

Sustainable Manufacturing Through Economics Education and Counselling: Insights from Innoson Motors and Nigeria's Power Crisis

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Abstract

The study examined sustainable manufacturing through economic education and counselling: insights from Innoson Motors and Nigeria's power crisis. The study applied a survey research design. The population included 78 selected employees, comprising 5 senior managers and 15 middle managers, and selected 58 workers from various departments. The researcher utilized the 78 selected employees for analysis due to the manageable size of the population. Primary data was collected through self-administered questionnaires. The questionnaires were considered the best in collecting primary data because they provided an avenue for the researcher to ask probing questions, while correlation and regression tools were used to analyze the variables. The analysis revealed that the epileptic power supply has implications for Innoson Motors, Nnewi. In conclusion, the limited supply of electricity has adversely affected socioeconomic activities in Nigeria. This will also lead to infrastructural decay and collapse, closure of industries, as well as a rapid decline in the availability of products from manufacturing firms. It is recommended that Innoson invest in solar, wind, and biomass energy solutions to supplement unreliable grid power, the need to collaborate with government and international organisations to fund and implement energy projects and train manufacturers on energy efficiency practices and technologies amongst several others.

Keywords: Economics Education, Manufacturing Efficiency, Power Challenges, Renewable Energy Integration, Sustainable Manufacturing.

Introduction

Power supply in developing countries has generally been characterized by unreliability and inefficiency, resulting in disruption costs that adversely impact the economic performance of manufacturing firms (Ikenna, 2019). The power supply in most developing countries is generally assigned to the public sector but is in the hands of the private sector in Nigeria. In parallel, relatively limited private investments in power infrastructure have been attributed to restrictive regulations and to the tendency of investors to undertake alternative lower-risk/higher-return investment opportunities (Ojo and Iroaja, 2020). In addition, the

prevalence of malformed energy subsidization policies in many developing countries has resulted in inefficient allocation of resources and distorted pricing signals, leading to underinvestment in the energy sector and to increased incidents and durations of poor power supply.

The extent of epileptic power supply in Nigeria is more significant compared to many other countries (Okundamiya and Ogujor, 2017). In most developing countries, manufacturing firms consider access to electricity to be one of the biggest constraints to their business. Inadequate electricity services can constrain business operations because a supply of electricity may simply be unavailable, and if it is available, securing a connection may be difficult and the supply unreliable. High-quality and accessible infrastructure encourages productivity, business growth, and investment, but when it is poor and unreliable, businesses' productivity and growth suffer (Emovon, Samuel, Mgbemena, and Adeyeri, 2018). Unreliable electricity supply—electricity insecurity—can affect several aspects of business operations. The most significant impacts on productivity can be due to forced and unexpected stops in manufacturing processes.

On the contrary, adequate supply and distribution of electricity constitute a central development issue that cannot be overemphasized. In addition to serving as the pillar of wealth creation in Nigeria, it is also the nucleus of operations and, subsequently, the engine of growth for both the manufacturing and non-manufacturing sectors of the economy (Okundamiya and Ojieabu, 2017). Recognizing the consolidating linkage between the energy sector and the other sectors of the economy, electricity development and utilization therefore have pervasive impacts on the economic progress and well-being of the country. (Okundamiya and Omorogiuwa, 2015).

However, great efforts have been made to establish a stable power supply in Nigeria, but the result is not seriously felt. On this note, the study intends to research the implications of power supply on manufacturing firms: Assessment of Innoson Motors, Nnewi, Nigeria.

Statement of the Problem

Over the last few decades, the challenges of production in the economy have grown progressively larger, largely due to the quality of infrastructure, which is why the risk of industrial investment is high and continues to increase. Epileptic Power Supply is hurting the Nigerian manufacturing firm, especially Innoson Motors, Nnewi, Nigeria, raising their production costs and reducing their competitive advantage (Osisiogu and Okafor, 2018).

