# EFFECT OF PREPAID METERING SYSTEM ON CUSTOMER SATISFACTION IN MINNA, NIGER STATE, NIGERIA

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**MTech/SEMT/2018/8244**

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**MINNA**

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**A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL OF FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF TECHNOLOGY IN PROJECT MANAGEMENT**

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## ABSTRACT

The state of metering in the Nigerian electricity industry requires immediate attention in order to bridge the large gap in customer satisfaction. Energy consumers in Nigeria have long complained about Distribution Companies' unfair billing practices, exorbitant monthly electricity bills resulting from meter estimation rather than accurate meter reading and calculation based on uninterrupted electricity use. The aim of this study is to examine the effects of prepaid metering system on customer satisfaction in Minna, Niger State. In carrying out the study, the designed questionnaire was administered to 393 randomly chosen respondents drawn from AEDC prepaid meter customers out of which 344 responded generating a response rate of 87.5%. In the study, four research questions were formulated and answered. The data derived were subjected to Pearson's correlation and multiple regression models. The major findings from the study showed a significant, moderate and positive relationship between the prepaid metering system and customer satisfaction. Additionally, three significant predictors, Affordability, Availability and Flexibility with a regression coefficient of 0.263, 0.127 and 0.189 respectively were positively related to the criterion in the regression model. The result implies that, since the introduction of the prepaid metering system in Minna, users have become more conscious of their electricity consumption, and have taken energy saving practices seriously. Further findings revealed that it is time consuming and expensive to acquire the prepaid metering system and user also experienced delay in receiving and installing of their meters among others. In conclusion, prepaid meter users in Minna have enthusiastically welcomed the introduction of the prepaid metering system to the city, and they believe that the ability of the distribution company to understand customer needs is an important factor in creating customer satisfaction as well as the company's readiness to effectively address any operational challenges or other challenges that may arise. The study therefore recommends the provision of a smart metering system, good customer care units and a marketing campaign for better knowledge of the prepaid metering system.

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| | |
|---|---|
| ACSI | America Customers Satisfaction Index |
| AEDC | Abuja Electricity Distribution Company |
| AHCN | Association of Housing Corporations of Nigeria |
| CSI | Customer Satisfaction Indexes |
| DISCO | Distribution Company |
| ECSI | European Customers Satisfaction Index |
| EDT | Expectancy Disconfirmation Theory |
| EEDC | Enugu Electricity Distribution Company |
| EKEDC | Eko Electricity Distribution Company |
| KPLC | Kenya power and lighting company |
| NBEM | Need Based Energy Management |
| NCC | Nigeria Communication Commission |
| NERC | Nigerian Electricity Regulatory Commission's |
| NESI | Nigerian Electricity Supply Industry |
| PHCN | Power Holding Company of Nigeria |
| PPM | Prepaid Metering |
| SCSI | Swedish Customers Satisfaction Index |
| SON | Standard Organization of Nigeria |
| SPSS | Statistical Package for Social Sciences |
| TAM | Technology Acceptance Model |
| TANESCO | Tanzania Electric Supply Company |
| WTP | Willingness to Pay |

# CHAPTER ONE

# 1.0 INTRODUCTION

## 1.1 Background of the Study

The process and technique of using devices to calculate the amount and direction of energy (electricity) flow, especially for end-use, is referred to as metering. It is also known as the installation of devices that allows a utility to determine how much electricity a specific customer has used (Makanjuola *et al*., 2015). In Nigeria, electricity was first introduced through a postpaid metering system, which requires employees of the Distribution Company (DISCO) to physically read meters and users pay for electricity that had already been consumed. This is a common technique for accounting for large non-technical or vampire losses caused by unethical practices such as paying bribes to waive bills for customers bypassing wires. Customers who claim they were overcharged as a result of inaccurate billing estimates frequently try to recoup their losses by paying bills late or not at all. Exorbitant monthly electricity bills resulting from meter estimation instead of accurate meter reading and estimation based on continuous electricity use, resulting in charging for electricity not used, can cause customers to ignore month - to - month meter bills and avoid paying electricity bills (Obafemi and Ifere, 2013). Estimated billing has become common, and there are numerous examples of customers who have paid for meters but have not received them after waiting for an unreasonable amount of time. This has a significant negative impact on the DISCOS' image and people's perception, which has been characterized as inefficient, irresponsible, unresponsive, dishonest, and sloppy. According to Njabulo *et al*. (2018), the utility and the consumer face postpaid meter challenges which include meter reading errors, which result in bill payment anomalies, readings that are not always available, forcing the meter reader to guesstimate, and many more. Accurate consumption metering is critical in Nigeria,

considering the poor quality of electricity supply and prevalent utility exploitation of customers through irregular billing. Due to Nigeria's poor billing practices, more than 80% of the complaints received by the regulator (Nigerian Electricity Regulatory Commission), are about inaccuracies in billing, increased tariff rates in the estimated metering approach, and poor infrastructure in metering (Okafor, 2013).

An organization's success is determined by its ability to recognize and meet the needs and desires of its customers on a regular basis. In today's ever-increasing competitive environment, customer satisfaction is one of the most powerful weapons a company can use to gain an advantage over its competitors. Every company that wants to grow its market share must constantly identify and improve the factors that increase customer satisfaction, as well as identify and avoid the factors that decrease customer satisfaction (Khan, 2012). Implementing a prepaid metering system is a great way to ensure customer satisfaction while also collecting revenue (Makanjuola *et al*., 2015). Consequently, in recent times, most municipalities and cooperatives have switched to this model (the prepaid metering system) in order to take advantage of the model's benefits (Harvey, 2005). Prepaid metering is a new energy billing approach that includes an advanced electronic customer account management system. It combines smartcard technology with metering equipment. It not only provides a utility, but also significant manpower and financial savings, as well as new payment options for customers. It features a paper - free payment system and can be used to replace any electro - mechanical meter on the market, lowering operational costs (Tamiru, 2018).

In order to reduce and eliminate complaints of overbilling and other related issues, the Power Holding Company of Nigeria (PHCN) introduced the digital prepaid metering system in 2006 as a result of a high customer debt profile and revenue collection difficulties (Ogujor and Otasowie, 2010). The prepaid metering system allows DISCOs

to collect electricity bills from customers before they use it, reducing the amount of revenue lost due to power theft, consumers' unwillingness or refusal to pay their utility bills due to inaccurate meter reading and payment (Jain and Bagree, 2011). The prepaid framework enables not only financial, but also political, innovation, and technological forms of socialization and socioeconomic ordering. Consumers can effectively and easily manage their budgets using the prepaid model, reducing wasteful and unnecessary electricity use, such as not saving electricity and leaving devices on (Tewari and Shah, 2003). Municipalities and utility companies benefit from the pre-paid system because it increases profits, postpaid outstanding debts are reduced, and customer relations are improved (Harvey, 2005). Another benefit to DISCOs that is underappreciated is the protection of their workers, making workers who are expected to read meters and visit customers' homes predisposed to dangers such as dog bites, harsh weather and hazards, among many others, as well as the impression of invasion of privacy (Jain and Bagree, 2011). Despite the political and social implications, the prepaid model has the potency to ensure a consistent supply at a lower cost (Soto *et al.*, 2012). Users can take control of their budget with the information provided by a smart meter and also enables decisions being made which save more energy and natural resources, ensuring environmental sustainability. The other advantage of these for users is that they provide accurate billing. Consumers in Nigeria, on the other hand, will only pay for the energy they use with these new energy prepaid meters. Control is another advantage of this meter for the consumer. Consumers of energy now have more control over their usage.

## 1.2 Statement of the Research Problem

In Nigeria's power sector, the condition of metering requires immediate attention in order to close the large gap in customer satisfaction. Consumers who claim they have been overcharged due to inaccurate billing estimates frequently try to recoup their losses by paying bills late or not at all. Exorbitant monthly electricity bills resulting from meter estimation instead of accurate meter reading as well as estimation based on continuous power usage, resulting in billing for electricity not used, led consumers to ignore monthly meter bills and avoid paying electricity bills (Obafemi and Ifere, 2013). Energy consumers in Nigeria have long complained about Distribution Companies' unfair billing practices. Estimated billing was used by the majority of DISCOs; while this reduces workload for DISCOs, it results in very unrealistic bills for consumers. The DISCOs sent bills to customers regardless of how much energy they used.

According to Makanjuola *et al*. (2015), implementing a prepaid metering system is a great way to ensure customer satisfaction while also collecting revenue. Prepaid meters are being introduced by countries and utilities to improve accessibility, reduce non-payment of electricity by households, and recover costs (Njabulo *et al*., 2018). Prepaid meters, according to Casarin and Nicollier (2011), result in improved consumer welfare, reduced account arrears, and lower operational and financial utility costs. Several studies have been conducted in Nigeria on the use of the prepaid metering system; its adoption, significance, and challenges (Amhenrior, 2018; Makanjuola *et al*., 2015; Oluwayemisi *et al*., 2013). Based on the gap identified in the literature, this study therefore seeks to examine the effect of the prepaid metering system on customer satisfaction in Minna, Niger State.

## 1.3 Aim and Objectives

The aim of this research is to study the effects of prepaid metering system on the satisfaction of customers in Minna, Niger State. The specific objectives of the research are to:

i. establish the relationship between the adoption of prepaid electricity metering system and customers satisfaction;
ii. examine the benefits of prepaid metering system over the postpaid metering system;
iii. evaluate the level of satisfaction with respect to prepaid metering usage; and
iv. identify the challenges faced by prepaid meter users in Minna, Niger State.

## 1.4 Research Questions

i. What is the relationship between the adoption of prepaid electricity metering system and customer satisfaction in Minna, Niger State?
ii. What are the benefits of prepaid metering system over the postpaid metering system in Minna, Niger State?
iii. What is the level of customer satisfaction with respect to prepaid meter usage in Minna, Niger State?
iv. What are the major constraints that limit the satisfaction of prepaid meter users in Minna, Niger State?

## 1.5 Research Scope

This research is limited to the effects of prepaid metering system on customer satisfaction. In addition, the second chapter critically addressed related literature concerning the postpaid metering system, the prepaid metering system and customer satisfaction. The geography scope was limited to the customers (prepaid metering system users) of the

Abuja Electricity Distribution Company (AEDC) in Minna, Niger State. The finding of this study was restricted to data acquired from the questionnaire administered to respondents between April and July, 2021.

## 1.6 Study Area

The city of Minna in Niger State was chosen as the study area for this study. Minna was preferred since it is an urban area where the majority of residents in Niger State use the prepaid metering system and is home to people from various social and economic backgrounds. Residents of urban centers are far more educated, and thus know what is expected from the DISCO, which is why prepaid electricity meters have become prevalent.

## 1.7 Significance of the Study

The findings of the study will aid DISCOs and policymakers in identifying current and various challenges faced by the users of the prepaid metering system, as well as developing appropriate strategies to improve the system's implementation and use. Users will be able to identify the benefits of this metering technology over the old metering system as a result of the study, which will help them understand, appreciate, and embrace the technology.

This study will also contribute to the body of knowledge in the field of prepaid metering and customer satisfaction, and as a result, it will be used as a reference material for students and other interested researchers who want to conduct a more in-depth investigation into the prepaid metering system. Furthermore, the study will assist the researcher in gaining knowledge in this field and gaining a thorough understanding in order to conduct further research.

# CHAPTER TWO

# 2.0 LITERATURE REVIEW

## 2.1 Postpaid Metering System

The two most common forms of electricity billing systems used globally are postpaid (credit) and prepaid meters (Njabulo *et al*., 2018). Majority of the homes have traditionally been subject to postpaid and estimated billing system and only lately has there been a major transition toward the use of the prepaid metering system (Brutscher, 2011). This transition is attributable to the fact that in a postpaid metering system, consumers are charged and pay monthly based on their consumption, meaning that service comes first before payment (Szabo and Ujhelyi, 2014; Taale and Kyeremeh, 2016; Njabulo *et al*., 2018), whereas in a prepaid metering system, the consumer first purchases credits before using electricity (Esteves *et al*., 2016). Furthermore, because postpaid billing involves meter reading, delivering of bills, connection and disconnection of users, the use of postpaid meters has been met with opposition from some consumers, many of whom have accused distribution companies of fraudulent practices. Since these postpaid readings are not collected regularly, average consumption rates are estimated in homes without accurate power usage records (Makonese, 2018). The challenges faced by DISCOs and Consumers are presented in Table 2.1.

**Table 2.1: Postpaid Metering System challenges for DISCOs and the Consumers**

| DISCO | Consumer |
|---|---|
| Errors in meter reading and, as a result, billing irregularities | Billing irregularities as a result of meter reading errors |
| Readings are sometimes unavailable, requiring the meter reader to estimate. | Readings are sometimes unavailable, forcing the meter reader to estimate. |
| Because readings are not accessible, it is difficult to keep track of usage. | In the event of non-payment, the utility may disconnect the service. |
| Increased costs due to administrative and logistical support for meter billing | Households' post-paid bills are being delivered late. |
| Between the meter reading, account administration, and account delivery, and the payment due date, there is a significant amount of time. | Switching off the electricity due to non-payment can be a difficult process. (There is no prior notification) |
| Pilferage – unauthorized connections. | Lumpy payment bills. |
| Due to late delivery of post-paid bills to households, revenue collection is delayed. | Arbitrary electricity consumption. |
| Supplier-client relationships are strained in the event of incorrect billing, as well as during disconnection and reconnection. | Supplier and client relationships are strained in the event of incorrect billing, as well as during disconnection and reconnection. |

Source: Njabulo *et al*. (2018)

## 2.2 Prepaid Metering System

The Prepaid metering system is a well-established technology that is being adopted by large number of utility companies across the globe. In the mid-1980s, the first country to use this prepaid billing was South Africa. The primary goal was to provide low-income neighbourhoods with affordable electricity (Nyangweso *et al*., 2013). Prepaid metering, in its most basic form, refers to paying for electricity, fuel, or power before using, or it is a payment method made in advance (Wambua *et al*, 2017). It's also known as a pay-as-you-go system with a display and a flexible payment option that requires customers to pay in advance for the electricity they expect to use, enabling them to monitor and control their overall power consumption since units are purchased and used until the unit runs out (Oluwayemisi and Egunjobi, 2013).

Most prepaid meters only measure active energy and are primarily used by households and small businesses (Khan *et al*., 2010). As a result, prepaid meters are unable to measure reactive energy, which is widely used by industries and large commercial entities (DeNysscheu, 2010). The prepaid metering systems are typically installed at the home of the user and provide constant feedback regarding the amount of power used. The prepaid meter works in a similar way to a telephone recharge service. To load up or reload a prepaid metering system, the user must purchase tokens that must be entered into the meter for instant recharge. The token loaded therefore appears on the meter's display and the user has the ability to track power usage on a regular basis and, as a result, make adjustments where necessary (Njabulo *et al*., 2018). The power is used up until it is depleted, at which point the user must purchase additional token to restore back power (Malama *et al*., 2014; Franek *et al*., 2013). One of the most important features of prepaid meters is that when the credit is depleted, the energy supply can be disrupted, and the household self-disconnects (Rocha *et al.*, 2019). The central server is that part of the meter that stores and manages all data about users' prepaid meters. The electronic key, smartcards, and alphanumeric pin codes are the three types of meters and the three types of prepaid meters commonly used are explained below (Esteves *et al*., 2016).

i. Electronic key meter: The user is given an electronic key that contains all of the meter's details; using this key is the only method needed to purchase tokens at the machine. The token is therefore charged when the electronic key is inserted into the meter.

ii. Smartcard meter: The user receives a smartcard rather than a key containing the meter’s details, which is used to purchase tokens and then charged when inserted into the system.

iii. Keypad meter: To add tokens to the meter, the user uses the keypad to type an alphanumeric pin code. The alphanumeric pin code is sixteen or twenty digits long. Online recharge and electronic payment can also be used to recharge this meter.

According to Esteves *et al*. (2016), the benefits of smartcards allows the collection of prepaid meter information, which is useful for the DISCO in capturing user behaviours and designing customized value-added electricity services. To access power, the user must buy tokens in all prepaid meter systems. This transaction varies frequently owing to a rise in wages or special desire for the meter (Boadu, 2016). The rate at which a user recharges their meter monthly determines the rate at which costs accrue or accumulate (Njabulo *et al*., 2018).

Globally, prepaid metering systems have been dubbed "the way of the future" (Ruiters, 2008). Prepaid meters are being introduced by countries and utilities to improve accessibility, reduce non-payment of electricity by households, and recover costs (Njabulo *et al*., 2018). Prepaid meters have been installed in over 22 million locations around the world; this is presented in Figure 2.1 which shows that the average annual growth rate between 2010 and 2017 was around 9.1%. Between 2011 and 2017, the number of installations increased by 20% - 34 million (Hedin and Strother, 2012; Azila-Gbettor *et al*., 2015; Villarreal *et al*., 2012). The prepaid metering system was implemented over four decades ago, the United Kingdom leads among developed countries. South Africa, on the other hand, is the developing world's leader; with majority of its homes now using this meters (Makonese *et al*., 2012). Other countries that have piloted or used this metering system include the United States of America, China, Argentina, Brazil, Australia, Nigeria, Ghana, Kenya, Rwanda, and Mozambique. Prepaid

electricity gives consumers control over how much electricity they use and allows them to divide their token purchases (Baptista, 2013).

