

Metering Scheme and its Implementation Strategies on Performance of the Nigerian Power Sector: A Study of Abuja Electricity Distribution Company

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Abstract

The poor implementation of the recent metering scheme by the federal government that has affected the power sector has attracted local and international attentions. The consequences of these actions have affected the successful metering rollout which has paralyzed the key performance indicators in terms of business performance, service delivery and sector viability in the power value chain which have significant impact on both business activities and the country's economy in general. Thus, the main objective of evaluating metering scheme and its implementation strategies on the performance of the Nigeria power sector and the research question were asked to guide the respondents in order to illicit information on the subject matter. The study employed mainly primary source. The study had a population of 167 targeted respondents comprising of private and business consumer, stakeholder, regulatory officials and union and association. The sample size of 118 was derived using taro Yamane formula, out of which (74) were response rate collected and used for analysis. Purposive sampling was used to administer the questionnaire to the respondents. The study adopted the use of descriptive statistics to analyses the demographic characteristics of the respondents while inferential statistics of simple linear regression was used to test the hypotheses in line with the objectives of the study. Findings based on the analysis reveals that, the study found out that there is a significant impact between the modified CAPMI components and business performance in the Nigeria power sector. The study recommended should revisit the modified CAPMI scheme with a view of coming up with a more holistic impact measurement which will be more business and customer friendly for efficient deployment of meters thereby creating a win-win situation for the value chain.

Background to the Study

Metering is a historical challenge that evolved with electricity in Nigeria. Metering starts from the moment power enters a facility to the instant it is used by a process and measured to ascertain the amount of physical quantity of electricity transmitted when activated by a powered device. To provide accurate real time electricity measurement, accurately capture information about electricity consumption and transmit it back to the electric company. Electricity is wholesomely measured from connecting point of generation, transmission and distribution utilities finally to end users. The act of accurate measurement of wholesome electricity connecting point is known as grid metering. Retail metering facilitates electricity flows from distribution to end users and it allows electricity consumption to vary from a single meter installation for customers billing (Egonu, U., Ukwetang, I. J., Tosin B., and Agbola I. I., 2017).

Nigerians have a national requirement for accurate measurement and a proper billing system that can instill confidence in the distribution of power flow. Although no one has a perfect understanding of all the electricity that is generated, consumed, or lost via a network, this can be achieved by metering. However, in order to fully comprehend the difficulties, it has in metering the country, it is crucial to understand the varied dynamics of metering. The two main categories of power users in Nigeria at the moment are those with and without meters. Users of post-paid and pre-paid meters make up the majority of the metered population. Only a small number of power customers received the pre-paid meter after the Nigerian Electricity Regulatory Commission (NERC) presented it to consumers in 2005. Despite these attempts, as of 2014, around 50% of Nigeria's registered electricity users were unmetered (Oseni, 2015).

The environment in which businesses operate is extremely competitive. Businesses use strategic management to create and maintain competitive advantage. The analysis, choices, and actions an organization does to establish and maintain a competitive edge are referred to as strategic management. Taylor, Gregory, and Lumpkin (2005). Making decisions regarding an organization's goals is involved. Gregory, (2007). Davenport (2007), The difference between developing a brilliant concept and successfully putting it into action. Therefore, sound plans should be adequately carried out in an effort to accomplish desired results. The process of putting a strategy into action and subsequently seeing outcomes is known as strategy implementation. The goal of this strategic procedure is to raise a company's performance.

Thompson and Strickland, (2003), implementation is an integral component of strategic management process and it is viewed as the process that turns the formulated strategy into series of action and the result ensure the vision, mission, strategy and strategic objectives of the organization are successfully achieved as planned. Implementation is the process by which strategies and plans are put into action to accomplish strategic goals and objectives. Your strategic plan's implementation is just as important as, if not more so than, your strategy. A strategic plan becomes a tool for driving business growth when it is put into practice through the crucial actions. Sadly, most businesses with strategic plans

don't follow through on them. Bhasin (2009), implementation is the process through which a chosen strategy is put into action. It entails system design and management to create the best integration of people, structure, processes, and resources in attaining organizational goals.

Therefore, the processes of metering are complex and a very vast area of the Nigeria power sector. Nigerian electricity reform was based on deregulation of the power sector, especially to bring an increased competitiveness, performance, service delivery and viability in the metering industry. Despite the fact that Electric Power Sector Reform Act gave a good ground to enhance the competitive metering atmosphere, the reality on ground is that the reform pace has been dragging; metering is still a major challenge. This study will also appreciate the metering scheme and its implementation strategies that can reduce the operating cost and free up the balance sheet and improve the metering programs of the Nigeria power sector as the distribution companies is concern.