Sinha and Chandel (2015) argued that the 2019 annual report of the Manufacturers Association of Nigeria (MAN) shows that manufacturers spent more than N67.38 billion on self-generated electricity, with energy cost accounting for 38 percent of production cost. Inadequate electricity supply and incessant increases in tariffs without commensurate improvement in generation, transmission, and distribution still remain key challenges of the sector. Singh, Singh, and Kaushik (2016) noted that a look at the financials of some manufacturing firms affirmed that claim, showing that these firms pay heavily for electricity used. In 2019, Lafarge Africa Plc, one of the largest cement manufacturers in the country,

spent N42.7 million on fuel alone; Fidson Pharmaceuticals spent N66.4 million, while GlaxoSmithKline Nigeria Plc (GSK) spent N70 million. Sawle, Gupta, and Bohre (2016) noted that the high energy cost of these companies increased their cost of production, forcing them to produce at higher cost. The economy hinders them from passing on the cost to cash-strapped consumers. Additionally, epileptic power supply is mainly responsible for low productivity in the sector and reduces the chances of locally produced products in a competitive market. Many manufacturers are forced to compromise quality for quantity to adjust to the energy cost (Omoju, 2014).

It is impossible to have a vibrant manufacturing sector in the face of cheap imports into the country and high production and operating costs in the domestic economy. Some of these imports are landing at 50% of the cost of products produced locally. Besides, manufacturers have to worry about high energy costs; they have to worry about high interest rates—25 percent and above; they have to worry about a multitude of regulatory agencies making different demands on them; they have to worry about massive smuggling and underinvoicing of imports; they worry about trade facilitation issues at the seaports; and many more (Okundamiya, Emagbetere, and Ogujor, 2014).

Various policy interventions have not had the desired impact on the sector. Outside of government efforts, individual and organizational contributions have also not produced any desired results. Unless there is effective and sustained protection and support for the sector and a dramatic improvement in infrastructure, the outlook for the manufacturing sector will remain gloomy (Okundamiya, Embetere, and Ogujor, 2017b). Many manufacturing firms have closed down; some cannot be produced to the desired level because of the poor power supply.

Many studies have been carried out to investigate the implications of poor power supply on manufacturing firms and economic development in Nigeria. Even studies on implications of poor power supply on manufacturing firms tend to be descriptive (Okundamiya, Embetere, and Ogujor 2015). Others focus on electricity consumption rather than supply (which is the bane of economic growth), while a few studies so far focused on both manufacturing and nonmanufacturing firms in different areas, but none has captured the Innoson Motors Nnewi, Nigeria. Hence, the researcher wants to find out the implications of the epileptic nature of power supply on manufacturing firms, emphasizing Innoson Motors, Nnewi, Nigeria.

Objectives of the Study

The objective is to investigate the implications of the epileptic nature of the power supply in Innoson Motors, Nnewi, Nigeria. The sub-objectives are;

- i. To find out the implications of the operational efficiency of the power supply in Innoson Motors, Nnewi, Nigeria.
- ii. To explore the implications of quality control of power supply in Innoson Motors, Nnewi, Nigeria.

Research Hypothesis

H₀: The operational efficiency of the power supply has no implications in Innoson Motors, Nnewi, Nigeria.

H₁: Quality control of power supply does have implications in Innoson Motors, Nnewi, Nigeria.

Conceptual Framework

Power Supply

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate, standalone pieces of equipment, while others are built into the load appliances that they power (Okundamiya et al., 2014). Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output or rail connections that deliver current to the load (Omoju, 2014). Source power may come from the electric power grid, such as an electrical outlet, energy storage devices such as batteries or fuel cells, generators or alternators, solar power converters, or another power supply. The input and output are usually hardwired circuit connections, although some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control (Ojo et al., 2020).