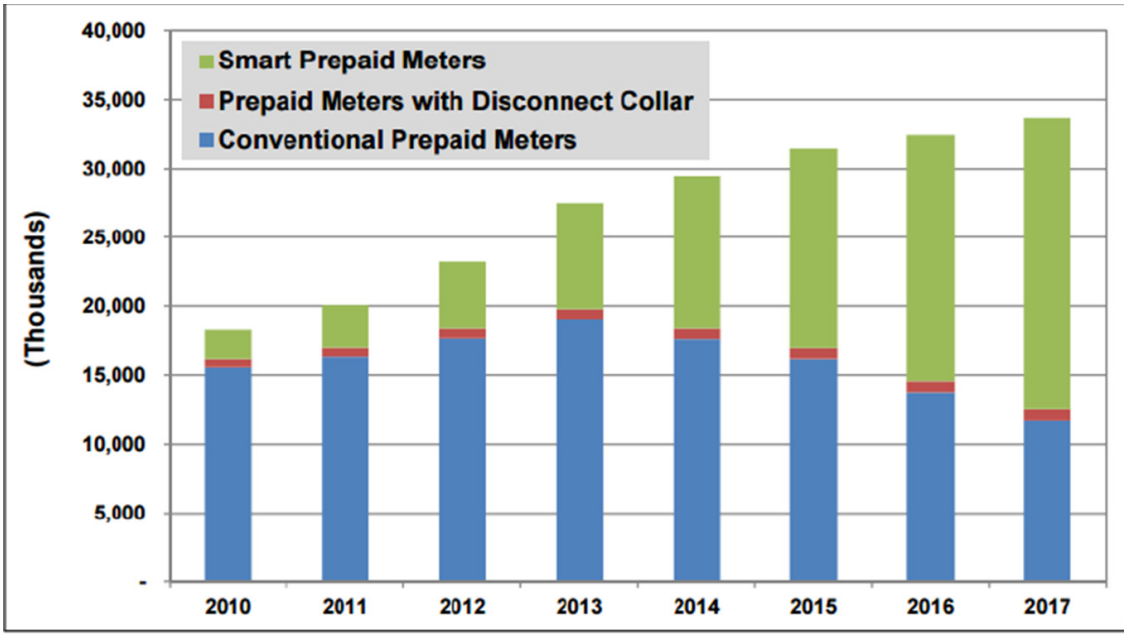


**Figure 2.1**: Prepaid electric meters by type, world markets: 2010 – 2017
Source: Hedin and Strother (2012)

Nigeria underwent power sector restructuring in 2005, and one of the measures taken was the implementation of the prepaid metering system, owing to the Power Holding Company of Nigeria's (PHCN) difficulties in receiving payments from electricity bills and minimizing loss (Ibrahim-dasuki, 2012). The majority of users expressed dissatisfaction with the amount of bills sent to their homes and failed to pay, resulting in significant debt. The prepaid metering system in Nigeria is based on vouchers with a thirteen digit pin which is available at any DISCO centre (Ibrahim-dasuki, 2012). The DISCO took initiatives to increase awareness among consumer and employee on the use of the prepaid metering systems, as well as devise methods to make great use of power and energy-saving alternatives. Users' awareness of the use of the prepaid metering system was done through a media campaign (radio, television, billboards, and posters). Surprisingly, rather than reducing power distribution losses and increase returns, the prepaid system created a new opportunity for extortion and bribery. Consumers were

threatened with extortion and bribes in exchange for installing new installation. In fact, switching from postpaid to prepaid meters was nearly impossible unless users paid bribes (Esteves *et al*., 2016).

The metering status as at June 2019 is presented in Figure 2.2

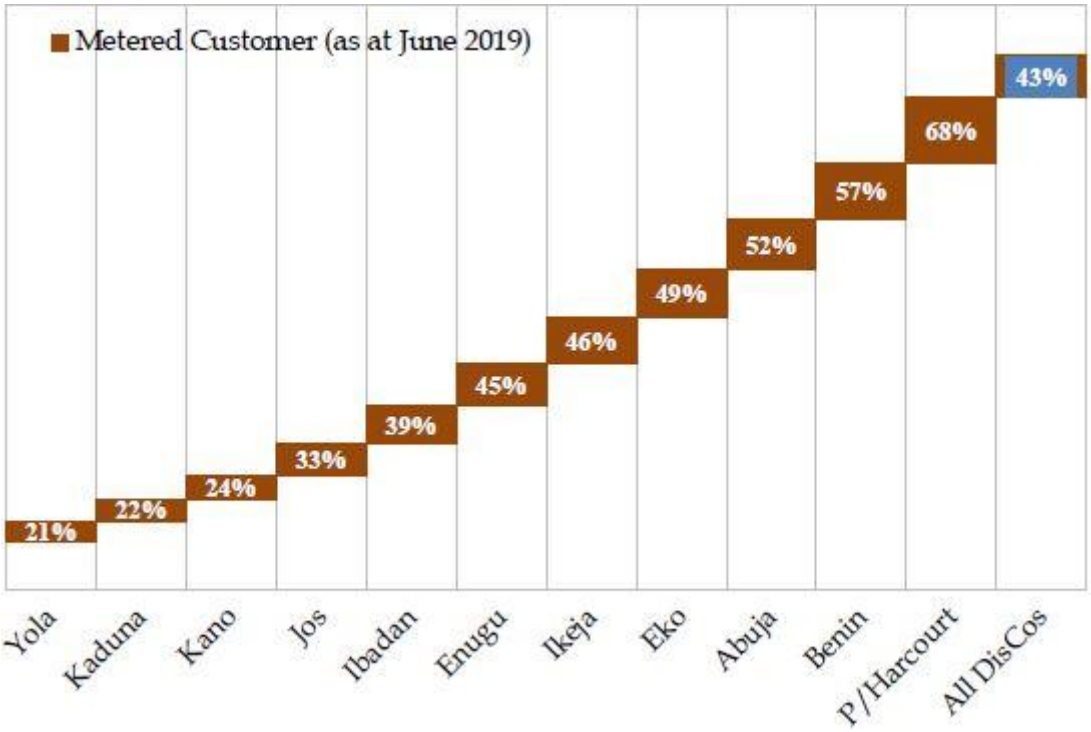


**Figure 2.2**: Metering Status as at June 2019
Source: NERC Quarterly Reports (2019)

According to the Nigerian Electricity Regulatory Commission's (NERC) quarterly reports for 2019, the industry's metering gap for end-use customers remains a major issue. According to the Commission's records, only 3,811,729 (42.92 percent) of the 8,881,443 registered electricity customers had been metered as of the end of the second quarter of 2019.As a result, 57.08 percent of registered customers are still on estimated billing, contributing to customer apathy toward electricity payment (NERC Quarterly Reports, 2019).

## 2.3 Benefits of Prepaid Metering System

The benefits associated with the technology are driving the growth of the prepaid meter market. There exists a positive perception about the impact of the prepaid metering system to both users and DISCOs. Critically, the prospects of this metering system vary by region, and thus are not universal (Baptista, 2013). Prepaid meters are being introduced by countries and utilities to improve accessibility, reduce non-payment of electricity by households, and recover costs (Njabulo *et al*., 2018). Prepaid meters, according to Casarin and Nicollier (2011), result in improved consumer welfare, reduced account arrears, and lower operational and financial utility costs. Another important benefit that encourages its usage is the technology's ability to reduce inaccuracy (Esteves *et al*., 2016). Prepaid meters in Uganda have continued to aid the utility in collecting revenue from households and this has increased the returns from $261000 to $4.2 million as the technology was rolled out more aggressively (Mwaura, 2012). The prepaid system also allowed DISCOs to recover debt in Zambia. This metering system assisted DISCOs in Mozambique to recover non-payment of bills by households (Malama *et al*., 2014; Baptista, 2013).

Several countries, including the United States, Canada, the Netherlands, Zambia, Nigeria, Ghana, and the United Kingdom, have experienced reduction in energy usage and consumption (Brutscher, 2011; King, 2012; Martin, 2014, Azila-Gbettor *et al*., 2015). This metering system continues to help homes with budgeting in the United Kingdom, Belgium, the United Kingdom, and Nigeria (Makanjuola *et al*., 2015). Because households are more aware of their power consumption, research shows that they plan better and use less power (Njabulo *et al*., 2018). Other advantages include reduced overall energy demand, less pressure on DISCOs to enhance generation capacity, and eradication of bill-related stress (Oseni, 2015; O'Sullivan *et al*., 2013; Depuru *et al*., 2011). Table 2.2

shows the benefits of this metering system in different regions (developed and developing regions).

**Table 2.2: Benefits of Prepaid Metering System in Different Regions**

| Region | Country | Meter Technology | Benefits |
|---|---|---|---|
| Developing | Nigeria | • Keypad meters<br>• Recharged using a voucher card with a 13-digit pin code | • Eliminated estimated billing<br>• Transparency of electricity bills has improved<br>• Beneficial to educate the population |
| | South Africa | • Smartcard meters<br>• Paper card meters<br>• Key pad meters | • Disconnection and reconnection fees are eliminated.<br>• Costs associated with meter reading and billing are eliminated.<br>• Operational cost reduction<br>• Enhance revenue management<br>• Consumer empowerment in terms of usage<br>• Give the consumer more control over their spending. |
| | Mozambique | • Keypad meters<br>• Recharged one using voucher, scratch card and SMS | • Non-technical losses have decreased from 43% in 1995 to 21% in 2011.<br>• Revenue collecting around 97% in 2011 against 88% in 2001<br>• Operational cost reduction<br>• Customer per employee increased from 106 in 2001 to 248 in 2010<br>• Increase in the rate of electrification<br>• Boost consumer quality standards and DSO trust. |
| | Ghana | • Keypad meters<br>• Recharged one using scratch card | • Revenue collection and cash flow have improved.<br>• Customers became more aware of energy conservation methods. |

Sources: Esteves *et al*. (2016)

**Table 2.2: Benefits of Prepaid Metering System in Different Regions (continued)**

| Region | Country | Meter Technology | Benefits |
|---|---|---|---|
| Developed | United States | • Salt River Project: double part meters with smartcards<br>• Oklahoma Cooperative Program: advanced smart meters<br>• Detroit Edison Pilot Program: advanced smart meters | • Electricity consumption reduction<br>• Prepaid customers use 12% less electricity.<br>• Oklahoma consumes 9–11 percent less electricity.<br>• Customers gain control over their electricity usage.<br>• Conservation effect<br>• The utility saves money by reducing write-offs.<br>• Many customers find that prepayment helps them manage their electricity costs. |
| | Australia | • Smartcard meters and card board card with magnetic strip | • 14% of consumers are repaying debts<br>• Consumers learn to adjust their electricity expenses to their income level.<br>• High number of vending points<br>• Prepaid was well received by customers.<br>• There will be no more unexpectedly large bills. |
| | United Kingdom | • First ones were coin operated<br>• Magnetic cards<br>• Electronic key meters<br>• Keypad meters<br>• Smart card meter | • 14% of consumers are repaying debts<br>• Consumers learn to adjust their electricity expenses to their income level. |

Sources: Esteves *et al*. (2016)

## 2.4 Concept of Customer Satisfaction

Customer satisfaction is an essential metrics for evaluating a company's performance. For analysing a business's success, there is a strong relationship between customer retention and satisfaction (Farooqui and Alwi, 2019). The theory of customer satisfaction is transforming all sectors from centralized production toward customer-based production and it is also the driving force behind a company's ability to maintain an economical advantage (Tsai *et al*., 2011). It is also the most cost-effective and efficient means of market communication, which is critical to achieving business excellence (Dubrovski, 2001).

Homburg *et al*. (2006) defined satisfaction as a distinct type of attitude known as "evaluative cognition" in psychology. Oliver (2010) defined satisfaction as a consumer's judgment that "a product or service provides an enjoyable level of consumption related fulfilment." These definitions show two different aspects of the concept of satisfaction. First, satisfaction is defined as an attitude directed toward a specific evaluation target. This target is a product or service in the case of consumer satisfaction. Second, satisfaction is linked to the relative fulfilment of individual needs that a product or service is expected to meet (Schiebler, 2019). The customer's fulfilment response is a widely accepted definition of "satisfaction. In simple terms, satisfaction refers to a customer's judgment of a product or service in relation to how well it meets his or her needs or expectations. Failure to meet needs and expectations is assumed to result in unhappiness with the service or product (Karolina, 2013; Gitomer, 1998).

Consumer satisfaction is an important factor in a company's success. The customer is satisfied when the product quality meets their expectations and they believe the item is of high quality; on the other hand, if it does not meet their perceived quality parameters, they believe the item is of low quality (Farooqui, 2019). Customers who are satisfied complain less, speak more positively about the products they like, and are more likely to remain loyal customers (Pansari and Kumar, 2017; Szymanski and Hise, 2002). Many businesses strive to satisfy and retain their customers by providing high-quality products and services (Schiebler, 2019). Almost every company's profitability is influenced by customer satisfaction. As a result, organizations that want to thrive will recognize the significance of this concept and develop a functional and appropriate operational definition. In conclusion, it is customer satisfaction with the product and service in general that deserves special recognition, as this satisfaction has an impact on future purchasing and consumption decisions (Karolina, 2013).

Customers' satisfaction has evolved into a powerful tool for assessing organizational effectiveness and relevance all over the world. This explains why many countries have created Customer Satisfaction Indexes (CSI) to measure customer satisfaction such as the America Customers Satisfaction Index (ACSI), Swedish Customers Satisfaction Index (SCSI) and European Customers Satisfaction Index (ECSI). Such indexes are unlikely to exist in Nigeria, and if they do, they are unlikely to have gotten enough attention. Other government regulatory bodies in Nigeria such as the Standard Organization of Nigeria (SON), the Nigeria Communication Commission (NCC), and the Nigeria Electricity Regulatory Commission (NERC), among others, are expected to produce such indexes. Customer satisfaction is an important element that must be tracked and organized in the same way that any other physical asset is. Analysing customer satisfaction enables businesses to improve their sales and customer strength by implementing new skills and practices (Karolina, 2013).

### 2.4.1 Reliability

Power supply reliability is described as the means of meeting customers' electricity demand even when equipment breaks down without warning (Bateson, 1991). To be adopted, the prepaid electricity meter must be tangible, capable of providing timely service, reliable, and the DISCOs must be capable of counselling the user (Jun & Cai, 2001). It is an indicator of an electricity network's ability to tolerate unexpected losses in system components or sudden disruptions. Maintaining sufficient infrastructure to ensure that consumers receive a continuous power supply at the proper voltage level is also a reflection of reliability (Akaranga, 2014). Fast response to power outages is also part of reliability. However, ensuring a steady supply of electricity is a challenging task that necessitates the daily monitoring of large numbers of generators (Besterfield *et al*., 2010).

Electricity is reliable when it produces electrical output and also satisfies consumption during busy hours. On the other hand, since all power sources have flaws and benefits, DISCOs must have a variety of power sources to improve and enhance reliability. Due to storm exposure, the environment, the station of the generating plant, with the age of the distribution line, power reliability varies for different customers and the status of the facility. One of the significant difficulties encountered by the Nigerian Electricity Supply Industry (NESI) is lack of reliability of electricity supply. Owing to exposed wires and a failure to obey safety protocols, consumers often experience power surges and blackouts that destroy devices, and even electric shocks among workers and the general public. The reasons for the unreliability are aging infrastructure, under-utilization/insufficient generation, transmission grid outages and failures, high transmission losses, inefficient metering system/high loss of revenue (Etukudor *et al*., 2015).

Prepaid meter infrastructure; electrical disruptions; shortened time from request to implementation; reaction to customer complaints about power outages are all factors that influence the reliability of prepaid metering services (Wambua *et al*., 2017). Customer satisfaction is created by reliability because it allows for a trusting relationship. Customers are not exploited and feel well taken care of. This is particularly true because the meters' distributors use them in their own homes and recommend them to family and friends (Luo and Bhattacharya, 2006). Customer satisfaction can therefore be achieved if the individuals who install the product are more responsible for defects in their product. Despite the political and social dimension, the adoption of the pre-paid models can ensure continuous supply for lower costs (Mathenge, 2015).

### 2.4.2 Affordability

The electricity prepaid billing system was developed with the aim of offering affordable power to low income households and individuals (Carolyne *et al*., 2013; McKinze, 2013). In 2006, the Power Holding Company of Nigeria (PHCN) introduced a prepaid scheme in response to a challenging customer debt profile and revenue collection challenges (Carolyne, *et al*., 2013). This transition was thought to increase revenue collection. However, also in countries where prepaid electric billing was implemented with specific targets in mind, it has never been determined whether or not those goals were reached. The persistence usage of postpaid billing systems in places like South Africa twenty five years after their implementation may suggest potential barriers to prepaid meter adoption (Wambua *et al*., 2017). Chandler (2005) believes that the prepaid scheme brings both energy providers and customers mixed financial fortunes. Prepaid metering provides a clearer view of the value of electricity used, allowing for more control over energy use and budget management from the consumer's perspective. The device as a whole should be cost effective in order to enable large-scale implementation. Reduced utility maintenance costs, upfront cash collection, reduced consumer complaints, odd-hour complaints, and a lower meter failure rate can all contribute to the utility's economic viability. The device should be inexpensive and quick to set up, as well as scalable for out-of-area sales.