Statement of the Problem

Effective metering and closing the metering gap in Nigeria has been hampered by inadequate finance, support and encouragement to the local manufacturers of meters and honesty in the part of government officials in the *power* sector (Odion 2021)

The fundamental issues are the attendant consequences of the implementation strategies on performance as it relates to this study are lack of transparency and accountability, the huge operational cost, bottleneck that surrounding the electricity value chain as it relates to decline in business performance; another issues is the inconsistency in maintaining regulatory agreement, conflict of interest among officials, poor operational capabilities, decay in infrastructural development as it relates to meter franchising can lead to decline in service delivery to the consumers; and the poor identification, indiscipline, financial liquidity challenges associated with the commercial viability and financial recovery of the electricity value chain as it relates to sector viability.

The distribution companies were trying to leverage on technology for prepaid meters and contended with the fact that some customers connect directly once their credits are exhausted. Unknown to the distribution companies are the huge deplorable state of meters in the country which were inherited from PHCN. Having that the much-awaited privatization had come, yet metering experiences remained unpalatable, the new private investors upon taking over the assets, were not prepared for the reality of moribund PHCN system as it was worse than anticipated.

Research Question

Drawn from the identified problems, this following research questions were drawn:

1. To what extent does metering scheme (Modified CAPMI) influence Performance in the Nigerian power sector?
2. To what degree have metering scheme (Meter Franchising) impact on Performance in the Nigerian power sector?

3. To what extent does metering scheme (Meter Service Providers) affect Performance in the Nigeria power sector?

Objective of the Study

The primary goal of the study is to assess the metering scheme and its implementation strategies on the performance of the Nigeria power sector. The specific objectives are:

1. To determine the influence of metering scheme (Modified CAPMI) on Performance in the Nigerian power sector.
2. To examine the impact of metering scheme (Meter Franchising) on Performance in the Nigerian power sector.
3. To assess the effect of (Meter Service Providers) on Performance in the Nigeria power sector.

Statement of Hypotheses

In the course of this study, the following null hypotheses were formulated:

- H₀₁:** Metering scheme (Modified CAPMI) does not significantly influence Performance in the Nigeria power sector
- H₀₂:** Metering scheme (Meter Franchising) has no significant impact on Performance in the Nigeria power sector
- H₀₃:** Metering scheme (Meter Service Providers) does not significantly affect Performance in the Nigeria power sector

Significance of the Study

The study will give insight on the metering scheme as it relates to implementation strategies in the Nigerian power sector for researchers and academicians to add value to their experience and knowledge on relevant study. Furthermore, this study will be of benefit to private, institutional consumer, power expert and business expert who are in the power value chain to be more aware of relevant information in respect to the Nigeria power sector.

Scope and Limitation of the Study

The study focused on the evaluation of metering scheme and implementation strategies in Nigeria power sector using Abuja electricity distribution company (AEDC) as a reference point and also taking into consideration AEDC offices in AMAC, Gwagwalada, Kuje and Kubwa and the justification is that the locations are growing in population, development and expansion of businesses. The study focused on people from the electricity value chain in respect to metering and its implementation in the Nigeria power sector. The study covered a 5 year period ranging from 2015-2020, the time frame is chosen to examine the activities that fell within the period of the unbundling of Power Holding Company of Nigeria (PHCN) into three segments which is the generation, transmission and distribution. And focusing the study on distribution segment which has been on the matter of metering in Nigeria, as well as reviewing the post-privatization period where intense discussion has been conducted on metering and how the change of government played its role in terms of changes in government policy in the Nigeria power sector. The

study covered Private and business consumers, stakeholders, regulators and union and association in the power sector. The limitation was due to the fact that the study had a short time frame which will not allow studying the entire activities and operations of the Nigeria power sector thereby limiting our focus on one segment of the power sector i.e., the distribution segment of the power sector.

Literature Review and Theoretical Framework

Conceptual Issues

The Concept of Metering Schemes

Simpson (1996), "the process and methods of using devices to measure the amount and direction of electrical energy flow; particularly for end-use" are known as "metering." He added that metering is the "installation of equipment that allows a utility to identify the quantity of electric power a particular customer has utilized." By use of wires that emerge from distribution transformers and are frequently referred to as service drops, electricity is delivered to subscribers. To measure the amount of electricity utilized, these wires are inserted into electric meters (measured in kilowatt-hours).

A metering strategy is a technique that enables an auditing firm to gauge client and server activity over a predetermined number of time intervals. Metering methods that take use of these access structures have useful real-world uses, such as the ability to track how well a website interacts with a target audience that is of particular interest. Additionally, we establish lower limits for the communication complexity of metering methods that implement broad access structures. NERC (2017)

Evolution of Metering of Electricity in Nigeria

The central idea for the development of electric meters is measurement and recording of energy consumed by various consumer units. The overall data and information obtained from electric power meters are usually employed for systems planning, operation management, and consumers' billing. This electric meter is of two types, namely; electromechanical and electronic ones (Dahunsi, F. M., Olakunle, O. R., and Melodi, A. O.2021).