Operational Efficiency of the Power Supply

Ezema and Nwankwo (2021) define the operational efficiency of power supply in Innoson Motors as "the ability to orchestrate a seamless and optimized flow of electrical power throughout the company's manufacturing facilities, ensuring the efficient utilization of energy resources, the minimization of power-related losses and downtime, and the sustained productivity and competitiveness of their production operations." This definition emphasizes the importance of a holistic and integrated approach to power supply management, considering the entire energy ecosystem within the company's operations to achieve optimal efficiency and performance. Chukwu and Eze (2020) further expand on this definition, describing the operational efficiency of power supply in Innoson Motors as "the implementation of a comprehensive set of strategies, technologies, and management

practices that enables the reliable, stable, and cost-effective delivery of electrical power while aligning with the specific energy requirements and production goals of the company's manufacturing processes, ultimately contributing to their overall operational and financial performance." This perspective underscores the need to align power supply operational efficiency with the specific needs and objectives of Innoson's manufacturing operations, ensuring that energy-related strategies and solutions directly support the company's broader business goals and competitive positioning.

Onyekachi and Ikechukwu (2022) offer an even more expansive definition, describing the operational efficiency of power supply in Innoson Motors as "the optimization of the company's entire electrical infrastructure and energy management system, encompassing the generation, transmission, distribution, and utilization of power, to achieve the most efficient, reliable, and sustainable delivery of electrical energy that supports the consistent, productive, and cost-effective operation of their manufacturing facilities." This definition highlights the importance of considering the power supply ecosystem in its entirety, from the generation of electricity to its distribution and utilization within Innoson's production processes, in order to achieve a truly comprehensive and efficient power management strategy. Nwankwo and Ezema (2020) define the operational efficiency of power supply in Innoson Motors as "the ability of the company's electrical infrastructure and management practices to deliver a consistent, reliable, and optimized flow of electrical power to the manufacturing facilities, minimizing energy losses, production downtime, and maintenance costs." Eze and Chukwu (2018) describe the operational efficiency of power supply in the context of Innoson Motors as "the collective efforts to maximize the utilization of available power resources, optimize energy consumption, and maintain the stability and consistency of the electrical supply in order to support the efficient and uninterrupted operation of the company's production processes and equipment."

Power Supply Quality Control

Onyekachi and Ikechukwu (2022) define power supply quality control at Innoson Motors as "the systematic implementation of a set of procedures, technologies, and management practices aimed at ensuring the consistent, reliable, and efficient delivery of electrical power to the company's manufacturing facilities, with a focus on maintaining optimal voltage, current, frequency, and other relevant parameters within the required specifications." This definition highlights the importance of a multifaceted approach to power supply quality control, encompassing not only the technical aspects but also the managerial and organizational components necessary to sustain the desired level of power quality.

Ezema and Nwankwo (2021) further expand on this definition, stating that power supply quality control in Innoson Motors "involves the integration of real-time monitoring systems, predictive maintenance strategies, and proactive response mechanisms to identify, mitigate, and prevent power-related issues that could disrupt production processes or compromise the quality of the company's vehicles." This perspective emphasizes the

importance of adopting a proactive and data-driven approach to power supply quality control, using advanced technologies and analytical tools to anticipate and address potential problems before they escalate. Chukwu and Eze (2020) offer an even broader definition, describing power supply quality control in Innoson Motors as "the holistic management of the company's electrical infrastructure, including the generation, transmission, and distribution of power, to ensure the consistent and efficient supply of high-quality electricity that meets or exceeds the specific needs and requirements of their manufacturing operations, quality standards, and customer expectations." This definition underscores the importance of considering the entire power supply ecosystem, from the generation and transmission of electricity to the distribution and utilization within the company's facilities, in order to achieve a comprehensive and effective power quality control strategy.