The cost of electricity, according to Stoner (2009), measures generation cost. Operating costs, government taxes, cost of fuelling, and service costs are also included. Any of these expenses are beyond the company's influence. As a result, managing the cost of energy within the firm is extremely challenging. Potential buyers have been turned off as a result, and the company's earnings have suffered as a result (Wambua *et al*., 2017).

### 2.4.3 Availability

The phrase "availability of supply" refers to making it simple for customers to receive the product or service that suits their needs. It is critical to ensure that a consumer is happy by making supply simple. Since the procurement process is more open and straightforward, this sense of readily available supply fosters confidence (Mathenge, 2015). Suppliers of all materials aim to get products to customers as quickly as possible before they change their minds and to avoid causing them irritation. Customers are less likely to appreciate the product as a result of this dissatisfaction, and as a result, they are dissatisfied (Oliver and DeSarbo, 1988).

According to Wambua *et al*., (2017), power utilities have been working hard to improve revenue collection efficiency in order to provide the best possible service to customers. Meter reading, bill planning, bill delivery, and payment processing consume a significant number of time and effort for the DISCOs. These can be avoided by the use of the prepaid metering system. Kwan and Moghavvemi (2012) highlighted that power is currently the single product that is billed after consumption; everything else is paid for before consumption. Utilities all over the world have accepted the new system due to demand side management, increased supply efficiency, and high customer satisfaction. The availability of this system is influenced by the metering service's accessibility to consumers; organization personnel are available at all times; and routine maintenance services are provided to customers. Customer service is always accessible; tokens are available whenever necessary with also reconnections carried out (Wambua *et al*., 2017).

### 2.4.4 Flexibility

Postpaid monthly use has been an issue for poor households, causing DISCOs to struggle with the provision of electricity on a long-term basis. Installing prepaid metering system, which offer customers with more control over when and how much they spend on electricity while still ensuring that DISCOs are paid for the electricity they supply, is one potential strategy for addressing this (Mwangi, 2017). Prepaid metering system work similarly to prepaid mobile phone plans in that customers can buy tokens at any time and quantity before using it. DISCOs may also be able to reclaim a larger portion of the money that is owed (Mathenge, 2015).

According to Wambua *et al*.(2017), prepaid system technology developers and inventors must consider how consumers view and respond to new technology elements, as well as how to best implement it to improve service quality and customer satisfaction. Understanding customers' intentions and identifying different factors that affect customers' attitudes will assist system administrators and managers in developing mechanisms to encourage more customers to embrace this new technology. Customers' ability to purchase tokens with relieve; prepare well for power usage; choices in token purchasing; do not require education and early notice to buy units all shaped the flexibility of prepaid metering services (Grandon *et al*., 2005).

## 2.5 Relationship Between Customer Satisfaction and the Prepaid Metering System

The implementation of this prepaid technology is a great means of ensuring customer satisfaction while also ensuring returns (Makanjuola *et al*., 2015). Numerous studies examining the perception of people on the prepaid metering system has recently increased. The majority of these researches are focused on developing countries. Mburu and Sathyamoorthi (2014) and Esteves *et al*. (2016) highlighted the role of collaboration,

politics, advertisement and media in changing customer perception and adoption of this system in countries like Botswana, Ethiopia, Nigeria, and South Africa. Despite the fact that technology criticism is no longer as prevalent as it was before, some homes and individuals still view this metering system as socioeconomically expensive and thus ignore them (Makonese *et al*., 2012). Rejection has a long history, but it still manifests itself in the form of violence and destruction. Nigeria is such a nation where homes are responding negatively to this technology and expressing displeasure with it. Makanjuola *et al*. (2015) attribute this to corruption, and the expensive expense of procuring the prepaid metering system. In other nations like Zambia it was found that 92% of homes are pleased with this metering system (Malama *et al*., 2014). Furthermore, Botswana homes are satisfied with this system, citing its convenience and ability to empower them in making good decisions (Mburu & Sathyamoorthi, 2014). In addition, Krishnamurti *et al*. (2012) discovered that a lot of homes in the United States were open to use a smart system. As a result, there appears to be an upsurge in studies assessing societal perceptions, willingness, and acceptance of the prepaid metering system.

In 2012, a study was conducted in Ghana to determine customers' perceptions and acceptability of the use of this metering system. Prepaid meter user friendliness, durability, access to vending points, user educational level, and rate of response to technical issues in the meter are among the major factors determining acceptability in that region, according to the study (John, 2012). As shown in a study on the management and performance of Kenya Power's prepaid electricity metering project, Kitengela had the highest customer satisfaction (74.2%), the highest prepayment service complaints (61%) in Tala and Gatundu branches, and the highest prepaid meter replacement (46% in Tala branch) (Kebeya, 2015). This demonstrates that consumer perceptions of technology, as well as the necessary improvements, differ by location. As a result, most manufacturers

assess their markets to see if their products are meeting expectations (Amehenrior, 2018). In line with this, a study also conducted in the South African province of KwaZulu-Natal to see if Conlog's (prepaid meter manufacturer) services and products meet people's expectations. Customer satisfaction in the electricity prepaid metering industry in the area was determined to be a result of the quality provided, as Conlog strives to understand and meet the needs of its customers (Mondli, 2016).

## 2.6 Empirical Studies on Prepaid Metering System and Customer Satisfaction

This section presents the empirical studies on matters related to prepaid metering system and customer satisfaction. The findings that have been selected for use are categorized into three main groups as follows:

### 2.6.1 Empirical studies in other regions of the world

Wagner and Wiegand (2018) studied Prepaid Metering (PPM): Household Experiences in Germany. The aim was to understand how prepaid users deal with this kind of billing system and what impact using a PPM has on electricity usage. Approximately half of the homes researched had been using this system less than 24 months; only 5 homes had been using it for more than 5 years. One of the study's main findings is that homes with this metering system has become more conscious of their budget and improved on their energy-saving behaviour. Despite the drawbacks, the study found that customers were extremely satisfied.

O'Sullivan *et al*. (2014) investigated the Impact the prepaid metering system use has on energy behaviour of homes. The study's purpose was to look into how this metering system facilitates budgeting, and if an alternative in-home display equipment, without it disconnecting itself, might be an improved budgeting aid for low earners. Using an interview-based qualitative method, the study concludes that better regulation of current

market-led prepaid billing systems could decrease drawbacks while capturing the potential benefits to users. In general, this study found that home owners are ready to engage with this system to have an improved understanding of their power consumption than postpaid and estimated billing provides. Better response may aid in the reduction of some pointless power consumption.

Akand (2018) conducted a study in Khulna City on the public's view of the Prepaid metering System. Customer perception of this meter was divided into two categories: the importance of prepaid billing system and the difficulties encountered when using prepaid meters. According to the study's findings, the majority of consumers are pleased with their prepaid meters and are willing to learn more about it. According to the findings, the following factors contribute to consumer dissatisfaction: prepaid meter vending station, mobile vending, technical feature, vending time, awareness program, fear of new technology, and support system. The study also recommended that the following steps be taken to overcome the challenges of prepaid meter usage: The awareness campaign can be organized using electronic media, leaflets, newspapers, social media, training programs, and so on. To improve organizational officials' skill and knowledge of this meters so that they can transfer the knowledge to users and motivate them; boost logistical support for the execution of the systems, such as building vending stations available in a suitable place; solving meter-related inconvenience, prompt reply from staffs, and so on.

Holmukhe (2016) studied the Major Challenges facing Customer Satisfaction in Indian DISCOs. Here, a literature review approach methodology was employed to investigate all genuine issues. The paper focuses on the issues concerning the quality of metropolitan homes level electricity distribution service provided by various DISCOs in India. Furthermore, it underlines the importance of service quality policies and plans to ensure

customers are satisfied. The distribution segment's main challenges are slowly improving governance and reducing losses to satisfactory least level. Additionally, removing deterioration, strengthening the speed of reforms, and escalating distribution sector investments are some of the major customer satisfaction concerns in the power industry.

Mahapatra and Golhar (2018) studied Customer Perception and Satisfaction of Shifting from Postpaid System to the Prepaid Billing System. The aim was to investigate how Pune residents perceived the city's prepaid meter system for electricity. The study's objectives are as follows: to investigate the consumer preferences for switching from postpaid to prepaid metering systems; to investigate the factors influencing the level of satisfaction of prepaid metering system consumers; and to investigate the perceived utility for prepaid meter among consumers and how satisfied they are in comparison to postpaid meters. In conclusion, consumers prefer the prepaid system over the postpaid system, according to the findings; consumers are satisfied with the prepaid meter system.

A study on Prepaid Electricity Plans and Electricity Consumption Behaviour was conducted by Qiu *et al.* (2017). The study employed a matching methodology and a difference-in-differences method to estimate empirically the impact of a prepaid metering system on residential power consumption. According to the findings, the system is associated with a twelve percent reduction in power usage; users who are low-earners prior to switching to the metering tend to save more power after shifting and prepaid users save more power in the summer than in the winter.

### 2.6.2 Empirical studies in Sub-Saharan African region

Wambua *et al.* (2017) conducted a study in Kenya as regards customer satisfaction and the prepaid billing system. The study's general objective was to determine the connection between the prepaid metering systems and customer satisfaction. A multiple regression

model was used for this study with different variables identified. The findings recognized a relationship between customer satisfaction and the prepaid billing system. The study established that the factors that influence prepaid billing system and customer satisfaction are: availability, reliability, costing, and flexibility. In conclusion, there was a weak positive relationship between prepaid billing system and customer satisfaction in Kenya.Also in Kenya, Mwangi and Mangusho (2017) conducted a study on Innovation Services and Customer Satisfaction. The research examined the impact of technological innovation on customer satisfaction. The study specially targeted Kenya power and lighting company (KPLC) customers and employees. Descriptive and inferential statistics were both used and the results showed that: the Prepaid billing system has a significant influence on customer satisfaction.

Mburu and Sathyamoorthi (2014) conducted their study in Botswana on User's Perception and the Organizational Role in Managing Change as related to shifting from postpaid to prepaid. The study looked at consumers' perceptions after Botswana Power Corporation (BPC) switched from a postpaid to prepaid electricity billing model, as well as different variables that measure customer satisfaction with DISCOs. The study also looked at users perceptions of how the BPC handled the change to see if general satisfaction had improved or diminished. Consumers have accepted the prepaid metering system, and they have acknowledged the benefits of prepaid systems. The positive view of this system necessitates that quality service is ensured, a great network, and regular meter checks are implemented to ensure it reaches its zenith. As a result, the study suggested that in the future, users be informed and modifications conveyed to them ahead of time to avoid any negative perceptions about the change. Making customers accept the adjustments more quickly as a result of this approach.

Simiyu (2010) conducted a research in Nairobi on the Factors that Influences the Adoption of the Prepaid Billing System. The study's objectives and research questions were to determine how and to what extent the following factors influenced the adoption of the new electricity prepayment metering system: access to or lack of access to information, level of education, economic status, the benefits of the prepayment metering system, and income levels. The researcher attempted to correlate these factors and determine how they influenced the consumer's adoption of the new technology using the Descriptive Survey design. The aim was also to assess the success of the prepayment project based on the number of residents who used the system during the pilot phase. According to the findings, access to information was the most important factor influencing adoption. Given the enlightenment, the project was deemed a success, with all respondents opting for the prepaid meter. According to the findings, the higher one's level of education, the better the reception to adoptability. Given that KPLC intends to implement this project throughout the country, literacy levels in the target community will be a major determinant of adoption. The third determinant was income level. The higher one's income, the better one could budget for their monthly electricity consumption. The fourth factor was the consumer's economic status. It was discovered that the more reliable the consumer's source of income, the higher the level of acceptability. Finally, while the benefits of prepaid meters were important in their acceptance, the disadvantages only served to slow down the entire process. The age factor was critical in the adoption process. According to the study, a sizable proportion of Nairobi residents prefer the electricity prepaid metering system over the postpaid metering system. However, because the country's population has not yet been depleted, more customers are likely to be brought on board with extensive marketing from the power utility - to raise awareness and disseminate information.

Kiangi (2015) conducted a study in Tanzania which was focused on the conventional billing system and satisfaction. According to the findings of the study, there exist two billing system. Furthermore, the study discovered that employees were responsible for reading meters. It was also discovered that, at times, meters were not read correctly, despite the fact that the majority of users were pleased with the meter interpretations. Tanzania Electric Supply Company (TANESCO) services were unsatisfactory to the majority of users, even though bills were paid on time. Furthermore, it was discovered that the main challenges of the conventional billing system were long distance travel to electric pay stations and customers spending a lot of time paying electric bills. According to the study, TANESCO should abandon its traditional billing system of electricity in order to invest more in prepaid systems. Both TANESCO and customers must be involved in order to sustain the correctness of meter readings. Furthermore, price of energy should be cheap, particularly for homes, to discourage them from using alternative means, which are not only bad for their health but also bad for the economy.

Quayson-Dadzie (2012) conducted a study in Ghana on user's awareness and tolerability of the use of prepaid billing systems. One of the study's major findings is that users consider a number of variables before accepting the meter for usage, including the prepaid meter's user friendliness, durability, and access to payment stations. As a result, to boost customer approval of the use of this metering system, management should consider enhancing the durability and accessibility of meter payment stations.

### 2.6.3 Empirical Studies in Nigeria

Amhenrior (2018) conducted a study in Benin City and Warri on the Prepaid Users Experiences and Expected Adjustments on Current Meters. The findings of the study revealed that users of prepaid meters want their meters to do more for them, particularly

in terms of being able to recharge and communicate with their meters wirelessly via mobile phones, as opposed to the existing manual methods of recharging and obtaining information from the meters. Respondents, in particular, want to have value-added services such as wireless token recharge into meters via mobile phones; wireless information sourcing from meters such as unit balance, time of power failure and restoration, and so on. The research findings also revealed that the level of education of prepaid meter users was a major determinant of the acceptability of suggested device improvements. It is therefore critical that a deliberate education campaign on the value and benefits of having the meter improved to perform more efficiently, particularly in the area of communication, be launched for users of prepayment meters and those planning to migrate to the prepaid metering system. This will also help with meter usage. In conclusion, prepaid meter designers and engineers now have a guide on the areas that require improvement, particularly from the standpoint of consumers, in order to advance the measuring device for better performance.

Muazu *et al.* (2019) conducted a study in Lokoja on the Availability of Prepaid Metering System and Utilization in Abuja Electricity Distribution Company (AEDC). Six research questions and six hypotheses were developed to guide the study in order to obtain the relevant information. According to the study, the level of availability of these meters was fair. This indicates that prepaid meters are not widely available to consumers. It was also discovered that consumers are very pleased with the extended suitability of using prepaid meters. The researcher suggested that the government implement policies to encourage local meter manufacturers to be more industrious, which will boost accessibility. Proper regulation of the tariff charge on the prepaid meter should also be implemented in order to increase its utilization. Consumers have to be educated on the prepaid metering system as well as their benefits over others

Odunlami and Sokefun (2018) conducted a study in Lagos State on Service Delivery and Customer Satisfaction. The study investigated the relationship between electricity service delivery and customer satisfaction among electricity consumers in Lagos State, Nigeria. The study used a survey research design. This study employed the convenience sampling technique. According to the study, service quality has a significant relationship with customer satisfaction. Price had a significant impact on customer satisfaction. Customer satisfaction had no significant relationship with customer service. The study concluded that service quality entices customers to buy products and services and to return for more. Companies that set fair prices will expand their market coverage and generate more sales by retaining existing customers and attracting the attention of competitors' customers to their products and services. Dealing with customer complaints and suggestions does not guarantee customer satisfaction or increased customer patronage for a business. The study recommended, among other things, that electricity distribution companies generate more megawatts in order to provide consistent power supply to their numerous customers, as well as adequate facilities such as transformers, switch boxes, switch gears, wire cables, meters, and circuit breakers in order to supply regular electricity to their customers.

Makanjuola *et al*. (2015) carried out a study in Lagos by investigating the challenges of the prepaid metering systems. Some of the recognized challenges include the lack of payment infrastructure, the cost to acquire the device, and delays in delivery of the device. The obtained results allowed the study to make broad recommendations that are deemed best for the successful performance of the device. These include high-quality meters, continuous power supply, automation of the device, nationwide implementation, and constant training for staff and officials.

Arimoro *et al.* (2019) examined the electricity billing systems in commercial buildings in Lagos. This study focuses on the electricity billing system at the Association of Housing Corporations (AHCN) Tower in Ikeja, Lagos State, with the aim of developing an efficient electricity billing system for use in the facilities management of multi-tenanted buildings. The study's relevant data were gathered through an interview with the stakeholders responsible for the property's management and the occupants. The findings revealed that the implementation of automated prepaid meters reduces the difficulties encountered in the manual system when allocating electricity bills among tenants. According to the study, because information technology is now global, stakeholders in the facility management practice should collaborate to secure an application program that will serve for commercial building management.

