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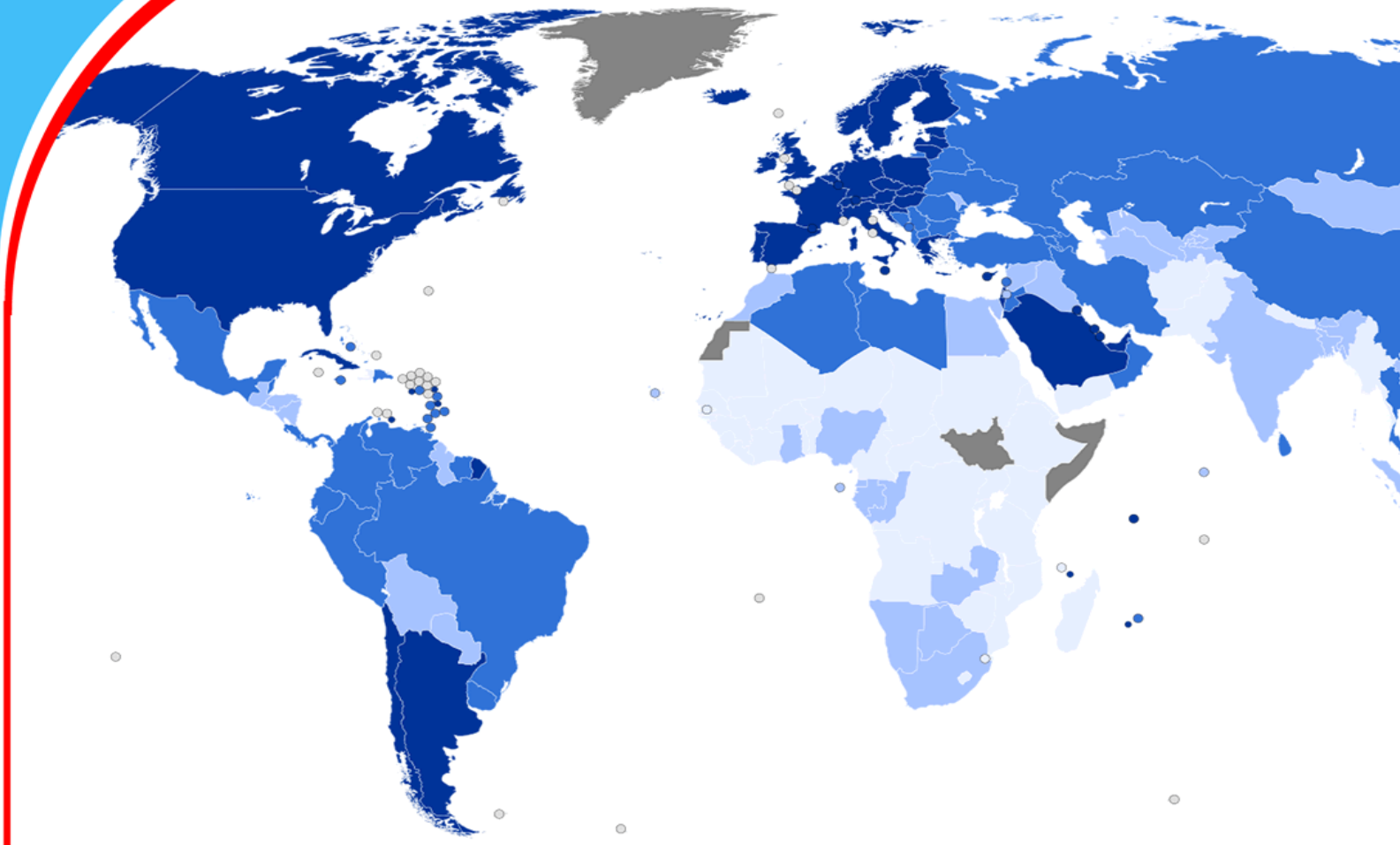

Assessment of Power Sector and Industrial Development in Nigeria: A Study of Ikeja Electricity Distribution Company

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Assessment of Power Sector and Industrial Development in Nigeria: A Study of Ikeja Electricity Distribution Company

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Abstract

Purpose: The paper examines the nexus of power sector and industrial development in Nigeria using Ikeja Electricity Distribution Company as a case study. Industrial development necessitates efficient management of available resources, as well as equitably allocating these resources and effectively utilizing them productively for industrial growth. Contemporary, industries uses modern operational technologies in respect to production, resource allocation and utilization. These are designed and tied strictly to the use of energy in one form or the other. Over a decade ago, lack of improvement in the power sector has led to total collapse of industrial sector in Nigeria. The resultant effect of poor power generation, distribution and transmission has crippled many manufacturing companies in Nigeria leading to mass exodus of investors in the industrial sector.