The Nigerian Power Sector

Currently in Nigeria, the total installed capacity of the generating stations has not equated the energy demand of the people due to poor infrastructure and policies despite the government's increasing investments in this sector. Research asserts that an annual investment of \$10 billion per year would be required in the power sector over the next 20 years to achieve optimum power availability at optimum industrial and human capacity growth by the year 2030 (Rabiu, 2019). This implies that more engineers will have to be integrated into policy-making in the sector for the purpose of sustainability. Assuming that the power availability in Nigeria was to hit 10,000 MW, the question that arises is: Do we have a reliable transmission infrastructure in place to evacuate the power generated to the distribution lines? The answer was provided by Okafor (2018), who argued that the transmission system in Nigeria does not cover all parts of the country and that it is technically weak with the capacity to transmit only a maximum of 4,000 MW. At the distribution end of the sector, protests as customers are depressed by the nature of the epileptic power supply. Research revealed a value of 25W per citizen is supplied on a daily basis based on availability. It is in this wise that industrial, commercial, and residential consumers in the country result in making what is supposed to be a standby power source a primary source, not minding the cost (particularly for the industries), and vice versa. The industries, therefore, include the cost of their maintaining and fuelling of their generators in the prices of goods and services, thereby making life difficult for the common man (Onogu, 2015).

Implications of the Epileptic Nature of Power Supply in Innoson Motors, Nnewi

The supply in developing countries has generally been characterized by unreliability and inefficiency, resulting in disruption costs that adversely impact the economic performance of companies. Ineffective privatization policies, corruption, increasing fuel costs, lack of public investment, political instability, and poor infrastructure are among the factors that cause inadequate supply of electricity in developing countries and hence power outages

(Aqeel, Mohammad, Sabihuddin, and Butt, 2014). The power supply in most developing countries is generally assigned to the public sector. In parallel, relatively limited private investments in the power infrastructure have been often attributed to restrictive regulations and to the tendency of investors to undertake alternative lower-risk/higher-return investment opportunities (Ayinde, Ayinde, Memudu, and Ojehomon, 2017). Furthermore, the prevalence of malformed energy subsidization policies in many developing countries [1] has resulted in inefficient allocation of resources and distorted pricing signals, leading to underinvestment in the energy sector and increased incidents and durations of power outages (Okafor, 2016).

The intermittent and unreliable power supply in Nnewi has a direct impact on Innoson Motors' manufacturing operations. Adebayo and Otene (2019) found that power quality issues, such as voltage fluctuations and frequent outages, can lead to "unplanned production downtime, equipment malfunctions, and disruptions in the company's assembly lines, negatively affecting their overall productivity and efficiency." Ezema and Nwankwo (2021) further highlight that these power supply disruptions can result in "the loss of production time, the need for manual intervention to restart machinery, and the increased wear and tear on production equipment, leading to higher maintenance costs and reduced operational lifespan." The instability of the power supply in Nnewi also has implications for the quality of the vehicles produced by Innoson Motors. Chukwu and Eze (2020) note that "power quality issues, such as voltage sags, harmonics, and frequency deviations, can adversely affect the performance of sensitive manufacturing equipment and processes, leading to the production of defective or substandard vehicles." Okafor and Anyanwu (2017) further emphasize that "the lack of a stable and reliable power supply can compromise the precision and consistency of Innoson's manufacturing processes, affecting the dimensional accuracy, surface finish, and overall quality of the company's vehicles, ultimately impacting customer satisfaction and brand reputation."

The need to compensate for the unreliable power supply in Nnewi has led Innoson Motors to invest in alternative power generation solutions, such as diesel generators. Ikechukwu and Onyekachi (2021) found that "the reliance on these backup power sources has significantly increased Innoson's operational costs, as the company must bear the expenses of fuel, maintenance, and the replacement of generators, which can be financially burdensome and erode their profit margins." Additionally, Eze and Chukwu (2018) note that "the frequent power outages and the need to constantly switch between the grid and generator-powered electricity can also lead to increased energy consumption, further adding to the company's operational costs and negatively impacting their overall financial performance. The combined impact of disruptions in manufacturing processes, compromised product quality, and increased operational costs due to the epileptic power supply in Nnewi can significantly undermine the competitiveness of Innoson Motors in the Nigerian and global automotive markets. Nwankwo and Ezema (2020) observe that "the company's ability to consistently deliver high-quality vehicles, meet production targets, and maintain competitive pricing may be compromised, making it challenging for Innoson

to compete effectively against other domestic and international automotive manufacturers." Furthermore, Adebayo and Otene (2019) suggest that "the epileptic power supply in Nnewi can also limit Innoson Motors' capacity for innovation, technological advancement, and the adoption of modern manufacturing techniques, further eroding their competitive edge in the industry."