## 2.7 Theoretical Framework: Theories on Provision of Services and Customer Satisfaction

Any management theory's idea is to devise a plan that will improve product excellence and, as a result, increase the firm's profit rating through consumer repurchase and brand trustworthiness (Usman, 2013). This is why Naumann *et al* (2001) recognized Consumer Satisfaction as one of the key techniques used by businesses to carve out a place in the market. The relationship between disconfirmation and satisfaction has been explained using a variety of theoretical techniques, including the ones listed below.

### 2.7.1 Expectancy disconfirmation theory (EDT)

Based on the inadequacies of the early theories, Oliver (1977; 1980) presented the Expectancy-Disconfirmation Paradigm as the most viable theoretical structure for gauging customer satisfaction (Dissonance and Contrast theory). According to the paradigm, consumers purchase goods and services with pre-purchase anticipation about how effectively they will perform. The level of expectation then becomes a benchmark

against which the product is measured. That is, after the product or service has been used, the results are compared to what was expected (Wambua *et al*., 2017). A consumer is either satisfied or unsatisfied as a result of a positive or negative divergence between expectations and perceptions. When service expectations are exceeded, there is a positive disconfirmation between expectations and performance, resulting to satisfaction, however when service performance is as planned, expectations and perceptions are validated, leading to satisfaction. When a service fails to meet a customer's expectations, a negative disconfirmation among expectations and perceptions emerges, leading to dissatisfaction (Yuksel and Yuksel, 2008).

The Expectancy Disconfirmation Theory underpins customer satisfaction with Nigeria's prepaid metering system. Customers had high expectations for the prepaid metering system's performance before they bought it. Expectations, performance, disconfirmation, and satisfaction are the four main constructs in the model. Some people find out that the prepaid meter exceeds their expectations (positive confirmation), allowing them to budget wisely and control their electricity consumption, resulting in post-purchase satisfaction. However, for the vast majority, the prepaid meter falls short of their expectations (negative disconfirmation); the findings revealed a high cost of meter acquisition; users want their meters to do more for them, particularly in terms of being able to recharge and communicate with their meters wirelessly via mobile phones, rather than the existing manual means of recharging and obtaining information from their meters; and users want their meters to do more for them.

Despite the fact that EDT has been widely used to study consumer satisfaction, post-purchase behaviour, and service in general, it has been noted that it has several limitations. Among the major criticisms of this approach are the use of expectations as a comparison

standard in measuring customer satisfaction, the dynamic nature of expectations and the timing of their measurement, the meaning of expectations to respondents, the use of difference scores in assessing satisfaction, and the reliability and validity of the EDT in predicting customer satisfaction. One of the challenges with the EDT is the model's suggested sequence, which assumes that everybody has clear expectations before the service experience. It is self-evident that there can be no dis/confirmation of expectations without these prior expectations (Halstead *et al*., 1994).

### 2.7.2 Value-percept disparity theory

The value-percept disparity theory was originally formulated by Locke (1967; 1969). According to this theory, satisfaction/dissatisfaction is an emotional response triggered by a cognitive-evaluative process in which one's values (or needs, wants, desires) are compared to one's impressions of (or thoughts about) a certain thing, action, or circumstance (Westbrook and Reily, 1983). It expressly recognizes that customers have personal values and perceive those values in services. The smaller the gap between one's perception of service values and one's own values, the more favourable the evaluation becomes, resulting in increased satisfaction (Bloemer and Dekker, 2003). The greater the value-percept disparity, the less favourable the evaluation, the less positive effect generation, and the greater the generation of negative affect associated with goal frustration, i.e., dissatisfaction. In other words, customers are looking for confirmation of their expectations on service attributes rather than attainment of values. As a result, it is argued that consumers' perceptions of items, institutions, and market behaviours are simply compared to how well they fulfil their values, rather than the confirmation of their expectations, because consumers want the attainment of values.

Westbrook and Reilly (1983) conducted an empirical study that found that value percept disparity has a positive impact on satisfaction. However, they failed to show that the value percept disparity model outperforms the disconfirmation model. Because neither the expectation-disconfirmation model nor the value percept model was sufficient on their own, they claimed that both components (expectations and values) are required to explain customer happiness. Recent research on the potential of value and expectations to predict satisfaction suggests that it may be better to incorporate wishes and expectations into a single framework, as they both affect consumer pleasure (Spreng *et al*., 1996; Bloemer and Dekker, 2003).

### 2.7.3 Cognitive dissonance theory

The original theory of cognitive dissonance was developed by Leon Festinger in the mid-1950s, and the first formal and comprehensive presentation of the theory was published in 1957. When an individual possesses two or more elements of knowledge that are related but incompatible with one another, Festinger theorized, a state of discomfort is created (Harmon-Jones and Harmon-Jones, 2007). According to the cognitive dissonance theory, people have a motivating urge to eliminate cognitive dissonance by modifying their attitudes, views, and actions, or justifying or reasoning those (Wambua *et al*., 2017). Consumer behaviour research has quickly embraced the concept of cognitive dissonance. Cognitive dissonance exhibited excellent exploratory power when it comes to explaining the state of discomfort purchasers often experience after making a purchase. Customer satisfaction in power supply (in the use of prepaid metering system) is also based on the cognitive dissonance theory, according to Wambua *et al*., 2017. Customers had high expectations for the effectiveness of the prepaid metering system, according to the theory, because they believed it would be less expensive than the prior metering method.

# CHAPTER THREE

# 3.0 RESEARCH METHODOLOGY

## 3.1 Target Population

The study's target population is made up of prepaid meter users of AEDC in Minna, Niger State. This comprises of those who are using or interacting with the prepaid electricity meters. According to AEDC, the total number of prepaid meter users in Minna as at April 2021 was 21,734.Minna was preferred since it is an urban area where the majority of residents in Niger State use the prepaid metering system and is home to people from various social and economic backgrounds. Residents of urban centers are far more educated, and thus know what is expected from the DISCO, which is why prepaid electricity meters have become prevalent.

## 3.2 Sampling Technique and Sample Size

Random sampling is a method of selecting participants from a population in which each participant has an equal probability of being selected and the choice of one does not affect the choice of others. The study's respondents were chosen using a random sampling technique, with each prepaid meter user having an equal chance of being chosen.

The sample size refers to the number of participants chosen from the population to be representative of the whole (Saunders *et al*., 2014), In order to determine the sample size, the Slovin sampling method was used. The formula is written as follows:

$$n = \frac{N}{1+N(e^2)} \qquad \textit{(Equation 3.1)}$$

Where n = sample size;

N = sample frame;

e = margin of error/confidence level.

$$n = \frac{21734}{1+21734(0.05^2)} = 393$$

From the above result, 393 respondents were selected for the study.

### 3.3 Methods of Data Collection

The primary data collection method, which involves the use of a questionnaire, was used for the purpose of this study. Structured multiple choice questions and descriptive statements were used in the questionnaire and questions were asked on the demographic information and socio-economic characteristics of the respondents, the relevance of prepaid meters over postpaid meters, and its effect on customer satisfaction.

The questionnaire was divided into five sections. The first section is made up of the socio-demographic characteristics (their; gender, age, educational qualification, marital status, household size, primary occupation, household income, years of meter usage, types of apartment and mode of payment). The second section includes question relating to the reliability, affordability, availability and flexibility of the prepaid metering system. The third section includes questions on the relevance of the prepaid metering system over the postpaid metering system. The fourth section comprises of questions on the challenges faced by users of the prepaid metering system. The fifth section is made up of question on the level of customer satisfaction with respect to the prepaid metering system. Variables were adopted from existing literature and respondents rated them on a 5-point Likert scale of (Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree) and (Strong (Highly Dissatisfied, Dissatisfied, Neutral, Satisfied, Highly Satisfied). Finally,

the respondents were asked to recommend measures to improve the prepaid metering system.

### 3.4 Reliability of the Instrument

Reliability is defined as the degree to which a research instrument produces consistent results after repeated tests when used multiple times. It also refers to a situation in which a study's findings may be replicated using similar methods (Mugenda and Mugenda, 1999). The Cronbach's alpha coefficient was calculated on the collected data to verify the reliability of the scale. The purpose of Cronbach's alpha is to test the reliability of the instruments employed in the study. It tests the internal consistency of the scale. The instrument is regarded reliable if the alpha value is .70 or greater. The reliability statistics is presented in Table 3.1

**Table 3.1: Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| 0.708 | 5 |

The result is a reflection that the instrument is reliable since the Cronbach's Alpha is above 0.7.

### 3.5 Methods of Data Analysis

Data analysis is concerned with discovering underlying structures, eliminating critical variables, identifying outliers, and testing any theoretical underpinnings. Both descriptive and inferential statistics was used in this study. The data was summarized, organized, and simplified using descriptive statistics such as frequencies. Quantitative data was presented in the form of percentages, mean, standard deviation and frequency tables. The data for this study was edited, coded, and descriptively analysed in Microsoft Excel and the Statistical Package for Social Sciences (SPSS) software.

In determining the effect of Prepaid Metering System on Customer Satisfaction in Minna, Niger State as specified in the first objective of the study, the study adopted the multiple regression model used by Wambua *et al.* (2017). Multiple regression is a technique for explaining a more complex and dynamic relationship between one dependent variable and multiple independent variables. It seeks to predict a single dependent variable from a collection of independent variables. The components of metering system adoption include Reliability, Affordability, Availability and Flexibility, resulting into the given equation:

$$CS = f(REL, AFF, AVA, FLE) \qquad \textit{(Equation 3.2)}$$

Transforming into a multiple regression model

$$CS = \beta_0 + \beta_1 REL + \beta_2 AFF + \beta_3 AVA + \beta_4 FLE + \varepsilon \qquad \textit{(Equation 3.3)}$$

Where: CS = Customer Satisfaction

$B_0$ = Constant

$\beta_1 – \beta_4$ = Regression Coefficients

REL = Reliability

AFF = Affordability

AVA = Availability

FLE = Flexibility

$\varepsilon$ = Stochastic Disturbance Error Term

The Pearson's correlation was also used in inferential statistics (because the samples were normally distributed) to investigate the relationship between the Prepaid Metering System and Customer Satisfaction. Five variables were tested (Reliability, Affordability, Availability, Flexibility and Customer Satisfaction) and the significance level for all correlation coefficients was set at 0.05 (2-tailed). Pearson's correlation coefficients, which range from -1 to +1, indicate whether there is a positive or negative correlation and thus provide an absolute value that indicates the strength of the relationship. A range of 0.50

to 1.00 was considered strong, 0.30 to 0.49 was considered moderate, and less than 0.30 was considered weak when measuring the strength of a relationship between variables.

# CHAPTER FOUR

## 4.0 RESULTS AND DISCUSSION

### 4.1 Response Rate

The response rate is presented in Table 4.1

**Table 4.1: Questionnaire Response Rate**

| Response Rate | Frequency | Percentage (%) |
|---|---|---|
| Response | 344 | 87.5 |
| Spoilt/Not returned | 49 | 12.5 |
| Total | 393 | 100 |

From the results, out of 393 questionnaires administered, 344 were filled out correctly and collected, yielding a response rate of 87.5%. According to Idrus and Newman (2002), in research a response rate of 50% and over is adequate. The high response rate of 87.5% indicates that respondents are willing to take part in the project while the remaining 49 questionnaires were either incomplete or not returned and as a result was disqualified.

### 4.2 Descriptive Statistics of Respondents' Socio-Demographic Characteristics

The socio-demographic parameters considered in this study are gender, age, educational level, marital status, household size, primary occupation, average household income, years of prepaid meter usage, place of usage, type of residence and mode of payment.

The gender of prepaid meter users is presented in Figure 4.1

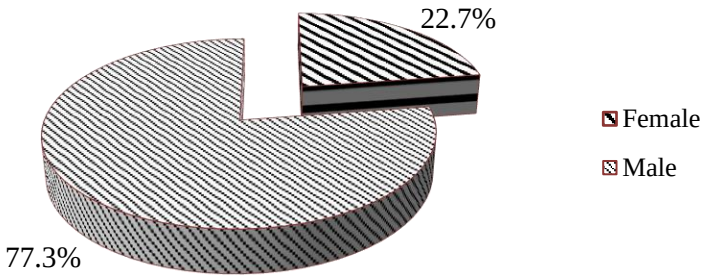


**Figure 4.1**: Gender of Prepaid Meter Users

The study discovered that males account for 77.3% (266) of the 344 prepaid meter users, while females account for the remaining 22.7%. This reveals that there are more male household head using the prepaid metering system than females and also, most men are responsible for paying the bills hence dominate this distribution.

The age of prepaid meter users is represented in Figure 4.2.

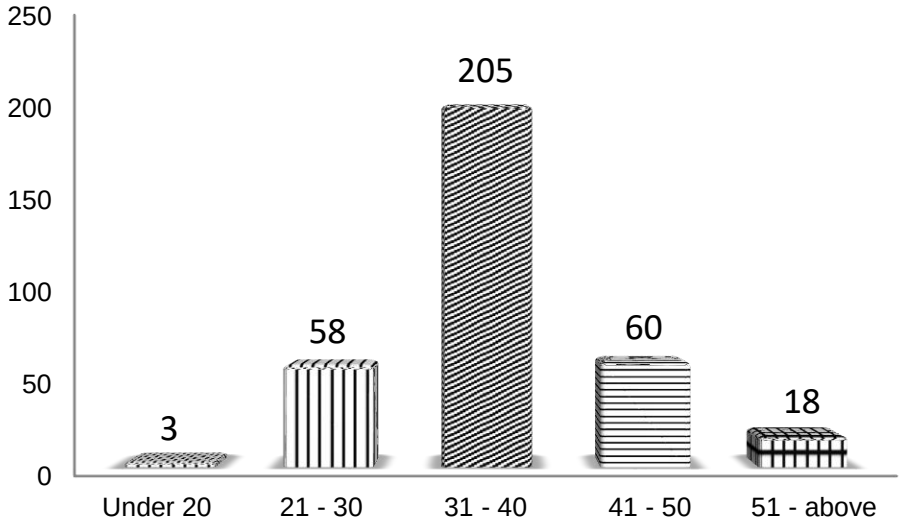


**Figure 4.2**: Ages of Prepaid Meter Users

The users were divided into four categories based on their age: under 20, 21–30, 31–40, 41–50, and 51 – above years. The study as represented in figure 4.2 indicated that the majority of users (59.6%) are between the ages of 31 to 40 years. Users between the ages of 41 and 50 years, as well as those between the ages of 21 and 30 years, account for 17.4% and 16.7% respectively. Users aged 51 years and above, as well as those under the age of 20 years had the lowest representation with 5.2% and 0.9% respectively. This implies that the usage of prepaid meters is more prevalent among the youths and adults.

The educational level of prepaid meter users is presented in Figure 4.3

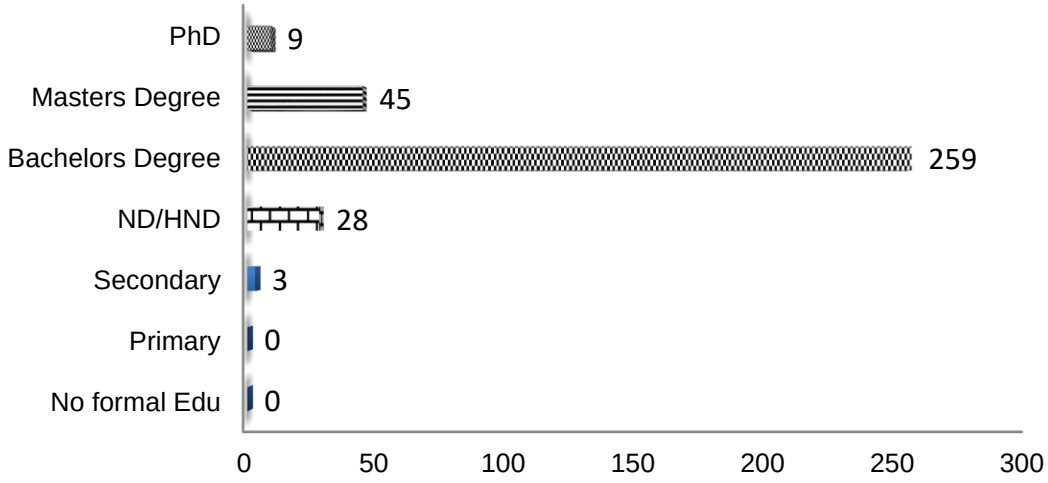


**Figure 4.3**: Educational Level of Prepaid Meter Users

The study inquired on the level of education of these prepaid meter users in order to determine their literacy level. According to findings, 9 users have a PhD, 45 have a Master's degree, with a rate of 75.3%, 259 of them have a bachelor's degree, making up the largest group, 28 have an ND/HND, and 3 have completed secondary school. This revealed that a large number of prepaid meter users had a higher level of education than the average secondary school student.