Methodology: The study adopts a survey research design and chi-square statistical method. The population of the study which consist of employees of Ikeja Electricity Distribution Company were purposely selected for the study.

Findings: Findings provide that significant relationship exists between power generation, transmission and distribution and industrial development in Nigeria.

Recommendation: Based on the findings, the major recommendations proffered require power sector operators to ensure adequate investment in power infrastructure that will meet the electricity needs of consumers, render qualitative services at affordable tariffs, taking post-privatization challenges into account by creating a good governance structure that will boost consumers' confidence.

Keywords: *Power, Transmission, Generation, Distribution, Industrial Development.*

INTRODUCTION

In Nigeria, poor electricity supply is perhaps one of the greatest problems confronting both the manufacturing and service sector, hence the high level of backwardness in industrial development. The typical Nigerian firm experiences power failure or voltage fluctuations about ten times per week, each lasting for about two hours, without the benefit of prior warning. This imposes a huge cost on the firm arising from idle workers, spoiled materials, lost output, damaged equipment and restart costs. The overall impact is to increase business uncertainty and lower returns on investment. For the aggregate economy, this has seriously undermined Nigeria's growth potential and the attractiveness of the economy to external investors. The Ikeja Electricity Distribution Company (IKEDC) is the private utility vested with the responsibility of electricity distribution within Lagos environment. However, the failure of IKEDC to provide adequate and reliable electricity to consumers despite billions of naira of investment expenditure has generated a confidence crisis in the industry. Public confidence in IKEDC's ability to supply uninterrupted and stable electric power is so low that consumers have resorted to alternative means of generating power such as the use of solar energy.

According to Verolme (2015), the inefficiency of IKEDC imposes a huge cost on the economy which has led to high operating cost for most firms within Lagos environs and those who cannot cope with such billing system either closes business permanently or moves to neighbouring countries such as Ghana, Benin Republic, or Cameroun whose tariffs and distribution are friendlier.

From the opinion of Sambo et al (2012), there are essentially five ways by which firms may respond to unreliable electricity supply and these are choice of location, factor substitution, private provision, choice of business and output reduction. While all these elements are presently observed among Nigerian firms, the most common approach has been through private provision. Electricity consumers have responded to IKEDC's inefficiency through self-generation. Electricity users, both firms and households, now find it necessary to provide their own electricity in part or in whole to substitute or complement IKEDC supply by factoring generator costs into the overall investment cost, thus raising significantly the set-up cost for manufacturing firms operating in the country. Incidentally, indigenous small-scale enterprises are worse affected and according to Lee and Anas (1991) report that small-scale enterprises spend as much as 25% of the initial investment on self-provision of a generator.

Most financial institutions do insist that firms seeking project loans must make provisions for investments in capital generating equipment (Ajayi, 1995). This affects the range of profitable investment available to budding entrepreneurs, raises cost of production, reduces cost competitiveness of local production and represents a loss of revenue to the electricity monopoly. Electricity, strictly speaking, is not a private good. The sector is characterized by high set-up costs and increasing returns to scale that permit at most very few producers.

The continuous setback in Nigeria's economy is no doubt appauling and as such it has led to collapse in virtually all productive sectors of the economy. This has prompted prominent manufacturing companies in Nigeria to pitch their tents in the neighbouring countries such as Ghana, Benin Republic, and Cameroun etc. The poor performance of Nigeria's hitherto state – controlled power sector, resulting in unstable electricity supply and frequent outages, has been seen by ordinary Nigerians as evidence of the ineffectiveness of their governments. However, the

situation has not improved much since the privatization of the power sector in recent years, even with continued government subsidies for some users. Some of these problems which remain unaddressed by Nigerian government include the following: Lack of proper funding faced by dwindling income due mainly to the collapse of global oil prices, challenge of convincing frustrated electricity consumers that they must accept substantial increases in energy tariff if Nigeria is to achieve constant, stable and nationwide supply, myriad of structural problems that continue to hamper growth in the power sector (eg shortage of gas supply for thermal plants, high level of unpaid electricity bills and the country's outdated band poorly maintained transmission network, which the government still owns but put under private management), inability of the existing transmission network to handle much more load than current peak electricity production and lastly many of the new power operators have struggled to make progress, especially as they have had to contend with aging facilities requiring substantial amounts of investments to upgrade and expand. Thus, the paper assess the influence of power generation; power transmission and power distribution on industrial development in Nigeria.