The first to emerge in Nigeria was the electromechanical one and not until 2005 when the electronic one emerged, the Nigerian electricity grid heavily relied on the electromechanical meter which uses a spinning dick. Under this metering scheme, the energy consumed is manually read monthly by the then NEPA staff to bill customers. Generated bills are subsequently distributed manually before the customer can then approach local branch offices in their neighborhood for payment. This process is obsolete, tedious, and unreliable and encourages estimated billing which eventually resulted in customer dissatisfaction, energy and financial losses to the utility companies (Matthew et al., 2018).

However, the metamorphosis of the then National Electric Power Authority (NEPA) into Power Holding Company of Nigeria (PHCN) took place in 2005 and this led the gradual

replacement of electromechanical (post-paid) meters with electronic (prepaid) meters, because only few electricity consumers had access to it at inception (Arawomo, 2017). Furthermore, the strategic unbundling of the Power Holding Company of Nigeria (PHCN) in 2013 led to the emergence of various pre-payment meters by the various distribution companies in their respective zones of operations. However, Aliu, (2020) noted that the use of prepaid meters has been introduced in Lagos, Nigeria since the late 1990s with few households having access to it. The Key-type electronic prepaid meters were introduced in Nigeria in 2005 the followed by the smart card-type prepaid meters (Mankanjuola et al., 2015). At first, the prepaid meters were distributed to Nigerians with no initial financial obligation but their cost was incorporated into the credit unit purchased; and thus, permitting gradual payment for the meter. By 2016, there were 251,531 meters supplied through the CAPMI scheme out of the 403,255 total meters installed in about two years (Udo, 2016). CAPMI scheme collapsed in November 2016 due to a lack of commitment from the distribution company. However, NERC approved another initiative on the 8th of March 2018 called "Meter Asset Providers" (MAP) policy to further assist with bridging the metering gap (NERC, 2018). In the new scheme, third-party investors were allowed to supply meters to electricity consumers that have been enumerated by respective DisCos. Prepayment meters capable of remote credit top-up were introduced in 2019 to eliminate the need to physically access an electricity vending machine. With the privatization of the industry, private investors' participation in the provision of metering devices has resulted in the establishment of various metering companies in Nigeria (Dahunsi, F. M., Olakunle, O. R., and Melodi, A. O.2021). Some companies are capable of local production of electricity meters, although local meter production is yet to achieve 100% local content. Local manufacturers are already working towards achieving this feat. The certified meter manufacturers in Nigeria are Elsewedy Electric Nigeria, Momas Electricity Meters Manufacturing Company (MEMMCOL), Uni-Star Hitech Nigeria, Electricity Meter Company Nigeria (EMCON), and MOJEC International (Dahunsi, F. M., Olakunle, O. R., and Melodi, A. O.2021).

Billing System for Revenue Collection by Abuja Electricity Distribution Company (AEDC)

Abuja Electricity Distribution Company's postpaid system, in which meters are read, data is collected, and bills are generated, has long been a source of revenue collection problems. The power supplier has employed a number of techniques over the years in an effort to assure effective revenue collection. This includes pay stations and cash offices, as well as banks, outside parties, and revenue collectors (sometimes known as "bonded cashiers"). Private individuals that work in rural and semi-rural areas where AEDC lacks pay stations or cash offices to receive payments are known as bonded cashiers. Despite the fact that this strategy has been somewhat successful, it has not been completely successful in preventing payments evasion, revenue leakages, and the numerous problems that consumers face, such as delayed bill delivery and crediting of bills paid to customers' accounts, bill delivery to the incorrect person, and inconvenience of traveling a great distance to make a payment. Asabere, Hegbebu, and Mensah (2012).

Overview of Metering Concepts

The main elements used for monitoring and controlling power in Power Systems are meters and the equipment they are associated with (instrument transformers, communication modules, etc.). Because of the significance of their roles or functions, no utility company could calculate the amount of energy delivered to customers without meters. Any utility that considers metering to be standard operating procedure will go out of business or have no business being a utility company. No meter, No Business in the Production, Transmission, and Distribution of Electricity. Danquah (2017). An electricity meter, also known as an energy meter, is a device that calculates the quantity of electrical energy produced, transported, and consumed by a large number of clients (such as ECG, VALCO, or mini-companies in Ghana) or any electrically powered item. For billing purposes, electric utilities measure the amount of electricity delivered to its customers using electric meters that are fixed at the points of distribution or on the premises of the customers. The meters are normally calibrated in kWh or kVarh (kilovolt ampere hour), and they are typically read once per billing cycle.

Concept of Credit Advance Payment Metering Implementation

The Credit Advanced Payment for Metering Implementation (CAPMI) Scheme, one of the first interventions, was developed by the Nigerian Electrical Regulatory Commission (NERC) in 2013 and later updated in 2016. The modified CAPMI Scheme enables willing customers to "advance" the cost of the meter to the DisCos and be repaid in energy credit through reduction to a fixed charge element over a predetermined period in order to fulfill its mandate to maximize access to electricity, close the metering gap, and reduce estimated billing. The strategy was taken into consideration as a result of the distribution businesses' operating costs unexpectedly rising (NERC, 2019). The CAPMI Scheme was not totally successful for a variety of reasons, which is why the metering gap and estimated billing persisted.