The marital status of prepaid meter users is presented in Figure 4.4

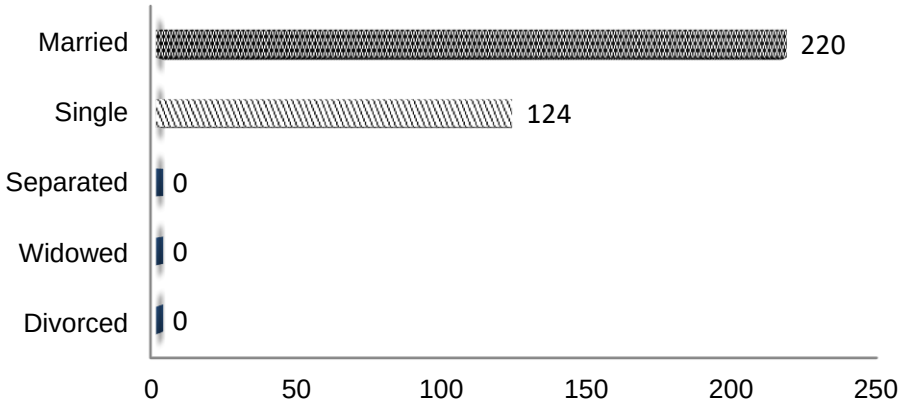


**Figure 4.4**: Marital Statuses of Prepaid Meter Users

It reveals that 124 are single, accounting for 36% of all users, while 220 are married, accounting for 64% of all users.

The household sizes of prepaid meter users is presented in Figure 4.5

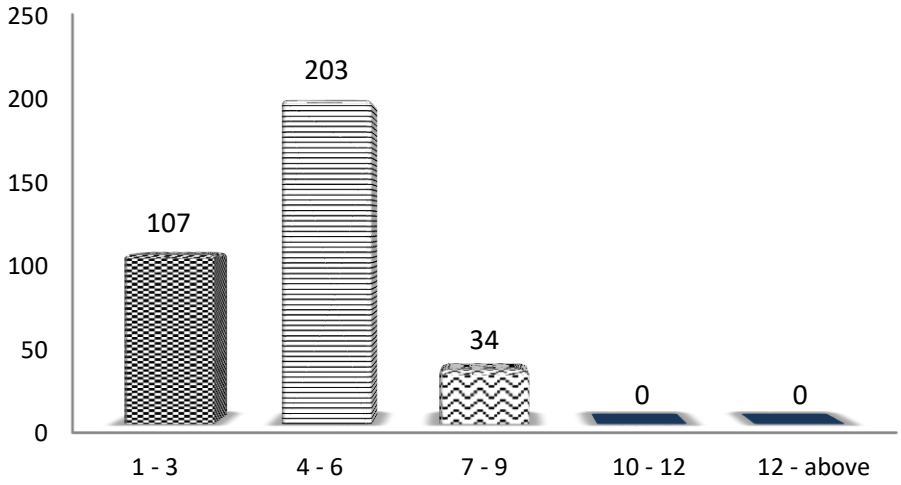


**Figure 4.5**: Household Sizes of Prepaid Meter Users

The users were divided into four categories based on their household size: 1 – 3, 4 – 6, 7 – 9, 10 – 12, and 12 – above. The study result revealed that the majority of the household sizes (59%) are between 4 and 6. Household sizes between 1 and 3, as well as those between 7 and 9, account for 31.1% and 9.9% respectively.

The primary occupation of prepaid meter users is presented in Figure 4.6

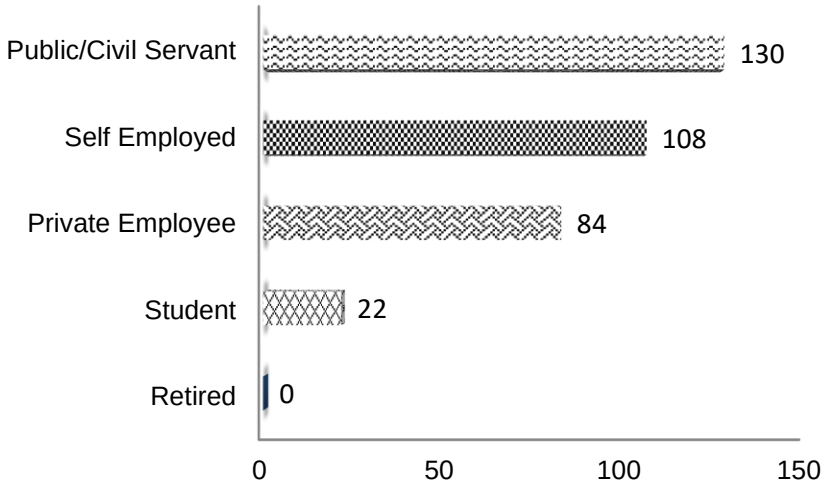


**Figure 4.6**: Primary Occupations of Prepaid Meter Users

Furthermore, the study inquired on the primary occupation of prepaid meter users in order to determine their economic status. The majority of users (37.8%) were employed by the public/civil service, and they were closely followed by those who were self-employed

(31.4%), private sector employees (24.4%), and students (6.4%). This trend showed that those employed in the public/civil service preferred prepaid electricity.

The household income of prepaid meter users is represented in Figure 4.7.

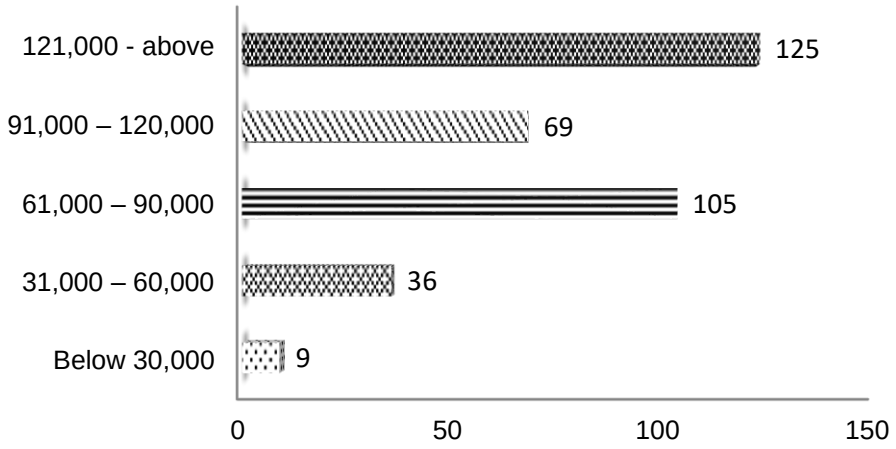


**Figure 4.7**: Household Incomes of Prepaid Meter Users

The users were divided into four categories based on their income: Below ₦30000, ₦31000 – ₦60000, ₦61000 – ₦90000, ₦91000 – ₦120000, ₦121000 – above. This study revealed that 36.3% (which constitute the highest percentage) earn ₦121000 or more while 30.5% earn between ₦61000 and ₦90000 followed by 20.1% who earn between ₦91000 to ₦120000. 10.5% and 2.6% earn between ₦31000 to ₦60000 and less than ₦30000 respectively.

The years of prepaid meter usage is represented in Figure 4.8.

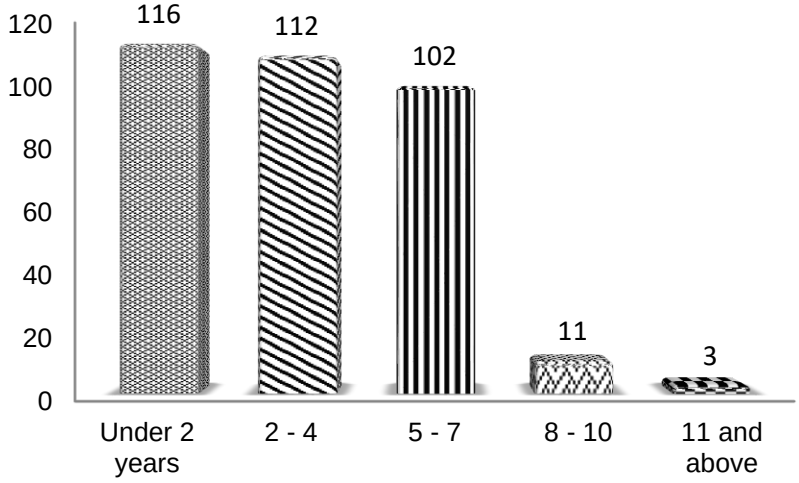


**Figure 4.8**: Years of Prepaid Meter Usage

The study revealed that 116 of the users representing 33.7% have been using prepaid meter for less than 2 years, 112 of them with a percentage of 32.6% are between 2 and 4 years, 102 of them representing 29.7% are between 5 to 7 years while 3.2% and 0.9% have been using them for 8 to 10 years and 11 years and above respectively.

The purpose of using prepaid meter is represented in Figure 4.9.

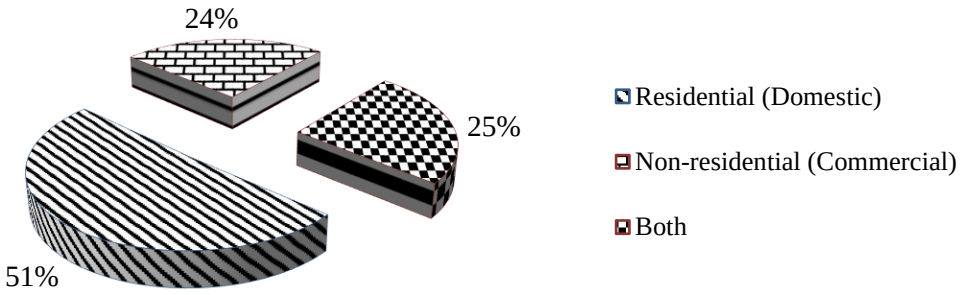


**Figure 4.9**: Purpose of Prepaid Meter Usage

According to the findings, 51% (which constitute the highest percentage) of prepaid meter users use it for residential purposes, 24% for commercial purposes, and the other 25% are using it for both domestic and commercial purposes.

The type of apartment where Prepaid Meter is used is presented in Figure 4.10.

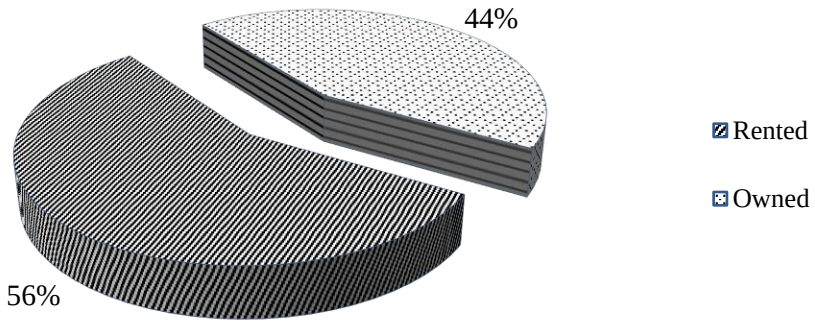


**Figure 4.10**: Type of Apartment

According to the findings, 56% of the 393 prepaid meter users live in their own home, while 44% live in a rented apartment.

The Rate of Prepaid Meter Usage is presented in Figure 4.11

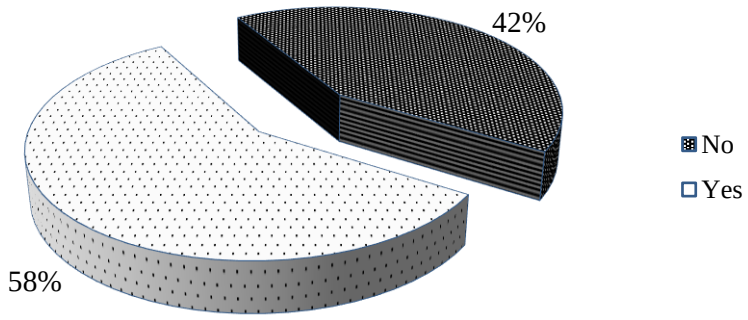


**Figure 4.11**: Rate of Prepaid Meter Usage

In order to determine whether respondents use the prepaid meter alone or share it with their neighbours, it was found that 145 of the prepaid meter users claimed that they are not using the prepaid meter alone, but instead share it with others. While the remaining 199 use it alone.

The Mode of Payment is presented in Figure 4.12.

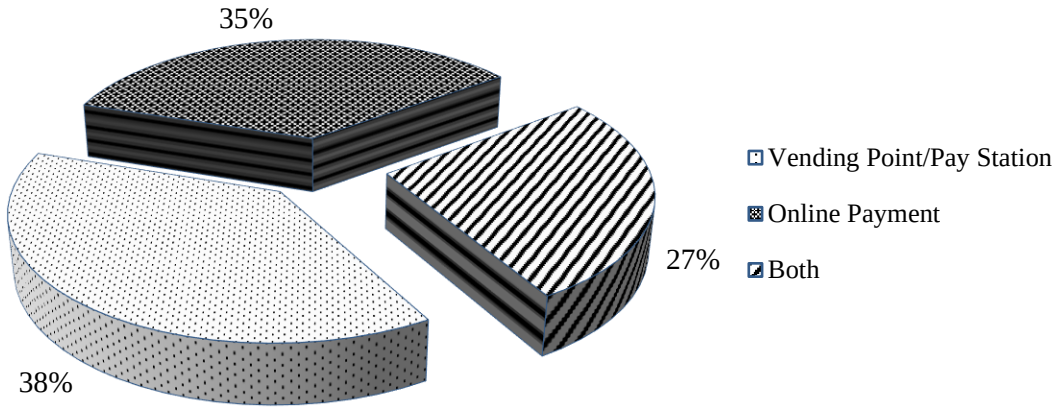


**Figure 4.12**: Mode of Payment

This revealed that 38% of the users pay through the vending point/pay station while 27% of them through the online channels/system, and the remaining 35% use both the vending point/pay station and the online system as their mode of payment.

## 4.3 Descriptive Statistics of the Relevance, Challenges and Customer Satisfaction of the Prepaid Metering System

The Mean Interpretation of the Responses is presented in Table 4.2.

**Table 4.2: Mean Interpretations of Responses**

| Responses | Mean Interval |
|---|---|
| Strongly Disagree | 1.00 – 1.80 |
| Disagree | 1.81 – 2.60 |
| Undecided | 2.61 – 3.40 |
| Agree | 3.41 – 4.20 |
| Strongly Agree | 4.21 – 5.00 |

The mean interval is divided into each level of agreement or disagreement, with 1.00–1.80 indicating strongly disagree, 1.81–2.60 indicating disagree, 2.61–3.40 indicating undecided, 3.41–4.20 Agree, and 4.21–5.00 indicating strongly agree

The benefit of the prepaid system over the postpaid system is presented in Table 4.3. The result shows that the most prevalent benefit of the prepaid metering system over the postpaid metering system to the users are: 'no disconnection', 'no reconnection fee', 'no accumulated debt', 'careful with electricity usage' and 'no hazard of billing process' with a mean value of 4.50, 4.49, 4.45, 4.42 and 4.38 respectively.

**Table 4.3: Benefits of Prepaid Metering System over the Postpaid Metering System**

| Factors | S-Disagree | Disagree | Neutral | Agree | S-Agree | Mean | S.D |
|---|---|---|---|---|---|---|---|
| | Freq (%) | Freq (%) | Freq (%) | Freq (%) | Freq (%) | | |
| I am now careful with my usage of electricity | 0 (0%) | 2 (0.6%) | 9 (2.6%) | 177 (51.5%) | 156 (45.3%) | 4.42 | 0.575 |
| I am conscious of how much I spend in a month | 0 (0%) | 2 (0.6%) | 26 (7.6%) | 178 (51.7%) | 138 (40.1%) | 4.31 | 0.635 |
| No more meter readers | 4 (1.2%) | 4 (1.2%) | 23 (6.7%) | 167 (48.5%) | 146 (42.4%) | 4.30 | 0.745 |
| No accumulated debt | 2 (0.6%) | 5 (1.5%) | 5 (1.5%) | 156 (45.3%) | 176 (51.2%) | 4.45 | 0.659 |
| No struggle for bill | 0 (0%) | 5 (1.5%) | 39 (11.3%) | 162 (47.1%) | 138 (40.1%) | 4.26 | 0.712 |
| I pay less since I started using the prepaid meter | 16 (4.7%) | 87 (25.3%) | 74 (21.5%) | 67 (19.5%) | 100 (29.1%) | 3.43 | 1.271 |
| No need to pay any money when meter is not used | 7 (2.0%) | 12 (3.5%) | 19 (5.5%) | 159 (46.2%) | 147 (42.7%) | 4.24 | 0.866 |
| No hazard of billing process | 1 (0.3%) | 7 (2.0%) | 24 (7.0%) | 140 (40.7) | 172 (50%) | 4.38 | 0.731 |
| No disconnection | 2 (0.6%) | 3 (0.9%) | 7 (2.0%) | 141 (41%) | 191 (55.5%) | 4.50 | 0.643 |
| No need to pay reconnection fee | 2 (0.6%) | 3 (0.9%) | 9 (2.6%) | 140 (40.7%) | 190 (55.2%) | 4.49 | 0.652 |

To examine the benefits of the prepaid meters over the postpaid meters, customers were further asked if they prefer prepaid meters more than the postpaid meters. The findings as shown in Table 4.4 indicated that the majority of users (82.8%) indicate that the prepaid metering system is more beneficial than the postpaid system.