The Nigeria electricity market is yet to efficiently allocate resources and yield favorable outcomes for market participants. The supply side of the market is struggling to find its footing after a promising reform that saw the government-owned utility that failed to deliver reliable power unbundled and mostly sold to private investors. The promise of the reform is yet to materialize as new market entrants battle to optimize their operations amid daunting challenges. High electricity demand occasioned by a huge and growing population and economy creates large demand-supply gap in the electricity market. Challenges hindering the realization of an efficient market equilibrium require the most innovative of solutions and this conceptualizes around power generation, power transmission and power distribution.

(a) Concept of power generation: Three main factors typically play a role in determining the productivity and performance of GenCos in the NESI. These include: energy source, finance, and the activities of the other segments of NESI value chain. Particularly, ensuring the availability, reliability, sustainability, and affordability of energy sources is critical to higher and sustained power generation in the country. Currently, the NESI has undiversified energy sources, with GenCos heavily dependent on thermal energy (which constitute 80% of energy sources) and hydro (20%). The government has been reluctant to diversify energy sources due to the relative affordability of large hydro and gas-powered plants over alternative sources (Henrich Boll Stiftung, 2017). Unfortunately, gas supply in Nigeria is presently constrained by: vandalism, poor gas infrastructure, pricing regulation, failure of GenCos to meet gas payments, as well as delayed reforms in the oil and gas sector. As such, there are only 25 grid-connected generating plants in operation in the NESI with a total installed capacity of 11,165.4 MW but available capacity of 7,139.6 MW. However, the government and private sector are looking to diversify the energy sources and improve generation capacity by pursuing alternative energy projects, with a focus on solar, and further exploiting the thermal and hydro sources.

(b) Concept of Power Transmission: The challenges in the transmission segment of the electricity value chain lies in: financial constraints, lack of modern transmission lines and equipment, gross mismanagement, poor maintenance of available infrastructure as well as inefficient grid design and operation (Sambo et al., 2012). The operations of the Transmission Company of Nigeria (TCN) has been largely constrained by financial deficits. The TCN, on

average, receives only about 21 percent of its transmission invoice from distribution companies (Gumel, 2016). TCNs owed over N107 billion due to non-remittance by distribution companies, the ₦17 billion Electricity Facility Fund is yet to be released for the operations of the TCN (Nigeria Electricity Power Hub, 2017). Besides financial constraint, the TCN has limited transmission capacity due to infrastructure deficits and poor maintenance. Presently, the TCN has the capacity to transmit just about 7,200MW of electricity and at present capacity, the national grid cannot evacuate all available electricity from GenCos. These problems have contributed to the high electric power transmission and distribution losses recorded over the years, thereby significantly increasing the unit cost of electricity. The liquidity crisis further dampens the ability of the TCN to improve operations and capacity.

(c) Concept of Power Distribution: DisCos are faced with the challenges of huge Aggregate Technical, Commercial, and Collection (ATC&C) losses and lack of access to finance. First, DisCos are experiencing substantial ATC&C losses on a daily basis due to poor distribution infrastructure, poor billing system, electricity theft, and non-payment of electricity bill. The average ATC&C losses is estimated at 58.91 percent (NERC, 2017) Particularly, weak distribution networks coupled with heavy demands loads have increased the technical losses in power distribution (Emodi & Yusuf, 2015). This is further exacerbated by network glitches caused by vandalism, accidents, and infrastructural decay that make DisCos unable to relay power even when it is available on the national grid leading to long-term power outages and load shedding. According to the World Bank 2014 Enterprise Survey, the number of power outages in firms in a typical month in Nigeria is recorded at 33 –this is well-above the average for sub-Saharan Africa estimated at 8.3.To reduce these losses and enhance service delivery, DisCos have implemented maintenance and upgrades on their network by installing new transformers and building dedicated lines to commercial and industrial customers over the past year. Also, some DisCos have introduced a unit to curb power thefts and incidents of vandalism