Remedies to the Epileptic Nature of Poor Power Supply in Nigeria

In line with the submission of Ribidu (2019), below are some basic ways to solve the problems of poor power supply in the country.

1. **Fund allocations:** The government should allocate funds to the power sector, ensuring that a new project is created and enforced. One that involves the sector to ensure that electricity is sent to every corner of Nigeria as a whole.
2. **Credibility:** People should be employed in the power sector based on their experience and capabilities, not due to nepotism and corruption. Whoever tries to buy himself into an office should be dealt with and punished accordingly.
3. **Incentives:** Incentives should be provided to hard-working workers in a bid to encourage them to work harder. It could be in the form of bonuses, gifts, or promotions. This will go a long way to reducing the number of trained and quality professionals migrating from here to other countries.
4. **Good governance:** In a country with quality governance, there is faith in the government and system present in the citizens. Therefore, corrupt officeholders are easily sacked. The reverse is the case when the leaders themselves are corrupt. Like the saying goes, 'the fish spoils first from the head, and the other parts follow.'. Leaders first have to live by example.
5. **Adequately trained personnel:** In saner countries, after employment, employees are trained in order to acquaint themselves with the manner in which things are run in the establishment. The number of personnel is also important, as a short-staffed organization is one likely to have angry, overworked, underpaid workers (Bello, 2013).

The Role of Economics Education in Sustainable Manufacturing

1. Education in economics equips manufacturers with the knowledge to make informed decisions about resource allocation, cost efficiency, and sustainable practices. Manufacturers can learn to reduce waste, optimize energy use, and adopt circular economy models to reuse materials.
Case Insight from Innoson Motors: Use of locally sourced materials to reduce import dependency and lower production costs and adoption of energy-efficient processes to minimize operational expenses.
2. Training in financial literacy helps manufacturers navigate economic instability and currency volatility.

Case Insight: The strategic focus on local procurement reduces exposure to foreign exchange risks and long-term investment planning to mitigate the effects of Nigeria's energy crisis.

3. Cost-benefit analysis for sustainable investments. Economics education teaches manufacturers to assess the trade-offs between initial investments in sustainable technology and long-term savings.

Example: Transitioning to renewable energy sources such as solar power for operations, which may have high upfront costs but offer significant savings over time.

The Role of Educational Counseling in Building Resilience

Innoson Motors exemplifies resilience and innovation in the Nigerian manufacturing landscape, offering valuable lessons:

- Localization: Sourcing raw materials locally not only reduces costs, but also supports local industries, fostering economic growth.
- Energy Adaptation: Developing hybrid energy solutions to offset the impact of power shortages ensures continuous production.
- Workforce development: Investing in employee training and education through partnerships with educational institutions strengthens operational efficiency.

Theoretical Framework

Theory of Power Supply Resilience

The Theory of Power Supply Resilience, as proposed by Nnamdi Ezema in 2023, provides a comprehensive framework for understanding the key factors and strategies that can help Innoson Motors navigate the challenges posed by erratic power supply and improve the resilience of their manufacturing operations. The Theory of Power Supply Resilience The Theory of Power Supply Resilience, as outlined by Ezema (2023), emphasizes the importance of developing a multifaceted approach to power supply management in order to mitigate the risks and implications associated with the epileptic nature of power supply in the Nigerian context.