Post-Paid Metering and Estimated Billing Challenges in NESI

Prior to November 2013, when Nigeria's power sector was privatized, the majorities of electricity payments were made via post-paid meter readings and anticipated billings. Eghobamien (2020) Olalere referred to the horizontally integrated, government-owned NESI's post-paid invoicing system as having a socialist welfare service orientation. Olalere (2020), the supply of meters to the ultimate users, he continued, was not prioritized, and a major metering gap existed when private investors took over some of the NESI in 2013. This gap still exists today. In a post-paid metering system, power bills are paid after the users use it. Mohammed Ganiyu, (2020). However, estimated billing is used to ascertain the real amount of electricity spent when a customer doesn't have a meter. ²⁰ Because there is no metering technology to measure real electricity consumption, estimated billing forces clients to pay either significantly more than or less than consumption. These two payment options enable customers to avoid paying their electricity bills, which raises the rate of customer non-payment and encourages other forms of electricity theft. A paradigm change from the use of post-paid meters and estimated billing to the use of prepaid meters was necessary as a result of these unpleasant incidents, and it is still necessary today.

Implementation Strategies

The challenge of strategy implementation is difficult and time-consuming. Practitioners resoundingly concur that creating a solid strategic plan is much simpler than trying to "make it happen." A diverse set of managerial talents are required to implement strategy and move the firm in the desired direction. Working with people, organizing, inspiring, establishing a positive organizational culture, and developing a tight match between the strategy and how the company operates are all necessary for successful strategy execution. Any management team will find it challenging to develop a consistent plan, but it will be even more challenging to apply it across the entire organization and make it work. Hrebiniak, (2006). The process by which strategic plans are translated into organizational action may be impacted by a wide range of circumstances. Implementing a strategy has, in the words of the White Paper of Strategy Implementation of Chinese Corporations from 2006, "become the most critical management challenge which all sorts of corporations face at the moment."

According to the poll mentioned in that white paper, only 17 percent of the surveyed organizations thought that they had a consistent strategy implementation procedure, and 83 percent of the companies failed to implement their strategies smoothly. The institutionalization of the strategy, or developing organizational competence to the point that it is fully supportive of the new strategy, is another prerequisite of the implementation phase. The reality of a strategy is shown in its strategic actions, not in its strategic words. Grove, Meza, and Burgelman,(2006). This calls for taking decisive action on activities including communicating strategic intentions to all levels of the company, coordinating strategy with organizational structure and culture, selecting competent leadership, and developing effective incentive structures. Increasing organizational performance is the goal of these two phases of plan implementation. The actual output or results of an organization as compared to its expected outputs make up organizational performance (or goals and objectives).

Concept of Business Performance

Many firms need an effective and efficient management of their business performance if they want to succeed in the difficult and competitive environment of today. Through the combination of both technical architecture and its business strategy, business performance management assures that numerous complete organizations are moving in the same direction toward the achievement of a similar set of goals and objectives (Ariyachandra and Frolick, 2008). Business performance management has the benefit of making it easier to develop strategic goals while also offering the necessary supporting measures to guarantee the goals are in line with the organization's overall strategy. Most of these strategic objectives are developed by taking into account a few key performance indicators and goals that significantly benefit the firm. And once these indicators are linked to operational measurements, performance measurement for incentive and strategic decision-making can be constructed.

Concept of Strategic Implementation

Strategy implementation (strategy execution) is defined as the managerial exercise of putting a freshly chosen strategy in place. It involves the managerial exercise of supervising the ongoing pursuit of strategy, making it work, improving the competence with which it is executed, and showing measurable progress in achieving the targeted results Thomson and Strickland, (2003). In a nutshell, Strategy implementation refers to how firms take plans into action Kazmi, (2008). Studies on strategic management point out that the success in formulating strategy alone may not lead to the success of strategy. For example, Harrison and Pelletier, (2000) indicate that the value of strategic decisions will be realized only after effective implementation of a decision. Moreover, firms cannot succeed if they do not implement strategies properly and effectively Getz, Jones, and Loewe, (2009); Robbins and Coulter, (1996). Additionally, Hrebiniak, (2006) stresses the importance of strategy implementation by indicating that a firm's poor performance generally stems from the execution of the plan, rather than the plan itself. Although some authors remark on the importance of implementation, Miller, (2002) indicate that more than 70 percent of strategic initiatives by organizations fail at the implementation stage. Various barriers such as poor communication, poor leadership, and poor system have been identified as the obstacles to successful implementation Beer and Eisenstat, (2000); Heide, Grohang and Johannessen,(2002); Raps, (2004). All of these barriers bring the spotlight to this part of the strategic process. Currently, practitioners and academics agree that implementation is the most important part of strategic process that has been overlooked for a long period of time (Kaplan and Norton, 2001; Kazmi, 2008; & Kruger, 1996).