Despite the fact that Nigeria has been electrified for over a century, the rate of development of electricity infrastructure in the country is low and supply of power to Nigerians remain inadequate. Ike (2012) examined impact of loss of infrastructural facilities on power delivery in Nigeria taking into consideration rural electrification. The study revealed that infrastructural facilities positively affect the extent to which power is delivered within a country. According to Joseph (2014); Olaoye et al., (2016) investigated the assessment of pricing mechanisms on customers' power affordability. The study showed that there is a positive correlation between pricing mechanisms of distribution companies and customers' power affordability. Ferguson et al, 2000; Morimoto and Hope (2001) tested the relationship between electrical supply and economic development in Nigeria and it was found to have a significant effect between electrical supply and economic development in Nigeria. Straplan Research (2012), in their analysis on the legal regime for exploring power regulations for economic growth in Nigeria, employing mainly qualitative analysis. The study revealed that the power sector remains crucial to economic development, wealth creation and poverty alleviation in any nation that is blessed with such mineral deposits and concluded that Nigeria government should adopt best practices and mechanisms that have been used by different countries to formalize and regulate mining explorations in order to attain sustainable development in the power sector in Nigeria. Azura (2016) in their analysis on the role of power infrastructure on economic diversification in Nigeria, employing both qualitative and quantitative (descriptive) analysis, the study shows that the infrastructures in power sector in Nigeria has the potential to contribute immensely to the economic and industrial development of

Nigeria. Specifically, it reveals that the development of the solid mineral sector could help to combat poverty in Nigeria via job creation; especially, given its forward linkage with other sectors of the economy.

Achieving a sustainable industrial development in any economy is largely dependent on stability of power and as such, researchers have come up with certain theoretical framework underlying such proves which include the following:

Modernization Theory: This has been defined as a theory (Reyes, 2001a) that uses a systematic process to move underdeveloped countries to a more sophisticated level of development. It is a US and European-centric normative model of development. The focus of Modernization Theory is cultural change directed at institutional structures in non-industrialized countries. Modernization Theory explains inequality within or between states by identifying different values, systems and ideas held by different nation states (Martinussen 1997, pp. 61-66, 167- 172). Modernization Theory emerged in the late 1950s when it appeared as a North American political scientists' reaction to the incipient failure of many of the prescriptions of development economists (Rapley 2002, p. 15). While Modernization Theory stresses the importance of political development in the progress and climactic improvement of a nations' economic standing, it also acknowledges social and cultural reforms.

Dependency Theory: This theory has been presented as a theory of development that improves Modernization Theory (Reyes, 2001a). It combines elements from a neo-Marxist theory and adopts a "revolution of under developed nations model". The focus of this theory is the totality of society and social system periphery, which highlights the differences between imperialistic countries in the first world and underdeveloped countries. Dependency Theory explains these differences by focusing on regions and structural conditions in different nation states. Although the radical dependency outlooks of Andre Gunder Frank, Ruy Mauro Marinin, Thetonio Dos Santos, and Immanuel Wallerstein, cited in Haque (1999), have the hue and revolutionary aspect of social change, they do not demonstrate the exact result of classical Marxism or Leninism in their evaluation and consideration of historical development and underdevelopment. For example, although Wallerstein applies Marxist terms like production mode, and challenges classes and state, he changes the order of the cause and effect relationship that originally was believed to exist among them from a Marxist viewpoint (Haque, 1999, p. 111).

World Systems Theory: This theory uses other levels of quantitative analysis, though it admits that there is no set of processes in World Systems Theory that is applicable to all economies. World Systems Theory argues that international trade specialization and transfer of resources from less developed countries to developed countries (known as a "core" countries) prevents development in less developed countries by making them rely on core countries and by encouraging peripheralization (Szymanski, 1982). World Systems Theory therefore views the world economy as an international hierarchy of unequal relations. A country can change its position in the global hierarchy with changes controlled by the "World System". Relations between countries are similar to what developing theorists described (Szymanski, 1982). In other words, wealth is taken from semi-periphery or periphery zones to economies in the core countries. World Systems Theory is a theory of development that deals with different forms of capitalism world-wide (Reyes, 2001a). It thus takes a world-centric view and focuses on the relationship between countries. This

relationship is directed by culture through social change. World Systems Theory explains inequality by identifying different cultures and the role of the state in international connections.