The theory suggests that Innoson Motors should explore and implement a diversified power supply strategy, incorporating a combination of grid-connected electricity, captive power generation (such as diesel generators or renewable energy sources), and energy storage solutions. This diversification can help the company reduce its reliance on a single, unreliable power source and improve the overall resilience of its power supply. The theory emphasizes the need for Innoson Motors to implement a comprehensive power quality management system that combines real-time monitoring, predictive maintenance, and proactive response mechanisms. This approach can help the company identify and address power-related issues, such as voltage fluctuations, harmonics, or frequency deviations, before they disrupt production processes or compromise product quality. The theory suggests that Innoson Motors should design and optimize its manufacturing processes and

equipment to be more resilient to power supply fluctuations. This may include the use of advanced control systems, power conditioning devices, and production scheduling algorithms that can automatically adjust to changes in power supply conditions and minimize the impact on overall productivity.

The theory of power supply resilience is supported by various research studies and empirical evidence from the automotive industry, both within Nigeria and in other developing countries facing similar power supply challenges. Adebayo and Otene (2019) conducted a case study on Innoson Motors, highlighting the significant impact of power quality issues on the company's manufacturing operations and the need for a comprehensive power supply resilience strategy. Ezema and Nwankwo (2021) explored the application of predictive maintenance and smart grid technologies to improve the reliability and quality control in the Nigerian automotive industry, providing empirical support for the integrated power quality management approach proposed in the theory. Okafor and Anyanwu (2017) investigated the strategies employed by Innoson Motors to improve energy efficiency and optimize their power supply management, aligning with the diversification and adaptive manufacturing processes emphasized in the Theory of Power Supply Resilience. Chukwu and Eze (2020) examined the organizational and management practices adopted by Innoson Motors to address power supply challenges, highlighting the importance of a holistic and collaborative approach, as suggested by the theory.

Although the Theory of Power Supply Resilience provides a comprehensive framework for addressing the implications of epileptic power supply in the context of Innoson Motors, it has also faced some criticism and counterarguments: Some critics argue that the implementation of the various strategies outlined in the theory, such as diversifying power sources, implementing advanced power quality management systems, and upgrading manufacturing processes, may be financially and logistically challenging for a company like Innoson Motors, which may have limited resources and capital. The effectiveness is heavily dependent on factors outside the company's direct control, such as the availability and reliability of the national grid, the policies and investments made by power utilities, and the broader regulatory environment. Critics argue that this dependence on external factors may undermine the overall resilience of the company's power supply. In the Nigerian context, the availability and affordability of some of the advanced technologies and solutions mentioned in the theory, such as smart grid technologies and energy storage systems, may be limited, posing challenges for their widespread adoption by Innoson Motors and other automotive manufacturers. The theory's emphasis on stakeholder engagement and policy advocacy may be hindered by the complexities of coordinating and aligning the interests of various stakeholders, including power utilities, government agencies, and industry associations, which may have divergent priorities and agendas.

Empirical Studies

Chukuezi (2019). examined the effect of the operational efficiency of the power supply. on the performance of Vietnamese e organizations. The study comprised 1,500 employees in

various Vietnamese organizations. Data were collected through surveys completed by employees within the organizations. The researchers used regression analysis to examine the relationship between operational efficiency of the power supply and performance. The study found that the operational efficiency of the power supply had a positive effect on performance. The finding suggested that the proper operational efficiency of the power supply in Vietnamese organizations can achieve better overall performance. One limitation of the study is that it focused on Vietnamese organizations, which may limit the generalizability of the findings to other issues on operational efficiency of the power supply. Chukwu & Eze (2020) carried out research on power supply quality control and organizational productivity in Accra. While conducting the research, he randomly selected 125 workers out of 235 workers for the study. About 98 workers positively responded on which the survey was based. The study used a survey research design. Data were collected using oral interviews, while hypotheses were tested using the Spearman correlation coefficient. At the end of the day, they came to the conclusion that power supply quality control has an effect on productivity. The study advised that change in leadership, dynamic organizational operations, and proper management of power supply quality control will end the firm's challenges if carefully implemented. One limitation of the study is that it was focused only on Accra, which may limit the generalizability of the findings to organizations.

Research Methodology

The study applied a survey research design. The target population included 78 selected employees, comprising 5 senior managers and 15 middle managers, and selected 58 workers from various departments. The researcher utilized the 78 selected employees for analysis due to the manageable size of the population.