**Table 4.4: Users' Preference of Prepaid Meters over Postpaid Meters**

| Responses | Frequency (N) | Percent (%) |
|---|---|---|
| Yes | 285 | 82.8 |
| No | 36 | 10.5 |
| I don't know | 23 | 6.7 |
| Total | 344 | 100.0 |

The factors determining customer satisfaction with prepaid meter are presented in Table 4.5.

**Table 4.5: Customer Satisfaction with Prepaid Meter Usage**

| Factors | Mean | % | S.D | Remark |
|---|---|---|---|---|
| I am satisfied because it is efficient and not easily damaged. | 4.38 | 87.56 | 0.645 | High Satisfaction |
| It is easy to buy prepaid credit (tokens/units). | 4.33 | 86.69 | 0.667 | High Satisfaction |
| I am satisfied with the billing system. | 2.55 | 51.05 | 1.225 | Low Satisfaction |
| I am satisfied with the mode of payment. | 4.31 | 86.28 | 0.712 | High Satisfaction |
| I am satisfied because there is no accumulated debt. | 4.42 | 88.43 | 0.700 | High Satisfaction |
| I am satisfied because I can monitor my consumption. | 4.39 | 87.85 | 0.724 | High Satisfaction |
| I am satisfied because I am not charged when there is power outage. | 4.40 | 87.97 | 0.725 | High Satisfaction |
| I am satisfied with paying upfront before use. | 3.99 | 79.59 | 0.924 | High Satisfaction |
| I am satisfied with the response anytime I encounter challenge. | 2.68 | 53.60 | 1.102 | Low Satisfaction |
| I am satisfied with the privacy I enjoyed as a result of no meter readers. | 4.42 | 88.43 | 0.643 | High Satisfaction |

To assess the level of customer satisfaction among prepaid meter users, the responses were divided into two categories according to the mean score: Low Satisfaction and High Satisfaction. The result implies that factors with a mean value greater than (or equal to) 3.99 show high satisfaction while factors with a mean value lesser than 3.99 show low satisfaction.

The challenges faced by prepaid meter users are presented in Table 4.6

**Table 4.6: Challenges faced by Prepaid Meter Users**

| Factors | S-Disagree Freq (%) | Disagree Freq (%) | Neutral Freq (%) | Agree Freq (%) | S-Agree Freq (%) | Mean | S.D |
|---|---|---|---|---|---|---|---|
| I am used to the postpaid meter. | 165 (48%) | 157 (45.6%) | 10 (2.95) | 6 (1.7%) | 6 (1.75) | 1.64 | 0.778 |
| Expensive to acquire the prepaid meter. | 9 (2.6%) | 9 (2.6%) | 21 (6.1%) | 141 (41%) | 164 (47.7%) | 4.28 | 0.894 |
| Delay in receiving and installation of prepaid meters. | 2 (0.6%) | 5 (1.55) | 11 (3.2%) | 143 (41.6%) | 183 (53.2%) | 4.45 | 0.686 |
| It is an extra economical pressure to me. | 84 (24.4%) | 76 (22.1%) | 82 (23.85) | 90 (26.25) | 12 (3.5%) | 2.62 | 1.208 |
| Misunderstanding when using in groups. | 11 (3.2%) | 11 (3.2%) | 27 (7.8%) | 144 (41.9%) | 151 (43.9%) | 4.20 | 0.946 |
| Limited use of electrical appliances. | 3 (0.9%) | 13 (3.8%) | 92 (26.7%) | 119 (34.6%) | 117 (34%) | 3.97 | 0.916 |
| Need to restrict children and visitors on use of lights and heating. | 3 (0.9%) | 8 (2.3%) | 91 (26.5%) | 115 (33.4%) | 127 (36.9%) | 4.03 | 0.898 |
| Tokens (Units) purchased get finished quickly. | 5 (1.5%) | 16 (4.7%) | 36 (10.5%) | 142 (41.3%) | 145 (42.2%) | 4.18 | 0.902 |
| Limited vending point | 16 (4.7%) | 16 (4.7%) | 101 (29.4%) | 103 (29.95) | 108 (31.45) | 3.79 | 1.082 |
| No training and awareness program. | 5 (1.5%) | 15 (14.4%) | 86 (25%) | 115 (33.4%) | 123 (35.8%) | 3.98 | 0.957 |

The findings show that the most prevalent challenges faced by prepaid meter users are: 'Delay in Receiving and Installation of Meters', 'Expensive to Acquire the Prepaid Meter', 'Misunderstanding When Using in Groups' 'Tokens Finishes Quickly' and "the need to restrict children and visitors on use of lights and heating" with a mean value of 4.45, 4.28, 4.20, 4.18 and 4.03 respectively.

## 4.4 Inferential Analysis

### 4.4.1 Result of correlation analysis between customer satisfaction and the prepaid metering system

The parametric statistic method is used since the collected samples are normally distributed. The Pearson's correlation is used in this section to investigate the relationship between Customer Satisfaction and the Prepaid Metering System. The result of the correlations between the Customer Satisfaction and Prepaid Metering System are presented in Table 4.7

**Table 4.7: Correlation between Customer Satisfaction and Prepaid Metering System**

| Predictor Variables | | Customer Satisfaction | Reliability | Affordability | Availability | Flexibility |
|---|---|---|---|---|---|---|
| Customer Satisfaction | Pearson Correlation | 1 | | | | |
| | Sig. | | | | | |
| Reliability | Pearson Correlation | .332** | 1 | | | |
| | Sig. | .000 | | | | |
| Affordability | Pearson Correlation | .454** | .460** | 1 | | |
| | Sig. | .000 | .000 | | | |
| Availability | Pearson Correlation | .318** | .352** | .265** | 1 | |
| | Sig. | .000 | .000 | .000 | | |
| Flexibility | Pearson Correlation | .355** | .302** | .265** | .220** | 1 |
| | Sig. | .000 | .000 | .000 | .000 | |

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

Here, Reliability and Customer Satisfaction have a significant, moderate, and positive relationship. ($r = .332$, $p < .01$). This indicates that the higher the reliability of the prepaid metering system, the higher the customer satisfaction. For Affordability, there is a significant, moderate and positive relationship between Affordability and Customer Satisfaction ($r = .454$, $p < .01$). This correlation indicates that the more affordable the

prepaid metering system, the more satisfied customers are. For Availability, there is a significant, moderate and positive relationship between Availability and Customer Satisfaction ($r = .318$, $p < .01$). This correlation indicates that increase in the availability of the prepaid metering system will lead to a corresponding increase in customer satisfaction. For Flexibility, there is a significant, moderate and positive relationship between Flexibility and Customer Satisfaction ($r = .355$, $p < .01$). This correlation indicates that the more flexible the prepaid metering system is, the more satisfied customers are.

### 4.4.2 Result of multiple regression analysis of customer satisfaction and prepaid metering system

A multiple regression analysis was performed using the identified variables (Reliability, Affordability, Availability, Flexibility and Customer Satisfaction). To assure the accuracy of the regression analysis outputs, the multiple regression assumptions were closely followed. The Collinearity Statistics is presented in Table 4.8;

**Table 4.8: Collinearity Statistics**

| Model | Collinearity Statistics | |
|---|---|---|
| | Tolerance | VIF |
| Reliability | 0.709 | 1.411 |
| Affordability | 0.762 | 1.313 |
| Availability | 0.852 | 1.174 |
| Flexibility | 0.878 | 1.139 |

Dependent Variable: Customer Satisfaction

All four predictors have tolerance values greater than .10 and variance inflection factor (VIF) values less than 10 in the collinearity statistic tests; this demonstrates that there is no multicollinearity between the variables.

The Model Summary is presented in Table 4.9,

**Table 4.9: Model Summary**

| Model | *R* | *R* Square | Adjusted *R* Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .544 | .596 | .588 | .36494 |

This shows that there is a multiple correlation ($R$ = .544) of the four significant variables with the criterion. The $R$ Square of this model is .596 which means that this model explains 59.6% of the variance in customers using prepaid meter. Additionally, the adjusted $R$ Square shows that the four variables account for 58.8% of the variance contributing to higher customer satisfaction.

The Analysis of Variance (ANOVA) is presented in Table 4.10;

**Table 4.10: ANOVA (Model Validity)**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 18.975 | 4 | 4.744 | 35.620 | .000 |
| | Residual | 45.148 | 339 | .133 | | |
| | Total | 64.124 | 343 | | | |

It shows that this regression is significant ($F_{4, 339} = 35.620$, $P < .01$). This result implies that all four predictor variables (Reliability, Affordability, Availability and Flexibility) are effective at explaining customer satisfaction variation.

The Multiple Regression Variable Coefficients is presented in Table 4.11;

**Table 4.11: Multiple Regression Variable Coefficients**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| Constant | 1.919 | .187 | | 10.240 | .000 |
| Reliability | .053 | .048 | .060 | 1.112 | .267 |
| Affordability | .263 | .042 | .326 | 6.244 | .000 |
| Availability | .127 | .038 | .163 | 3.305 | .001 |
| Flexibility | .189 | .043 | .214 | 4.408 | .000 |

Three significant predictors (Affordability, Availability and Flexibility) out of four independent variables have a significant value less than .01 and are positively related to the criterion in the regression. Affordability has the highest regression coefficient at

0.263, followed by Flexibility with a coefficient of 0.189, and Availability with a regression coefficient of 0.127. This indicates that Affordability have a stronger unique contribution in explaining the customer satisfaction as compared to flexibility and availability. However, one of the variables (Reliability) has a significant value greater than .05, indicating that it does not contribute significantly to the equation.

## 4.5 Discussion of Findings

### 4.5.1 Relationship between the adoption of prepaid metering system and customer satisfaction

Pearson's correlation was used to determine the relationship between Prepaid Metering System and Customer Satisfaction. Factors investigated were: Reliability, Affordability, Availability, Flexibility and Customer Satisfaction. The result of the correlation as presented in Table 4.7 shows that there is a significant positive relationship between Reliability and Customer Satisfaction ($r$ = .332, $p$ < .01), there is a significant positive relationship between Affordability and Customer Satisfaction ($r$ = .454, $p$ < .01), there is a significant positive relationship between Availability and Customer Satisfaction ($r$ = .318, $p$ < .01) and there is also a significant positive relationship between Flexibility and Customer Satisfaction ($r$ = .355, $p$ < .01). This implies that an improvement in prepaid metering service delivery will increase customer satisfaction.

Additionally, the multiple regression analysis was further used to analyse the relationship between the Prepaid Metering System and Customer Satisfaction in order to obtain an accurate understanding of the relationship between them. Results presented in Table 4.11 shows that Reliability has a non-statistically significant value of .267 ($p$ > .05), this shows that it has no statistically significant meaningful effect on the Customer Satisfaction. Additionally, the value of .053 unstandardized coefficients implies that each measurement in Reliability will produce a .053 change in the Customer Satisfaction. Hence, a rise in the

Reliability of the Prepaid Metering System will strengthen the satisfaction of customers. In explaining the standardized coefficients, for each one standard deviation of movement in Reliability, Customer Satisfaction increases by .060 standard deviations. Affordability also has a statistically significant value of $p < .01$; hence it has a statistically significant influence on the dependent variable. Unstandardized coefficient value of .263 shows that a unit rise in Affordability will cause a rise of .263 in Customer Satisfaction. Therefore, a rise in Affordability of the prepaid metering system will strengthen the satisfaction of customers. In explaining the standardized coefficients, for each one standard deviation of movement in Affordability, the dependent variable rises by .326 standard deviations. Availability has a statistically significant value of .001 ($p < .05$), hence it has a statistically significant influence on Customer Satisfaction. Unstandardized coefficient value of .127 shows that a unit increase in Availability will cause an increase of .127 in the Customer Satisfaction. Hence, increase in the Availability of the Prepaid Metering System and Services will increase the satisfaction of customers. In terms of the standardized coefficients, for every one standard deviation of movement in Availability, Customer Satisfaction increases by .163 standard deviations. Flexibility has a statistically significant value of $p < .01$; hence this has a statistically significant influence on Customer Satisfaction. Unstandardized coefficient value of .189 for this shows that a unit rise in Flexibility will cause an increase of .189 in Customer Satisfaction. Hence, increase in the Flexibility of the Prepaid Metering System and Services will strengthen the satisfaction of customers. In terms of the standardized coefficients, for every one standard deviation of movement in Flexibility, Customer Satisfaction increases by .214 standard deviations. Three significant predictors (Affordability, Availability and Flexibility) are positively related to the criterion in the regression. Affordability has the highest regression coefficient at 0.263, followed by Flexibility with a coefficient of 0.189, and Availability

with a regression coefficient of 0.127. This indicates that Affordability have a stronger unique contribution in explaining customer satisfaction as compared to Flexibility and Availability. However, one of the variables (Reliability) has a significant value greater than .05, indicating that it does not contribute significantly to the equation. Therefore, the Reliability will be excluded from the equation to improve the desirability of the regression model. Thus, based on findings presented in Table 4.11, the regression equation is as follows:

$$CS = 1.919 + 0.263AFF + 0.127AVA + 0.189FLE \quad \textit{(Equation 4.1)}$$

Where: *CS* = Customer Satisfaction

*AFF* = Affordability

*AVA* = Availability

*FLE* = Flexibility

These findings are in agreement with earlier studies who supported that the major factors that influence prepaid metering system and customer satisfaction were: costing; reliability; availability and flexibility. Customers also consider a number of factors before accepting the prepaid meter for use, including the prepaid meter's user friendliness, durability, and access to prepaid meter vending points while also establishing a weak positive correlation between the adoption Prepaid Metering System and Customer Satisfaction (Wambua *et al*., 2017; Quayson-Dadzie, 2012).

### 4.5.2 Benefits of prepaid metering system over the postpaid metering system

In order to examine the benefits of the prepaid metering system over the postpaid metering system in Minna, Niger State; the benefits of the prepaid meters over the postpaid meters were identified by the researcher, and users were asked to tick them according to their preferences. A broad review of the collected works related to the

prepaid metering system yielded the identified benefits. The findings are presented in Table 4.3 with the mean interpretations presented in Table 4.2.

From the findings, majority of users with a mean of 4.42 strongly agree that with the implementation of the prepaid meter, users are now cautious with the consumption and use of electricity and have taken energy saving practices seriously. This is due to the fact that the majority of users can now track their consumption, necessitating the need to carefully conserve and maintain the credits purchased. As a result, it reduces unnecessary and wasteful use of power such as leaving lights on and appliances running. The users were asked if being conscious of how much they spend in a month regarding the purchase of prepaid token is a determinant factor in determining the relevance of prepaid meter usage over postpaid meter usage in Minna, Niger State. The result shows that majority of users with a mean of 4.31 strongly agree that they are conscious with how much they spend in a month as opposed to the postpaid meters where individual users are often unaware and would find it difficult to be sure of their level of spending. However, with the prepaid metering system, the individual user is more aware of how much token they purchase at any given time, making it much easier to limit excessive spending. It was discovered that the majority of prepaid meter users, with a mean of 4.30, strongly agree that the absence of meter readers is a benefit of prepaid meters over postpaid meters. Since the amount of units every user purchases is determined by how much he or she pays, there is no meter reading. In other words, the fact that users can purchase only the amount of electricity they need implies that there is no excess supply and that they do not have to rely on anyone to read their meters. This is attributed, in addition, to the fact that meter readers were prone to error and were insufficient in number to accommodate the entire country's users. Some locations were too far away or otherwise unavailable, making it difficult to collect data for bill control. Prepaid meters, on the other hand, have solved

these obstacles. It was discovered that the majority of prepaid meter users, with a mean score of 4.45, strongly accept that the lack of unpaid debt and the prevention of non-payment problems are advantages of prepaid meters over postpaid meters. This implies that there are no accumulated debts because the consumer pays before consumption and there are no bill deliveries because a customer's bill is determined by what they can afford, and the meter automatically trips when the units are depleted, ensuring that they only buy what they have paid for. The results indicate that, unlike the postpaid metering system, the majority of prepaid meter users with a mean of 4.26 strongly agree that there is no struggle for bill payment using the prepaid metering system. In this case, users stated that the prepaid system has provided them with significant relief from the difficulties and challenges they faced under the postpaid metering system, where users in most cases struggle with bill payment in order to avoid distribution company staff disconnecting them from electricity as a result of late or delayed payment, which would also be accompanied with a reconnection fee. Since the prepaid metering system has provided users the ability and control over usage and payment, the usual discomfort experienced under the postpaid system has been eliminated.