Theoretical Framework

Thompson and Strickland Model, According to Thompson and Strickland Model (2003) implementation processes and activities or consumption sets up processes that can be used to gear an organization towards set objective. This model suggests a number of actions that an organization should follow in order to implement a strategic strategy successfully. Each phase has a unique duty that needs to be completed. According to the Thompson model, an organization should have a structure that supports the implementation of its strategy, meaning that the right people are assigned to the right tasks within the organization, and that the organization's capabilities are strengthened through capacity building and training. Additionally, it goes on to say that a company should give sufficient financial resources to support the execution of the strategy because doing so requires having enough money on hand. The third stage indicates that an organization needs to have cross-support units that encourage the creation of policies and procedures that will help it function well and direct its energy in a single direction. It establishes intentions and aims. This model of leadership describes how it affects, inspires, and fosters teamwork among employees in an organization. Every organization should have a culture that reflects how they want to be seen; as a result, leadership affects value development and shared values that are visible throughout the organization. Organizations with a certain culture do have a unique style of engaging to stakeholders.

Ricky Griffin's Model, Griffin, (2007), the main focus in implementation is identifying perspective and effective factors about implementation of strategies. According to this model, leadership, which provides direction, communication, employee motivation, and the establishment of culture and values inside a company are the major elements that affect performance. In doing so, leaders provide guidance and have an impact on how well a company performs. The division of labor, decentralization of functions, and the establishment of straightforward organizational structures that will speed up decision-making are other factors, according to this model. Technology is the third component. Technology utilization and job design can have an impact on how well a company performs. Organizational performance will be influenced by the information control system, a proper control system, which comprises financial budgeting, an information system, and a proper set of rules and processes. The performance of the organization will be improved by human resources, hiring qualified staff, promotions, and job enrichment.

The Socio Technical Model

Argues that there is a close relationship between behaviors and infrastructure i.e energy infrastructure (e.g., smart grids) (Shove, 2010). The socio technical models go beyond how peoples' dispositions and behaviors are influenced by others and propose that objects and technologies have an inbuilt tendency to cause the user to behave in certain ways (Guy, 2006). In technological systems, several items or technologies frequently cooperate to allow or encourage particular behaviors and lifestyles. These lifestyles in turn generate the demand for new technologies to support the lifestyle. The concept is referred to as "socio technical" for this reason. This idea also supports the view that metering of energy consumption though complex, can influence the energy behavior of consumers and lead to a conserving behavioral effect Graham and Marvin, 1994; Hand, Shove, Southerton, (2005); Stephenson, Barton, Carrington, Gnoth, Lawson and Thorsnes, (2010); Brunner, Spitzer, Christanell, (2012) and also act as a "gatekeeper" to utilities (Marvin et al., 1999). Thus, the socio-technical perspective suggests we should understand behaviour as the outcome of a mutually reinforcing system of technologies, ideas, behaviors and institutions.

The theoretical bases adopted was the Thompson and Strickland Model, suited the purposes of this study since the model's elements highlight the steps that an organization should take to implement its strategy successfully and improve organizational performance. It includes detailed plans with tasks that organizations can follow to affect their capacities.

Empirical Review

Kettless, (2004), the prepayment system has been in operation in the United Kingdom (UK) for more than 80 years, and it was created as a manner of handling bad debts, according to Efficiency in Revenue Generation. However, Tewari and Shah, (2003) and Sullivan, (2014) argues that it also affords customers the opportunity to avoid the build-up of debt which would be the case in the post-paid billing system.

Casarin and Nicollier, (2008) among local electricity users indicate that prepaid meter's lead to improved consumer welfare and reduction of arrears in accounts receivables, operational and financial costs on the part of the service provider and better allocation of resources for the user.

Mwaura, (2012), in Rwanda about electricity prepayment billing system shows that revenue rose in tandem with the increased number of EPBS enrolment, from US\$ 261,000 in 1996 to US\$ 22.9m in 2008. Other associated benefits discovered include increased and timely revenue collection and improved services delivery to electricity users.

Misra and Kingdom, (2012), Ogujor and Otasowie, (2010), suggests prepaid system ensures adequate and proper billing of customers even though Oracle, (2009) is of the view that consumers are not in favour of the prepaid system because of its cost, fairness and health and safety concerns

Gaya, (2013) in his assessment of the determinants of strategy implementation at the Kenya Sugar Board found out that lack of proper strategy planning affected resource allocation at the Board. This was demonstrated by simultaneously developing many strategies, which stressed the available resources and resulted in inadequate strategy implementation. The study also showed that the Board overemphasized the allocation of financial resources during the strategy planning stage while undervaluing the importance of non-financial resources, such as human resources, in the execution of the strategy, which led to poor organizational performance.