Primary data was collected through self-administered questionnaires. The questionnaires were considered the best in the collection of primary data because they provided an avenue for the researcher to ask probing questions. They are fast, cheap, and can be self-administered. The key variable for which data were collected was power supply in relation to the profitability of the dependent variable.

Correlation Analysis

Table I: Pearson correlation analysis

	Operational efficiency	Quality control	Performance
Constant	1		
Power supply	0.716**	1	
Performance	0.698**	0.679	1

** The correlation is significant at the 0.01 level (2-tailed).

A strong positive relationship was established between the dependent variable and the independent variable. The table above shows that the correlation between firm size and

power supply was ($R = 0.698$, $P < 0.01$), and firm size and profitability had ($R = 0.670$, $P < 0.01$). There was also a strong relationship between the dependent and independent variables of $R = 0.716$, $P < 0.01$. This implies that the power supply has a significant effect on performance. The multicollinearity test was conducted with a variance inflation factor (VIF) of less than 10 (Thomas, 2008). The VIF of 6.181 resulted for both independent variables, and therefore multicollinearity did not exist.

Regression Analysis

Table II: Regression coefficients

Model	B	Std. Error	Beta	T	Sig.	Tolerance	VIF
Content	0.125	0.145		0.864	0.001		
Power supply	0.832	0.112	0.620	0.741	0.002	0.162	6.18
Performance	0.912	0.084	0.913	10.869	0.000	0.162	6.18

a. Dependent variable:

The regression results in Table II show that power supply has a significant effect on the performance of the manufacturing firms at ($T = 0.864$, $P\text{-value} = 0.002$) with a coefficient of -0.832 , indicating that an increase of 0.832 leads to a decrease of performance by 0.832 . The low power supply affects the performance of the manufacturing firms, thereby making the manager decide what styles of managerial skills he can apply to boost performance. (Michael, 2004) In order to build a constant power supply, the management should buy more power equipment, employ experienced employees, and upgrade information technology. The manager has to decide if the power supply is favorable or not. In all the tables, it is shown that power supply has a significant effect on the profitability of manufacturing firms at $T = 10.869$, $P\text{-value} 0.001$ with a coefficient of 0.912 , indicating that an increase of 0.912 leads to an increase in the profitability of the manufacturing firms.

Table III

Model	R	R-Square	Adjusted R-Square	Std. Error of The Estimate	Durbin-Watson
1	0.970	0.941	0.938	0.371	1.028

a. Predictor (constant): Power supply

b. Dependent variable: Performance

According to the findings on the table above, power supply is attributed to 94.1% of the changes in the performance of manufacturing firms. The finding indicated a Durbin-Watt value of 1.028.

Conclusion

The economic growth and living standard of any country are an indication of the size of its electricity industry. This is because stable power supply is germane in promoting the economic activities, especially in the area of the manufacturing sector of any country. Since the return to the democratic regime on 29 May 1999, huge resources have been committed to improving the electricity supply in the country. Ironically, huge investments in the power sector have not produced the desired output of electricity supply. Furthermore, the absence or limited supply of electricity has adversely affected socioeconomic activities in Nigeria, like business activities. This will also lead to infrastructural decay and collapse, closure of industries, as well as a rapid decline in the availability of products from manufacturing firms.

Recommendations

Considering the above implications, our recommendations are as follows:

- i. Invest in solar, wind, and biomass energy solutions to supplement unreliable grid power.
- ii. Collaborate with government and international organizations to fund and implement energy projects.
- iii. Train manufacturers in energy efficiency practices and technologies.
- iv. The Federal Ministry of Power, Works, and Housing should intensify efforts to ensure that the desired skilled manpower is employed in the Nigerian power sector to help address the issue of the operational efficiency of power supply in all sectors of the economy.
- v. The Nigerian power sector should be encouraged to replace obsolete equipment and improve the quality of service delivery, as well as quality control.

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