The result further shows that majority of prepaid meter users with a mean of 3.43 agree that they pay less since they started using the prepaid billing system as opposed to the postpaid system where the distribution company no longer reads the meters but rather makes use of estimated billing that ensures that people pay a flat fee every month and this has been increasing over the years. However with the prepaid metering system, users begin to manage the token purchased effectively without wasting them and they follow the requisite energy savings tips. With a mean of 4.24, the majority of users strongly agree that when the meter is not in use, they do not pay any money. Here, it was clearly evident that if no power was consumed, no charges or payments were imposed on the user; thus,

the user has the freedom to regulate their own power consumption and may opt to switch off the meter at any time they want. In other words, the user does not pay when there is no consumption; instead, the user only pays for the units that are used, as opposed to the postpaid system, where the electricity is consumed before the user pays for it and is paid even when there is no consumption for that time. The result show that majority of users with a mean of 4.38 strongly agree that one of the relevance of the prepaid meter over the postpaid meter is that there is no hazard of billing process. This is because the postpaid system has been blamed for many of the customer complaints and revenue losses due to inaccurate meter reading and billing, which resulted in under-billing, over-billing, or missing bills. Prepaid meters have proved to be innovative in terms of bill accuracy. They also solved the issue of postpaid meters' lack of readings, taking incorrect readings, and taking irregular readings. It has also reduced the number of complaints that the customer service department has had to deal with. The findings show that majority of users with a mean of 4.50 strongly agree that there are no disconnections since they started using the prepaid metering system. This is due to the fact that the authority disconnects the supply in the postpaid metering system due to large outstanding payments; this means that when unpaid bills are past due, the distribution company can manually disconnect the electricity. In the prepaid meters, there are no disconnections since the device is self-regulating, as the meter trips when the units are drained and the decision to use or not use electricity is entirely up to the user. The findings also show that majority of users with a mean of 4.49 strongly agree that they with the use of prepaid meters there is no need to pay reconnection fees. This implies that since there are no disconnections, there are no reconnection fees. Because individual users can choose to disconnect and reconnect power at their leisure without having to pay any disconnection fees to the service providers and also the meter automatically trips when the units are exhausted and only

becomes energized when the units are loaded, the user is not charged for fuel or labour for the reconnections. Customers were asked if they prefer prepaid meters more than the postpaid meters. The findings indicated that the majority of users (82.8%) prefer the prepaid metering system more than the postpaid system. One important explanation for this is the various benefits associated with the usage of the prepaid metering system. Among the benefits are the avoidance of regular disconnections, consumers' privacy is reasonably safe, consumers have discretion over how to use the credit purchased, and many more. Meanwhile, 10.5% of consumers have a different opinion; they prefer the postpaid meter over the prepaid meter. The reason for this is that the prepaid meter has its own set of issues and challenges. The remaining 6.7% of users are unsure which of the meters they prefer.

These findings are in agreement with earlier studies who supported that prepaid meters continue to assist households with budgeting and as households have awareness and control over their electricity consumption, they therefore budget better and consume lower electricity levels (Njabulo *et al.*, 2018; Mahapatra and Golhar, 2018; Qiu *et al.*, 2017; Makanjuola *et al*., 2015)

### 4.5.3 Customer satisfaction with respect to prepaid meter usage

Customer satisfaction can refer to a specific feature or characteristic of a product or service, or it can refer to the product/service as a whole. The prepaid meter user is satisfied when the product quality meets their expectations and they assume the item to be of high quality; on the other hand, if it does not meet their parameters of perceived quality, they assume the product to be of low quality. Users who are satisfied complain less, speak more positively about the products they like, and are more likely to remain loyal customers. The tendency of prepaid meters to provide value to customers and thus meet

their needs is vital. The factors determining customer satisfaction with respect to prepaid meter usage are presented in Table 4.5. The findings indicate that there exist a low satisfaction level with the billing system and the response users receive whenever they encounter a problem. This is because prepaid meter users (particularly low-income earners who find it difficult to pay the previous tariff) are dissatisfied with the increase in electricity tariff. Users are also dissatisfied with the fact that when a problem is reported to the customer care unit, they tend to drag their feet and act slowly and also the customer service units that are available are unable to effectively address customer complaints in order to ensure customer satisfaction. There is also the issue of lateness and laziness among sales representatives and other workers who are responsible for the welfare of customers. Prepaid meter users had the highest level of satisfaction with the privacy they had as a result of no meter readers and no accumulated debt, with a mean score of 4.42. This is because they no longer have to rely on others to read their meters for them, and they are satisfied because they no longer have to worry about inaccurate readings or strangers posing as meter readers. On “no accumulated debts” users are highly satisfied because they pay before consumption and there are no bills delivered to their homes. Users also had high level of satisfaction because: they are not been charged during power outages or when the meter is not in use, they can now monitor their consumption, the meters are efficient and not easily damaged, tokens are easy to buy and they are satisfied paying upfront.

These findings is in agreement with Boadu (2016) who opined that a major prominent level of satisfaction that customers enjoy from the adoption of prepaid metering system is the payment before usage and it largely assist the user feel comfortable and get maximum satisfaction.

### 4.5.4 Challenges of the prepaid metering system

Customers have been generally pleased with the prepaid metering system; however, setbacks are a common feature of human endeavour, and prepaid meters are no exception. This section describes and discusses the difficulties that prepaid meter users in Minna, Niger State face. Numerous constraints were discovered, but the most important ones were identified and discussed here. The findings are presented in Table 4.6 with the mean interpretations presented in Table 4.2. Majority of users, with a mean of 1.64, strongly disagree that they are not comfortable using the prepaid metering system because they are used to the postpaid metering system. This is because switching to the prepaid meter is extremely beneficial to them because the tendency to postpone or misplace bill payment, which can lead to disconnection, is largely avoided under the prepaid meter system. Majority of users with a mean score of 4.28 strongly agree that it is time consuming and expensive to acquire the prepaid metering system. This is because even though prepaid meter replacement is technically free, it is alleged that officers installing these meters routinely demand money from users before replacing their postpaid meters with prepaid meters. The findings showed that the majority of prepaid meter users, with a mean score of 4.45, strongly agree that they experienced delay in receiving and installation of their meters. According to the findings, this is the most major issue faced by prepaid meter users and those considering switching. The problem is systemic, and the cause is that supply does not match demand (that is demand is more than supply). It was discovered that the majority of prepaid meter users, with a mean score of 2.64, are undecided as to whether paying before they use electricity is an extra economical pressure to them. They are sometimes uncomfortable with the upfront payment system because it places a significant financial burden on them, particularly when they are unable to recharge their meter due to financial constraints, and at other times they are comfortable

with it because it allows them to save money and avoid accumulating debt. The results indicate that majority of prepaid meter users with a mean score of 4.20 agree that it is a great challenge for them when the meter is been shared with them. Customers who live in apartments with multiple tenants sharing the same meter face conflicts over how to share or allocate fees, resulting in customer dissatisfaction. This occurs as a result of people's perceptions of dishonesty and irregularities that arise as a result of some people using more gadgets than others, and in this scenario, confrontations and disagreements are bound to occur, and in a situation where frequent bill payment and token purchases become intense, misunderstanding and petty fighting will naturally occur between such persons. When a user refuses to pay the amount due to them, misunderstandings arise, which can lead to fights.

The results indicated that the majority of prepaid meter users with a mean score of 3.97 agree that the limited use of electrical appliances is a great disadvantage to them. This is due to the fact that persistent use of power is largely dependent upon users' ability to frequently purchase tokens to enjoy electricity, and when the available credit on the meter is almost exhausted and money to charge newly or to purchase credit is unavailable, users will have to minimize the use of appliances. With a mean score of 4.03, users also agree that limiting the use of lights and heating by children and visitors is a major challenge. This is due to the fact that most visitors, including children, do not practice energy conservation, making it difficult to correct them. According to the findings, the majority of users, with a mean score of 4.18, agree that tokens purchased get finished quickly. Many factors can influence this, including the fact that most users do not turn off appliances when they are not in use, and that users spend more money and get smaller units when they buy more than once a month, causing discomfort and irritation among users. This is difficult to avoid because, regardless of how well consumers manage their

consumption and electricity usage, the credit is likely to be depleted before the end of each month. The findings also show that the majority of users, with a mean score of 3.79, agree that one of the challenges they face when using the prepaid metering system is limited customer service units and vending points. The customer service units that are available are unable to effectively address customer complaints in order to ensure customer satisfaction. There is also the issue of lateness and laziness among sales representatives and other workers who are responsible for the welfare of customers. It was also discovered that these vending points do not operate 24 hours a day, and as a result, customers do not have the flexibility to buy at any time they want. The findings show that majority of users with a mean of 3.98 agree that there is no training on the use of the prepaid metering system. This could be due to the employees who are in charge of disseminating information being lazy. This is because the distribution company's management and employees have a responsibility to educate both domestic and industrial electricity consumers about the need to switch to a prepaid metering system, but it is clear that this was not done. Even if it was done, it implies that it did not go over well with the majority of them, and that more needs to be done to increase education about the importance of using prepaid meters.

The findings are in agreement with earlier studies who supported that the prepaid metering system faces the following challenges: absence of vending infrastructure, corruption, absence of local manufacturers, high cost of meter acquisition, lack of expertise, inability to buy units on Sundays and Holidays, bypass frequently by consumers, delay in receiving and installation of prepaid meters, single-phase overloading, experiencing difficulty while trying to change tariff, network to recharge is sometimes difficult (Akand, 2018; Holmukhe, 2016; Makanjuola *et al*., 2015)

# CHAPTER FIVE

# 5.0 CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

Conclusions were drawn based on the findings of the research. The findings successfully demonstrated that the prepaid metering system and customer satisfaction have a relationship and are linked. Reliability, Affordability, Availability and Flexibility were the variables identified by the study as influencing the usage of prepaid electricity metering systems on customer satisfaction. However, Affordability has a stronger unique contribution in explaining the customer satisfaction as compared to Flexibility and Availability. Residents in Minna have enthusiastically welcomed the implementation of the prepaid electric meter in the city, and they believe that the ability of the distribution company to understand customer needs is an important factor in creating customer satisfaction as well as the company's readiness to effectively address any operational challenges or other challenges that may arise.

## 5.2 Limitations of the Study

During the study, some challenges and constraints were confronted in the field. The first limitation was that a few of the questionnaires sent were not returned, resulting in a response rate of less than 100%. The 87.5% response rate received on the other hand was an acceptable response rate and this was sufficient to address all the issues raised.

The second limitation is that some participants are unable to provide a correct explanation of their experience based on the reasons they are most familiar with. Some of the participants thought the study was a pointless exercise because they believed hardly anything good would come of it because past studies had been conducted and there had been no changes in service quality because their issues had not been resolved. The

researcher, on the other hand, was able to explain to them the clear benefits of the study, which encouraged them to complete the questionnaires. The participants understood the significance of the survey; hence this improved the reliability of information collected.

The pivotal role of financial limitations to the research cannot be omitted. As a result, the researcher pooled its limited resources to ensure the study's success. Also, the inability to meet some of the respondents physically due to covid-19 restrictions during the data collection, However, this was properly addressed by explaining the study's rationale well over phone to help convince them to participate. Within these constraints, furthermore, every effort was made to conduct a valid, concise, and comprehensive study resulting in a reliable and valid result.

## 5.3 Recommendations

The following recommendations are worth considering based on the findings.

i. **Receiving and Installation of Prepaid Meters on Time:** The distribution company should ensure that individuals/households receive and have their meters installed on time, as well as providing separate meters to each household or individual, particularly in compound houses, to avoid misunderstandings and petty arguments in the purchasing unit.

ii. **Free Installation of Meters:** Customers are unaware of the company's activities, so the company's communication techniques need to be re-evaluated. Some customers, for example, are unaware that they can apply for a free prepaid meter. This is because, despite the fact that prepaid meter replacement is technically free, officers installing these meters are accused of routinely demanding money from customers before upgrading their postpaid meters to prepaid meters.

iii. **Communication with Meters Wirelessly through Mobile Phones:** It is recommended that the company should ensure that prepaid meter users are able to communicate with their meters wirelessly via mobile phones, rather than the current manual methods of obtaining information from the meters. Users, in particular, want value-added services like wireless information sourcing from the meter such as unit balance, time of power outage and restoration, among others. The study further recommends that prepaid metering services be made more flexible in order to make the system easier to use.

iv. **Introduction of Smart Metering System:** It is also recommended that smart prepaid meters be installed, which show users the actual can power consumption of each appliance used. Consumers will feel more at ease when using a prepaid meter if they have knowledge of actual power consumption. The myth that units vanish when a load is connected to them will be debunked. Customers will also learn how to combine their loads to save money, as well as how to overcome their fear of using a prepaid meter.

v. **Good Customer Care Service (Units):** To ensure customer satisfaction, service delivery should be improved, and company employees should treat customers with respect. To bring service closer to the people, the company should ensure customer complaints are responded to within a reasonable time and the company should also decentralize its customer care services. This would strengthen customer support, especially for prepaid users who have no other means of communicating with the service provider. There should also be more logistical support for the prepaid metering system's widespread adoption, such as making self-service stations available in accessible locations, addressing meter-related complaints, and having officials react immediately, among other things.

vi. **Marketing Campaign for Better Knowledge of the Prepaid Meters:** There is an urgent need to increase customer knowledge about the importance of using prepaid meters in an attempt to optimise system reliability, and to further enhance organizational officials' knowledge and understanding of the prepaid meters so that they can communicate and motivate customers. More prepaid metering education is also strongly recommended, aimed at educating customers of the need to change to the prepaid metering system, and it must be done properly to avoid any misleading information and its resulting effect on consumer awareness.

## 5.4 Contribution to Knowledge

This research has contributed significantly to knowledge on the relationship between Prepaid Metering System and Customer Satisfaction, the importance of Prepaid Meters over Postpaid Meters, and the issues faced by users of this system in Minna, Niger State. This study has been able to establish the relationship between Prepaid Metering System and Customer Satisfaction in Minna, Niger State. Previous studies are not clear about the major factors influencing the usage of prepaid metering system on customers' satisfaction in Niger State and in Nigeria at large. But this study has therefore identified Reliability, Affordability, Availability and Flexibility as the major factors influencing the usage of Prepaid Metering Systems on Customers' Satisfaction in Minna, Niger State. Similar to earlier findings, this study supports that Prepaid Meters continue to assist households with budgeting and as households have awareness and control over electricity consumption, they therefore budget better and consume lower electricity levels (Njabulo *et al*., 2018; Mahapatra and Golhar, 2018; Qui *et al*., 2017; Makanjuola *et al*., 2015). Additionally, the study is also in agreement with who opined that the prepaid metering system faces the following challenges: absence of vending infrastructure, delay in receiving and

installation of prepaid meters, corruption and lack of expertise (Akand, 2018; Holmukhe, 2016; Makanjuola *et al*., 2015).

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**APPENDIX A: Sample of Research Instrument**

**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STAE**
**DEPARTMENT OF PROJECT MANAGEMENT TECHNOLOGY**

Sir/Ma,

**REQUEST FOR PARTICIPATION**

I am carrying out a research on "The Effect of Prepaid Metering System on Customer Satisfaction in Minna, Niger State**"**.

To achieve the aim and objectives of this research, I am conducting a survey of Prepaid Meter users and would like you to complete the attached questionnaire.

Please, kindly help me provide answers to questions and note that your cooperation and contribution to this questionnaire is important for the success of this research.

Your privacy will be kept in the strictest confidence and use for statistical purposes only. Thank you for your co-operation.