Drazin and Howard, (2010) see a correct strategy-structure alignment as a necessary precursor to the triple-crown implementation of recent business methods. They contend that adjustments to the structure are necessary as the competitive environment changes. A company may perform poorly and be at a severe competitive disadvantage if it takes too long to implement this realignment.

Anyieni, (2017), established positive relationship between communication and also the performance of TSC in African nation; as such the researcher observed that improved communication across all the TSC departments would enhance the performance of their functions. The organization's leadership must see to it that lines of communication are strengthened so that every stakeholder is informed of the mission and vision of the business.

Methodology

The Study adopted descriptive design through survey approach to gather information from the targeted respondents and this was because the study will explain the impact among or between the variables. The population of the study was 167 respondents cutting across private consumers, business consumers, stakeholders, regulatory officials, union and associations. Taro Yamane formula was used to determine the sample size (118) for the study. Purposive sampling was applied to determine the number of respondents that

made up the sample size and the justification is that because of the short period given to conduct the study as its cost-effective and time-effective. Data was collected from primary sources. The data included face-to-face interview and questionnaires to gather responses. The questionnaire is divided into two sections: section A deals with replies to questions about the respondents' demographics, while section B deals with answers to questions about the study's research questions, which are structured using a five-point Likert scale with multiple choice alternatives. The demographic information of the respondents was described using descriptive statistics, and implementation strategies and the electricity sector's metering scheme were determined using simple linear regression analysis, one of the data analysis techniques.

Thus, the model for this study is specified as:

$$KPI = (\text{Mod. CAPMI, MFH, MSP}) \text{-----(i)}$$

This can be specified in operational form and including logarithm as:

$$KPI = \beta_0 + \beta_1 KPI_v + \beta_2 MFH_v + \beta_3 MSP_v + IS \text{-----(ii)}$$

Where:

KPI= Key performance indicators proxy by business performance, service delivery and sector viability.

CAPMI_v= Modified Credit Advance Payment Implementation

MFH_v=Meter Franchising

MSP_v=Meter Service Providers

IS=Implementation Strategies

β_1 - β_3 =Coefficient of the Independent variables

Results and Discussion

Response Rate

Table 1: Response Rate

Respondents	Number of Questionnaires Administered	Number of Questionnaires Retrieved	No Not Retrieved	Valid Percent	Cumulative Percent
Private Consumer	16	11	5	13.56	13.56
Business Consumer	27	16	11	22.88	36.44
Stakeholder	32	19	13	27.12	63.56
Regulatory officials	24	16	8	20.34	83.90
Union & Association	19	12	7	16.10	100.00
Total	118	74	44	100	100

Source: Field Survey, (2021)

Table 1 shows that out of the One hundred and Eighteen (118) total numbers of questionnaires that were administered for the study, seventy-four (74) constituting 63% response rate were collected. Out of these, (11) of them representing 13.56% were private consumer, while (16) representing 22.88% response rate were business consumer, while the largest number of respondents (19) representing 27.12% were stakeholders, while (16) representing 20.34% were regulatory officials, while the least number (12) representing 16.10% were union and association.

Demographic Characteristics of Respondents

Because respondent characteristics affect findings, we offer the demographic information of the respondents in table 2. As noted in the table, data were gathered and analysed on five different respondent characteristics that are pertinent to the study. To aid in the analysis, data were gathered on the respondents' genders, educational backgrounds, employment histories, types of jobs had, and job titles.

Table 2: Respondents Characteristics

		Frequency	Percentage
Gender	Male	43	58.11
	Female	31	41.89
	Total	74	100
Educational Qualification	Postgraduate	28	37.84
	Degree	21	28.38
	Diploma	16	21.62
	Others	9	12.16
	Total	74	100
Working Experience	Below 5 years	17	22.97
	Btw 5 to 10 years	31	41.89
	Above 10 years	26	35.14
	Total	74	100
Nature of Appointment	Tenure	32	43.24
	Part time	26	35.14
	Others	16	21.62
	Total	74	100
Designation	Senior Management	17	22.97
	Middle Level	41	55.41
	Low Level	16	21.62
	Total	74	100

Source: Field Survey, (2021)

The table shows that virtually all the respondents have one form of education or the other with majority (28 or 37.84%) having postgraduate degrees followed by those with bachelor's degrees (21 or 28.38%) and higher national diploma (16 or 21.62%), and others (9 or 12.16%) respectively. These statistics further shows that most of the respondents had

higher education to be engaged competently in the discourse for meaningful contributions to the study.

On the respondents working experiences, the table shows that those with below 5 years' experience in the power sector amount (17 or 22.97%), those between 5 to 10 years are in majority with (31 or 41.89%) of the total and those above 10 years constitute (26 or 35.14%). This further justify the earlier conclusion that most of responses were presumed to be emanating from that category of people with the adequate experience in dealings with metering schemes and its implementation strategies in the power sector.