METHODOLOGY

According to Kothari (2012), research design is defined as 'the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. For the purpose of this research work, explanatory and descriptive designs are employed. The explanatory research is concerned with identifying the real nature of problems. We have decided to adopt this in the study in order to obtain a preliminary investigation of the subject matter from knowledgeable management personnel including administrative employees of selected Ikeja Electricity Distribution Company. The use of explanatory research design gave the opportunity of formulating relevant assumptions which later confirm and ascertain the nature of these assumptions.

In gathering information, for any research work the survey is aimed at enabling the research determine a practical situation from the reaction of the object concerned with the study. Hence, the word 'population' was described by Asika (2008) as 'all conceivable elements, subjects or observation relating to a particular phenomenon of interest to the researcher. Subjects or elements are individual items that make up the population'. The population of this study and some selected employees of Ikeja Electricity Distribution Company. These categories are considered appropriate for their knowledge in personnel matters. The method of data collection procedure adopted was direct face to face whereby questionnaires were distributed personally by the researcher. The questionnaire given was structured to elicit information from the organization's staff. Oral interview was administered to gather information not obtained by the use of questionnaire. Secondary data were sourced through textbooks, journals, articles, reports and other publications.

The data collected were organized by using tables. Tables were used because they allow for cross-classification of various variables using frequencies and percentages. The tabulation of data consists of counting the number of cases that fall into the various categories provided. It is often more interesting to know the percentages of the total number of cases that fall into a given class just than knowing the actual frequency when dealing with a large sample. In order to simplify the process of the collected data and presentation, chi-square (X^2) statistics and frequency counts and percentages are relevant statistical tools used in the study.

Thus, three hypotheses are formulated for analysis in the study.

H_1: There is no significant relationship between power generation and industrial development in Nigeria;

H_2: There is no significant relationship between power transmission and industrial development in Nigeria

H_3: There is no significant relationship between power distribution and industrial development in Nigeria.

RESULTS

The hypothesis formulated in the introductory stage of this study has been tested in the questionnaire to be confirmed and reported with the use of chi-square method. The chi-square

method will therefore be used in testing the formulated hypothesis so as to test discrepancies between facts and theories.

The test statistics is given by the formula:

$$X^2 = \frac{\sum (o - e)^2}{e}$$

Where:

e = Number Frequency

o = Observed frequency

Comparisons have to be made between the computed value of X^2 (value of a chi-square) and the table value at a determined level of significance and degree of freedom using:

Or = Levels of significance given as 5% or 0.05 (r – 1)(c – 1)

Where:

R = Number of rows

C = Number of columns in the contingency table

Research Hypothesis I

There is a relationship between power generation and industrial development in Nigeria

However, expected frequency (e) is computed as follows:

$$\frac{Total\ Number\ of\ Observation}{Total\ Number\ of\ Rows} = \frac{65}{5} = 13$$

Table 1: Results from questionnaire 1

Responses	Frequency	Percentage (%)
Strongly Agree	35	54
Agree	15	23
Undecided	6	9
Disagree	5	8
Strongly Disagree	4	6
Total	**65**	**100**

Source: Research survey 2022

From the table 54% respondents strongly agree, 23% agree while 9% were undecided that power generation has tendency to impact on industrial development in Nigeria. However, 8% disagree while 6% strongly disagree that with this fact.

Table 2: CHI square table

o	e	(o –e)	$(o\ e)^2$	$\sum. \frac{(o\ e)^2}{e}$
35	13	22	484	37.23
15	13	2	4	0.31
6	13	-7	49	3.78
5	13	-8	64	4.92
4	13	-9	81	6.23
				52.44

Degree of freedom = (n – 1)

= (5 – 1) = 4

Level of Significance = 0.05

Tabulated = 9.49

Calculated = 52.44

Decision Rule:

Accept **H_o** if calculated X^2 is less than 9.49

Accept **H_1** if calculated $X^2$is greater than 9.49

Interpretation:

Since calculated value of X^2=52.44 which is greater than tabulated $\mathbf{X^2}$ of 9.49, the Alternative Hypothesis is accepted ie power generation positively impacts industrial development in Nigeria

Research Hypothesis II

There is a relationship between power generation and industrial development in Nigeria

However, expected frequency (e) is computed as follows:

$$\frac{Total\ Number\ of\ Observation}{Total\ Number\ of\ Rows} = \frac{65}{5} = 13$$

Table 3: Results from questionnaire 2

Responses	Frequency	Percentage (%)
Strongly Agree	28	43
Agree	12	18
Undecided	10	15
Disagree	8	13
Strongly Disagree	7	11
Total	**65**	**100**

Source: Research survey 2022

From the table 43% respondents strongly agree, 18% agree while 15% were undecided that power transmission has tendency to impact industrial development in Nigeria. However, 13% disagree while 11% strongly disagree that with this fact.

