative Operations

The first research question looked at how unstable electricity impacts daily administrative workflows. The descriptive parameters in Table 5 reveal uniform agreement among respondents that power infrastructure deficits disrupt operations. The highest baseline disruption occurs within communication and digital workflows, where item 6 ("Internet and communication services are often interrupted") and item 12 ("Administrative decision making is affected") scored the highest average agreement (Mean = 3.5, SD = 0.058 and SD = 0.054 respectively).

The systemic threat to data integrity is also clear, with item 8 ("Loss of important administrative data") showing a high mean of 3.4 with SD = 0.049. This shows that electricity failures degrade modern e-administration systems. The cumulative effect is capturing a mean of 3.4 for general disruptions, delayed student documentation, and reduced staff productivity. This baseline is reinforced by the Chi-Square test (Table 9), which confirmed that electricity failures are a significant threat to steady institutional operations ($p < 0.05$).

4.5.2 Financial Implications of Alternative Power Sources

The second research question evaluated the financial

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strain of running alternative power sources. Table 6 shows that alternative energy reliance creates severe budgetary issues. Item 19 ("Inconsistent power supply increases operational costs") recorded the highest mean score in the section (Mean = 3.6, SD = 0.065). This indicates that the financial cost of running secondary power sources is a major burden for polytechnic management.

Furthermore, item 21 (Mean = 3.5, SD = 0.054) reveals that these alternative power expenses drain resources away from other development projects. The systematic costs of maintaining generators (item 22, Mean = 3.3) and fixing damaged office electronics broken by power surges (item 20, Mean = 3.4; item 24, Mean = 3.4) cause ongoing damage to institutional budgets. The Chi-Square analysis in Table 10 reinforces this, showing a significant relationship between grid failures and growing operational costs ($p < 0.05$).

4.5.3 Analysis of Administrative Coping Strategies

The third research question identified the practical strategies administrators use to keep operations running during blackouts. According to Table 7, the most effective coping mechanism is item 26 ("Regular maintenance of generators"), which earned the highest mean score (Mean = 3.6, SD = 0.063). This shows that keeping backup generators running remains the primary way institutions survive day-to-day grid failures.

However, respondents also strongly support cleaner, long-term options. Item 29 ("Government intervention") and item 30 ("Energy efficient equipment") both recorded a high mean of 3.5, while solar power integration (item 25) and inverter backup installations (item 27) scored a mean of 3.4. This reveals a desire to move away from expensive, fuel-reliant generators toward modern renewable energy systems. This perspective matches the Chi-Square results in Table 11, which show that choosing the right coping strategies is vital to preserving institutional administrative capacity ($p < 0.05$).

4.5.4 Paths to Improving Power Supply Reliability

The final research question looked at actionable solutions to build a reliable power setup. The descriptive data in Table 8 shows a strong call for better infrastructure and clearer policies. The highest consensus emerged around item 36 ("Faulty electrical equipment should be replaced immediately"), scoring a mean of 3.6 SD = 0.051.

There is also strong support for structural improvements, such as installing more transformers (item 34, Mean = 3.5), prioritizing facility maintenance (item 35, Mean = 3.5), enforcing strict energy conservation rules (item 41, Mean = 3.5), and creating dedicated technical energy management teams (item 46, Mean = 3.5). Crucially, item 45 (Mean = 3.5) and item 49 (Mean = 3.4) show that staff believe management must allocate dedicated annual funds to alternative power to move toward energy self-sufficiency. The Chi-Square test in Table 12 confirms that these structural improvements are significantly linked to long-term administrative stability ($p < 0.05$).

5.1 Conclusions

Based on the results of the study, it can be concluded that inconsistent public power supply is a major obstacle to polytechnic administration across the North-West geo-political zone of Nigeria. The empirical evidence confirms that grid failures stall daily workflows, disrupt vital internet services, slow down student registration, and cause stress for administrative staff. Financially, relying on generators and fuel drains institutional budgets, leaving less funding for core academic development. While keeping generators well-maintained serves as a

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temporary fix, the Chi-Square analyses show that true long-term stability requires a shift toward dedicated energy budgets, solar power integration, and modernizing the electrical infrastructure.

5.2 Recommendations

Based on the findings of the study, the following recommendations are made:

1. The Polytechnic management should invest in alternative power sources such as solar energy systems to reduce dependence on public electricity supply.
2. Adequate budgetary allocation should be made for sustainable power solutions rather than frequent generator fueling.
3. Government should improve national power infrastructure to ensure stable electricity supply to the polytechnics.
4. Regular maintenance of electrical facilities should be carried out to prevent equipment damage caused by power fluctuations.

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