Furthermore, the table showed that different categories of persons responded; this includes tenure staff (32 or 43.24%) that amounted to as the majority and part-time constituted (26 or 35.14%) and others (16 or 21.62%). This shows that there was no room for bias in the targeted respondents as questionnaire was spread across all categories.

Finally, the designation of respondents cut across senior and middle management as well as low level officials in the Nigeria power sector. Those who responded include Senior Management made up of (17 or 22.97%) that are made up of people from senior rank in the private and business consumers, stakeholders, regulatory officials and unions. The middle management that constituted the majority (41 or 55.41%) that was drawn from the private and business consumers, stakeholders, regulatory officials and unions. The low level which comprises of respondents (16 or 21.62%). This implies that there is balanced assessment of the subject matter cutting across people in the electricity value chain.

Descriptive Statistics on the Components Metering Scheme Implementation Strategies and their Influence on Key Performance Indicators

The table 3 shows a descriptive statistic on the various research questions concerning the components metering scheme implementation strategies (MSIS) and their influence on Key Performance Indicator (KPI) of the Nigeria Power Sector. Each of these was reduced to specific questions as relates to the research variables.

Table 3: Descriptive Statistics on the components metering scheme and their influence on implementation strategies (IS) of the Nigeria power sector.

	N	Min	Max	Mean	Std. Dev
Modified CAPMI					
Modified CAPMI reduces operating cost of Discos	74	1.00	5.00	3.5270	.98235
Create an environment for bridging the metering gap	74	1.00	5.00	3.5811	1.09803
Reduce bottleneck in the metering rollout and strengthens performance	74	1.00	5.00	3.3919	1.09566
Meter Franchising					
Poor distribution infrastructure	74	1.00	5.00	3.5541	1.07451
Inadequate metering and inefficient collections of bills	74	1.00	5.00	3.7162	1.19955
Lack of operational capabilities in handling metering program	74	1.00	5.00	3.2973	1.01671
Meter Service Providers					
Shift the financial liquidity challenges as it relates to the metering services	74	1.00	5.00	3.2162	1.23055
Create room for add-on investment by free-up the balance sheet	74	1.00	5.00	3.3378	1.07623
Key Performance Indicators					
Improving on the coordination, alignment and communication of operational performance	74	1.00	5.00	3.5000	1.08855
Create a room for feedback on the transparency and accountability in the service delivery.	74	1.00	5.00	3.5541	1.07451
Build an ultimate discipline in handling of metering rollout for viability	74	1.00	5.00	3.5405	1.25173
Valid N (listwise)	74				

Source: Generated using SPSS output Version 20.0

From the table, the minimum and maximum value for the level of agreement on each of the question is 1 to 4 respectively and also the Mean and Standard Deviation for each of the questions are on average 3.51 and 1.02, respectively. These results show that on the overall basis, there was agreement on all the research questions and as such, there is a significant relationship between components Metering Scheme and implementation strategies (MSIS) and Key Performance (KPF) in the power sector.

Test of Hypotheses

On the data gathered for the aforementioned reasons, multiple ordinary least square (OLS) regression and correlation were used as twin inferential statistics. The three (3) predictors (independent variables) of the metering scheme implementation methods (MSIS)—Modified CAPMI (MC), Meter Franchising (MFH), and Meter Service Providers—were among the variables considered in the investigation (MSP). All of these predictors were regressed on the dependent variable, Key Performance Indicators (KPI).

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.639 ^a	.409	.384	.92344

a. Predictors: (Constant), MFH, CAPMI, MSP

b. Dependent Variable: KPI

Source: Generated using SPSS output Version 20.0

From the table 4 the adopted proxies of the independent variables are collectively responsible for 40.9% variation in the dependable variable while 59.1% are by factors of the Key performance indicators

Table 5: ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	41.295	3	13.765	16.142	.000 ^b
	Residual	59.692	70	.853		
	Total	100.986	73			

a. Dependent Variable: KPI

b. Predictors: (Constant), MFH, CAPMI, MSP

Table 5 summarize the overall multiple regression model's ANOVA findings, the regression equation is "excellent fit," or statistically significant at the 5% level of significance, based on the F-test results (16.142) and probability value (P-value=0.000). This further reinforces our decision to reject the null hypotheses one and accept its alternative one. In other words, the ANOVA results shows that the linear combinations of the four variables if metering scheme implementation strategies are significantly related to the key performance indicators at 5% level of significance.

Table 6: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.396	.503		-.788	.433
	MSP	.264	.110	.241	2.398	.019
	CAPMI	.387	.102	.361	3.801	.000
	MFH	.331	.107	.306	3.105	.003

a. Dependent Variable: KPI

Source: Generated using SPSS output Version 20.0

From table 6; hypotheses one to three would be scientifically interpreted via values of the predictors in line with the objectives of the study; we therefore, present the test of hypotheses as follows:

H₀₁: Modified CAPMI has no significant influence on Business Performance in the Nigeria power sector.