Yours sincerely,

ARIBISALA, Ayooluwa Femi

**THIS QUESTIONNAIRE SEEKS TO STUDY THE EFFECT OF PREPAID METERS ON THE LEVEL OF CUSTOMER SATISFACTION**

**SECTION A: SOCIO-ECONOMIC CHARACTERISTICS OF PREPAID METER USER**

**Instruction:** Please specify and mark **(√)** in the appropriate column/box as it applies to you

| | | | |
|---|---|---|---|
| 3. | Gender | Male | |
| | | Female | |
| | | | |
| 4. | Age (years) | Under 20 | |
| | | 21 – 30 | |
| | | 31 – 40 | |
| | | 41 – 50 | |
| | | 51 – above | |
| | | | |
| 5. | Level of Education | No Formal Education | |
| | | Primary | |
| | | Secondary | |
| | | ND/HND | |
| | | First Degree | |
| | | Masters Degree | |
| | | PhD | |
| | | | |
| 6. | Marital Status | Single | |
| | | Married | |
| | | Divorced | |
| | | Widowed | |
| | | Separated | |
| | | | |
| 7. | Household Size | 1 – 3 | |
| | | 4 – 6 | |
| | | 7 – 9 | |
| | | 10 – 12 | |
| | | 12 – above | |
| | | | |
| 8. | Primary Occupation | Student | |
| | | Public/Civil Servant | |
| | | Private Employee | |
| | | Self Employed | |
| | | Retired | |
| | | | |
| 9. | Average Household Income per month (₦) | Below 30,000 | |
| | | 31,000 – 60,000 | |
| | | 61,000 – 90,000 | |
| | | 91,000 – 120,000 | |
| | | 121,000 - above | |

| | | | |
|---|---|---|---|
| 10. | Metering System in use | Prepaid Meter | |
| | | Post-paid Meter | |
| | | Estimated Billing | |
| | | | |
| 11. | Year(s) of Meter Usage | Under 2 years | |
| | | 2 – 4 | |
| | | 5 – 7 | |
| | | 8 – 10 | |
| | | 11 and above | |
| | | | |
| 12. | Which category of user do you belong to? | Residential (Domestic) | |
| | | Non-Residential (Commercial) | |
| | | Both | |
| | | | |
| | Types of Apartment | Rented | |
| | | Owned | |
| | | Both | |
| | | | |
| 13. | Are you using the meter alone? | Yes | |
| | | No | |
| | | | |
| 14. | Mode of Payment | Vending Point/Pay Station | |
| | | Online Payment | |
| | | Both | |

**SECTION B: RELATIONSHIP BETWEEN THE ADOPTION OF PREPAID ELECTRICITY METERING SYSTEM AND CUSTOMER SATISFACTION**

**Instruction:** Please mark **(√)** in the appropriate box to show your level of agreement or disagreement

| A | Reliability of the prepaid metering services | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| i | Electricity supply is reliable. | | | | | |
| ii | Prepaid meters installed in the house serves well without breaking down. | | | | | |
| iii | No delay in receiving and installation of prepaid meters. | | | | | |

| A | Reliability of the prepaid metering services | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| iv | Customers' complaints are responded to in a timely manner. | | | | | |
| v | I don't experience more blackouts (power outages) since I shifted to prepaid billing system. | | | | | |
| vi | The token number is always accepted by meter. | | | | | |
| vii | As soon as payments are received, reconnections are made. | | | | | |

| B | Costing of the prepaid metering services | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| i | Electricity prices don't fluctuate from time to time (prices are stable). | | | | | |
| ii | The price of electricity (token) is not excessively high. | | | | | |
| iii | I understand how my electricity token (bill) is estimated (calculated). | | | | | |
| iv | It is cheaper to use the prepaid meter than postpaid meter. | | | | | |
| v | No accumulated debts (bills) | | | | | |

| C | Availability of the prepaid metering services | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| i | Prepaid meter service is available to any customer who requires or applies for it. | | | | | |
| ii | Availability of Prepaid Electricity Information | | | | | |

| C | Availability of the prepaid metering services | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| iii | Credit tokens are always available when I need them. | | | | | |
| iv | Credit tokens can be purchased from a variety of vending points. | | | | | |
| v | When I have trouble loading my token/meter, I know where to go. | | | | | |
| vi | Customer care service is always available | | | | | |

| D | Flexibility of the prepaid metering services | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| i | I am able to plan my electricity usage for the month ahead of time. | | | | | |
| ii | When using the service, it is extremely user-friendly. | | | | | |
| iii | The system enables loading credit for electricity within the comfort of one´s home. | | | | | |
| iv | The prepaid metering system does not limit me due to my education level | | | | | |
| v | The device gives me notice before the token expires. | | | | | |

**SECTION C: BENEFITS OF PREPAID METERS OVER THE POST-PAID METERS**

**Instruction:** Please mark **(√)** in the appropriate column/box as it applies to you

1. Do you prefer prepaid meters to post-paid meters? Yes ( ) No ( ) I don't know ( )
2. The following are considered as the benefits of the prepaid meter over the post-paid meter. Please indicate your level of agreement or disagreement to the following factors.

| | Factors | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| i | I am now careful with my usage of electricity. | | | | | |

| | Factors | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| ii | I am conscious of how much I spend in a month. | | | | | |
| iii | No more meter readers. | | | | | |
| iv | No accumulated debt and I avoid non-payment problems | | | | | |
| v | No struggle for bill payment since I buy before I use | | | | | |
| vi | I pay less since I started using the prepaid billing system. | | | | | |
| vii | I don't pay any money when I don't use the meter. | | | | | |
| viii | No hazard of billing process (under billing/over-billing/bill missing). | | | | | |
| ix | There is no disconnection fee since I started using prepaid meter. | | | | | |
| x | No need to pay reconnection fee. | | | | | |
| xi | The prepaid meters are efficient and do not easily spoil. | | | | | |
| xii | Prepaid meter vending stations (recharge point) are available in convenient locations and online. | | | | | |

**SECTION D: CHALLENGES OF THE PREPAID METERING SYSTEM**

**Instruction:** Please mark **(√)** in the appropriate column/box as it applies to you

1. How often do you encounter problem(s) with your prepaid meter? Please tick one

| Always | Often | Sometimes | Rarely | Never |
|---|---|---|---|---|
| | | | | |

2. The following factors are considered as the major challenges encountered by prepaid meter users. Please indicate your level of agreement or disagreement to the following factors.

| | Factors | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| i | I am used to the postpaid meter system so I am not comfortable with prepaid meter. | | | | | |

| | Factors | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| ii | I am not certain of how durable the prepaid meters are. | | | | | |
| iii | It is time consuming and expensive to acquire the prepaid meter. | | | | | |
| iv | Delay in receiving and installation of prepaid meters. | | | | | |
| v | I am not much aware of the technical feature(s) of prepaid meter. | | | | | |
| vi | I have to pay before I use electricity which is an extra economical pressure to me. | | | | | |
| vii | Higher taxes are charged which increase the cost of electricity. | | | | | |
| viii | Cost of electricity fluctuates due to changes in fuel prices. | | | | | |
| ix | Network to recharge is sometimes difficult. | | | | | |
| x | Misunderstanding when using in groups. | | | | | |
| xi | Limited use of electrical appliances. | | | | | |
| xii | Need to restrict children and visitors on use of lights and heating. | | | | | |
| xiii | Tokens (Units) purchased get finished quickly. | | | | | |
| xiv | Limited vending point (Electric pay stations). | | | | | |
| xv | Unable to buy tokens on Sundays and holidays. | | | | | |
| xvi | No training/awareness program about prepaid meter. | | | | | |

**SECTION E: LEVEL OF CUSTOMER SATISFACTION WITH RESPECT TO PREPAID METERING SYSTEM**

**Instruction:** Please mark **(√)** in the appropriate column/box as it applies to you

1. From the statements below, please indicate your level of satisfaction or dissatisfaction to prepaid meter usage.

| | **Level of Customer Satisfaction** | **Highly Dissatisfied** | **Dissatisfied** | **Neutral** | **Satisfied** | **Highly Satisfied** |
|---|---|---|---|---|---|---|
| i | I am satisfied because it is efficient and not easily damaged. | | | | | |
| ii | It is easy to buy prepaid credit (tokens/units). | | | | | |
| iii | I am satisfied with the billing system. | | | | | |
| iv | I am satisfied with the mode of payment. | | | | | |
| v | I am satisfied because there is no accumulated debt. | | | | | |
| vi | I am satisfied because I can monitor my consumption. | | | | | |
| vii | I am satisfied because I am not charged when there is power outage. | | | | | |
| viii | I am satisfied with paying upfront before use. | | | | | |
| ix | I am satisfied with the response anytime I encounter challenge. | | | | | |
| x | I am satisfied with the privacy I enjoyed as a result of no meter readers. | | | | | |

**APPENDIX B: Descriptive Statistics of Independent and Dependent Variables**

| | Variables | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | Percentage (%) | Std. Deviation |
|---|---|---|---|---|---|---|---|---|---|
| | **Reliability ($X_1$)** | | | | | | | | |
| R1 | Electricity supply is reliable. | 113 (32.8%) | 117 (34%) | 76 (22.1%) | 27 (7.8%) | 11 (3.2%) | 2.15 | 42.91 | 1.065 |
| R2 | Prepaid meters installed in the house serves well without breaking down. | 0 (0%) | 3 (0.9%) | 46 (13.4%) | 140 (40.7%) | 155 (45.1%) | 4.30 | 85.99 | .729 |
| R3 | No delay in receiving and installation of prepaid meters. | 133 (38.7%) | 168 (48.8%) | 23 (6.7%) | 12 (3.5%) | 8 (2.3%) | 1.82 | 36.40 | .879 |
| R4 | Customers' complaints are responded to in a timely manner. | 57 (16.6%) | 111 (32.3%) | 96 (27.9%0 | 74 (21.5%) | 6 (1.7%) | 2.60 | 51.92 | 1.054 |
| R5 | I don't experience more blackouts (power outages) since I shifted to prepaid billing system. | 69 (20.1%) | 91 (26.5%) | 59 (17.2%) | 70 (20.3%) | 55 (16%) | 2.86 | 57.15 | 1.377 |
| R6 | The token number is always accepted by meter. | 2 (0.6%0 | 9 (2.6%) | 49 (14.2%) | 159 (46.2) | 125 (36.3%) | 4.15 | 83.02 | .801 |
| R7 | As soon as payments are received, reconnections are made. | 5 (1.5%) | 10 (2.9%) | 63 (18.3%) | 128 (37.2%) | 138 (40.1%) | 4.12 | 82.33 | .906 |

| | Variables | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | Percentage (%) | Std. Deviation |
|---|---|---|---|---|---|---|---|---|---|
| | **Affordability ($X_2$)** | | | | | | | | |
| C1 | Electricity prices don't fluctuate from time to time (prices are stable). | 99 (28.8%) | 121 (35.2%) | 105 (30.5%) | 13 (3.8%) | 6 (1.7%) | 2.15 | 42.91 | .939 |
| C2 | The price of electricity (token) is not excessively high. | 87 (25.3%) | 119 (34.65) | 82 (23.850 | 47 (13.7%) | 9 (2.6%) | 2.34 | 46.74 | 1.078 |
| C3 | I understand how my electricity token (bill) is estimated (calculated). | 69 (20.1%) | 115 (33.4%) | 81 (23.5%) | 72 (20.9%) | 7 (2%) | 2.51 | 50.29 | 1.093 |
| C4 | It is cheaper to use the prepaid meter than postpaid meter. | 12 (3.5%) | 18 (5.2%) | 103 (29.9%) | 110 (32%) | 101 (29.4%) | 3.78 | 75.70 | 1.036 |
| C5 | No accumulated debts (bills). | 8 (2.3%) | 6 (1.7%) | 37 (10.85) | 145 (42.2%) | 148 (43%) | 4.22 | 84.36 | .878 |
| | **Availability ($X_3$)** | | | | | | | | |
| A1 | Prepaid meter service is available to any customer who requires or applies for it. | 105 (30.5%) | 128 (37.2%) | 86 (25%) | 21 (6.1%) | 4 (1.2%) | 2.10 | 42.03 | .947 |
| A2 | There is availability of prepaid electricity meter information. | 65 (18.9%) | 102 (29.7%) | 110 (32%) | 58 (16.9%0 | 9 (2.6%) | 2.55 | 50.93 | 1.060 |
| A3 | Credit tokens are always available when I need them. | 7 (2%) | 11 (3.2%) | 42 (12.2%) | 154 (44.8%) | 130 (37.8%) | 4.13 | 82.62 | .892 |

| | Variables | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | Percentage (%) | Std. Deviation |
|---|---|---|---|---|---|---|---|---|---|
| A4 | Credit tokens can be purchased from a variety of vending points. | 25 (7.3%) | 41 (11.9%) | 82 (23.8%) | 112 (32.6%) | 84 (24.4%) | 3.55 | 70.99 | 1.189 |
| A5 | When I have trouble loading my token/meter, I know where to go. | 7 (2%) | 4 (1.2%) | 99 (28.8%) | 137 (39.8%) | 97 (28.2%) | 3.91 | 78.20 | .891 |
| A6 | Customer care service is always available | 70 (20.3%) | 105 (30.5%) | 104 (30.2%) | 60 (17.4%) | 5 (1.5%) | 2.49 | 49.83 | 1.047 |
| | **Flexibility ($X_4$)** | | | | | | | | |
| F1 | I am able to plan my electricity usage for the month ahead of time. | 9 (2.6%) | 29 (8.4%) | 81 (23.5%) | 128 (37.2%) | 97 (28.2%) | 3.80 | 75.99 | 1.026 |
| F2 | When using the service, it is extremely user-friendly. | 1 (0.3%) | 4 (1.2%) | 97 (28.2%) | 110 (32%) | 132 (38.4%) | 4.07 | 81.40 | .858 |
| F3 | The system enables loading credit for electricity within the comfort of one´s home. | 2 (0.6%) | 7 (2%) | 14 (14.1%) | 175 (50.9%) | 146 (42.4%) | 4.33 | 86.51 | .703 |
| F4 | The prepaid metering system does not limit me due to my education level | 8 (2.3%) | 61 (17.7%) | 97 (28.2%) | 100 (29.1%) | 78 (22.7%) | 3.52 | 70.41 | 1.096 |
| F5 | The device gives me notice before the token expires. | 36 (10.5%) | 75 (21.8%) | 69 (20.1%0 | 92 (26.7%0 | 72 (20.9%) | 3.26 | 65.17 | 1.296 |

| | Variables | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | Percentage (%) | Std. Deviation |
|---|---|---|---|---|---|---|---|---|---|
| | **Satisfaction (Y)** | | | | | | | | |
| S1 | I am satisfied because it is efficient and not easily damaged | 1 (0.3%) | 4 (1.2%) | 13 (3.8%) | 172 (50%) | 154 (44.8%) | 4.38 | 87.6 | 0.645 |
| S2 | I am satisfied because it is easy to buy prepaid credit | 2 (0.6%) | 2 (0.6%) | 20 (5.8%) | 175 (50.9%) | 145 (42.2%) | 4.33 | 86.6 | 0.667 |
| S3 | I am satisfied with the billing system | 88 (25.6%) | 82 (23.8%) | 93 (27%) | 58 (16.9%) | 23 (6.7%) | 2.55 | 51 | 1.225 |
| S4 | I am satisfied with the mode of payment | 0 (0%) | 5 (1.5%) | 35 (10.25) | 151 (43.9%) | 153 (44.5%) | 4.31 | 86.2 | 0.712 |
| S5 | I am satisfied because there is no accumulated debt | 2 (0.6%) | 5 (1.5%) | 15 (4.4%) | 146 (42.4%) | 176 (51.2%) | 4.42 | 88.4 | 0.700 |
| S6 | I am satisfied because I can monitor my consumption | 3 (0.9%) | 5 (1.5%) | 16 (4.7%) | 150 (43.6%) | 170 (49.4%) | 4.39 | 87.8 | 0.724 |
| S7 | I am satisfied because I am not charged when there is power outage | 3 (0.9%) | 5 (1.5%) | 16 (4.7%) | 148 (43%) | 172 (50%) | 4.40 | 88 | 0.725 |
| S8 | I am satisfied with paying upfront before use | 6 (1.7%) | 7 (2%) | 93 (27%) | 120 (34.9%) | 118 (34.3%) | 3.98 | 79.6 | 0.924 |
| S9 | I am satisfied with the response anytime I encounter challenge | 62 (18%) | 82 (23.8%) | 117 (34%) | 70 (20.3%) | 13 (3.8%) | 2.68 | 53.6 | 1.102 |
| S10 | I am satisfied with the privacy I enjoyed as a result of no meter readers | 1 (0.3%) | 3 (0.9%) | 14 (4.1%) | 158 (45.9%) | 168 (48.8%) | 4.42 | 88.4 | 0.643 |

## APPENDIX C: Outputs from SPSS

**Correlations**

| | | Relia | Affor | Avail | Flex | Satisfaction |
|---|---|---|---|---|---|---|
| Relia | Pearson Correlation | 1 | .460** | .352** | .302** | .332** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 |
| | N | 344 | 344 | 344 | 344 | 344 |
| Affor | Pearson Correlation | .460** | 1 | .265** | .265** | .454** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 |
| | N | 344 | 344 | 344 | 344 | 344 |
| Avail | Pearson Correlation | .352** | .265** | 1 | .220** | .318** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 |
| | N | 344 | 344 | 344 | 344 | 344 |
| Flex | Pearson Correlation | .302** | .265** | .220** | 1 | .355** |
| | Sig. (2-tailed) | .000 | .000 | .000 | | .000 |
| | N | 344 | 344 | 344 | 344 | 344 |
| Satisfaction | Pearson Correlation | .332** | .454** | .318** | .355** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | |
| | N | 344 | 344 | 344 | 344 | 344 |

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

**Variables Entered/Removed[a]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | Flex, Avail, Affor, Relia[b] | . | Enter |

a. Dependent Variable: Satisfaction

b. All requested variables entered.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .544[a] | .596 | .588 | .36494 |

a. Predictors: (Constant), Flex, Avail, Affor, Relia

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 18.975 | 4 | 4.744 | 35.620 | .000[b] |
| | Residual | 45.148 | 339 | .133 | | |
| | Total | 64.124 | 343 | | | |

a. Dependent Variable: Satisfaction

b. Predictors: (Constant), Flex, Avail, Affor, Relia

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.919 | .187 | | 10.240 | .000 |
| | Relia | .053 | .048 | .060 | 1.112 | .267 |
| | Affor | .263 | .042 | .326 | 6.244 | .000 |
| | Avail | .127 | .038 | .163 | 3.305 | .001 |
| | Flex | .189 | .043 | .214 | 4.408 | .000 |

a. Dependent Variable: Customer Satisfaction

**Coefficients[a]**

| Model | | Collinearity Statistics | |
|---|---|---|---|
| | | Tolerance | VIF |
| 1 | Relia | .709 | 1.411 |
| | Affor | .762 | 1.313 |
| | Avail | .852 | 1.174 |
| | Flex | .878 | 1.139 |

a. Dependent Variable: Customer Satisfaction

**Model Summary[b]**

| Model | Durbin-Watson |
|---|---|
| 1 | 1.848[a] |

a. Predictors: (Constant), Flex, Avail, Affor, Relia

b. Dependent Variable: Customer Satisfaction