Table 4: CHI square table

o	e	(o –e)	$(o\ e)^2$	$\sum. \frac{(o\ e)^2}{e}$
28	13	15	225	17.31
12	13	-1	1	0.08
10	13	-3	9	0.69
8	13	-5	25	1.92
7	13	-6	36	2.77
				22.77

Degree of freedom = (n – 1)

= (5 – 1) = 4

Level of Significance = 0.05

Tabulated = 9.49

Calculated = 22.77

Decision Rule:

Accept **H_o** if calculated X^2 is less than 9.49

Accept **H_1** if calculated $X^2$is greater than 9.49

Interpretation:

Since calculated value of X^2=22.77 which is greater than tabulated $\mathbf{X^2}$ of 9.49 therefore the Alternative Hypothesis is accepted ie power transmission has tendency to influence industrial development in Nigeria.

Research Hypothesis III

There is a relationship between power distribution and industrial development in Nigeria

However, expected frequency (e) is computed as follows:

$$\frac{Total\ Number\ of\ Observation}{Total\ Number\ of\ Rows} = \frac{65}{5} = 13$$

Table 5: Results from questionnaire 2

Responses	Frequency	Percentage (%)
Strongly Agree	30	46
Agree	15	23
Undecided	10	15
Disagree	6	9
Strongly Disagree	4	7
Total	**65**	**100**

Source: Research survey 2022

From the table 46% respondents strongly agree, 23% agree while 15% were undecided that power distribution has tendency to influence industrial development. However, 9% disagree while 7% strongly disagree that with this fact.

Table 6: CHI square table

o	e	(o –e)	$(o\ e)^2$	$\sum. \frac{(o\ e)^2}{e}$
30	13	17	289	22.23
15	13	2	4	0.31
10	13	-3	9	0.69
6	13	-7	49	3.77
4	13	-9	81	6.23
				33.23

Degree of freedom = (n – 1)

= (5 – 1)

= 4

Level of Significance = 0.05

Tabulated = 9.49

Calculated = 33.23

Decision Rule:

Accept $\mathbf{H_o}$ if calculated X^2 is less than 9.49

Accept $\mathbf{H_1}$ if calculated $X^2$is greater than 9.49

Interpretation:

Since calculated value of X^2=33.23 which is greater than tabulated $\mathbf{X^2}$ of 9.49 therefore the Alternative Hypothesis is accepted i.e. power distribution positively influences industrial development in Nigeria.

DISCUSSION

Considering the results obtained in this empirical research, it is evident that power generation has the capability of influencing industrial development in Nigeria given the calculated value of 52.44 as against the tabulated of 9.49. Nigeria Electricity Hub (2016) argued that in order to ensure that maximum industrial development is achieved, huge investment should be made in infrastructure while some dilapidated and defunct assets of Transmission Company of Nigeria should be resuscitated and used in generating power for Nigeria populace.

In addition, the study proved that the ability to effectively transmit power in a country has tendency to impact on industrial development. Using chi square, the calculated value gave 22.77 as against tabulated of 9.49. This assertion aligns with the views of Emodi and Yusuf (2015) who found that the private sector is exploring ways to reduce dependence on national grid and capitalize of transmission market in order to ensure that industries are powered and production is enhanced. Lastly, there is an evidence to prove that power distribution is capable of influencing industrial

development in Nigeria. Using the chi square, calculated value gave 33.23 as against tabulated of 9.49 which implies acceptance of alternative hypothesis. This assertion aligns with the views of Gumel (2016), existence of good distribution infrastructure and effective billing system will propel sustain companies in both service and manufacturing sectors rather than allowing them to collapse or move to neighbouring countries where goods can be produced at lower cost.

CONCLUSION

In view of the above findings, the study conclude that, it is necessary to provide reasonable assurance of the extent to which power sector positively promote industrial development. Thus, the need to project more investment in human capacity building within the power sector to help in providing power equitably across the value chain and also implement an integrated and realistic plan for improving efficient power generation capacity and a complimentary strategy for grid expansion and access. This would minimize the incidence of generation projects being held back by a lack of transmission capacity.

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