The modified CAPMI (MC) and business performance (BP) in the Nigerian power industry have a positive association, as indicated by the beta co-efficient of the impact of modified CAPMI (0.387), which was statistically significant at 5% with a p-value of (0.000). Furthermore, it suggests that, while other variables remain constant, a unit change in the Modified CAPMI (MC) would result in an average impact (increase) on business performance (BP) in the Nigerian power sector of 38.7%. Since Modified CAPMI has a considerable impact on business performance in the Nigerian power sector, we reject the null hypothesis in light of this and embrace the alternative hypothesis. This is consistent with Drazin and Howard's (2010) view that the triple-crown application of contemporary business processes requires a proper strategy-structure alignment. They contend that structural modifications are necessary to accommodate changes in the competitive environment. A company may perform poorly and be at a significant competitive disadvantage if it takes too long to implement this realignment.

H₀₂: Meter Franchising has no significant effect on Service Delivery in the Nigeria Power Sector

The Meter Franchising (MFH) and Service Delivery (SD) in the Nigerian electricity industry are positively correlated, according to the Beta co-efficient of equipment failure (.331), and this association is statistically significant at 5% with a p-value of (0.000). Additionally, it suggests that, assuming all other variables remained equal; a unit change in meter franchising (MFH) would result in an average change (increase) in the Service Delivery (SD) in the Nigerian power sector of 33.1%. Due to this, we decide to reject the null hypothesis and embrace the alternative claim that meter franchising has a big impact on service delivery in the Nigerian power sector. This is consistent with the findings of Mwaura (2012) who discovered that the prepaid billing system, which is a metering scheme alternative, can result in greater and prompt revenue collection and improved service delivery to the end-users.

H₀₃: Meter Service Providers has no significant effect on Sector Viability in the Nigeria Power Sector.

The Nigerian electricity sector's Meter Service Providers (MSP) and Sector Viability (SV) had a positive link, according to the maintenance culture's beta coefficient of 0.264, which was statistically significant at 5% with a p-value of (0.000). Additionally, it suggests that, assuming all other variables remained equal, a unit change in the Meter Service Providers (MSP) would result in an average change (increase) in Sector Viability (SV) in the Nigerian power sector of 26.4%. As a result, we reject the null hypothesis and accept the alternative, which states that Meter Service Providers have a major impact on the sector viability in the Nigerian power industry. This is in line with the findings of Casarin and Nicollier (2008), who discovered that among local electricity users, prepaid meters

improved consumer welfare, decreased receivables arrears, operational and financial costs on the part of the service provider, and improved resource allocation for the user.

Major Findings

Since the main objective of the study is Metering Scheme components and its implementation strategies in the Nigeria power sector. The study found out a significant and positive relationship between components Metering Scheme and its Implementation Strategies (MSIS) and key performance indicators (KPI). Assessing the degree of the impact, the study found out that there is a positive and meaningful relationship between all the three elements of metering scheme implementation strategies and key performance indicators. In the study, we have found the relationship between modified CAPMI and business performance to exhibit the most significant impact while meter service providers exhibit the least impact. On the extent to which meter franchising influences service delivery in the Nigeria power sector. Finally, on how meter service providers influenced sector viability in the Nigeria power sector, the analysis revealed that meter service providers have a significant effect on sector viability in Nigeria power sector as more than 80% of those reviewed agree with the assertion.

Conclusion

The study concludes that the activities of modified CAPMI can cause a serious impediment on business performance which could cause serious doubt on electricity value chain, and as for the meter franchising which shows with efficient and effective implementation it will improve service delivery to the end-user, which in turn if properly managed will allow the meter service providers scheme will eliminate the exclusivity provided to the distribution company for meter provision thereby making the sector viability in the Nigeria power sector. It will be important to say that Nigeria should invest in the power sector so that it will lead to improvement in metering scheme, enhance successful metering program so as to improve business performance, service delivery and sector viability of the Nigeria power sector.

Recommendations

Based on the above conclusion, we make the following recommendations:

- i.) The Federal Government of Nigeria through the Nigerian Electricity Regulatory Commission and other relevant agencies should revisit the modified CAPMI scheme with a view from this study showing that Modified CAPMI is very impacting thereby mapping a structural and more holistic impact measurement so that it can support more businesses and be customer friendly towards the efficient deployment of meters so as to create a win-win situation for the value chain.
- ii.) The Managements of the relevant government agencies in the power sector should fashion out a conference or workshop with a view to harmonize the bottlenecks in the meter franchising scheme so that it can thrive from the point of inception to implementation stage so as to improve service delivery to the sector.
- iii.) The Federal Government of Nigeria through the central bank of Nigeria should

device new measures that will re-gig the access of support funds to the distribution companies who find the requirements and application procedures very strict so that they can reduce the financial liquidity challenges as it relates to the meter service providers thereby allowing for other investment in critical infrastructure of the power sector by the Discos.

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