2019

Effects of prepaid electricity metering system on customer satisfaction: a case of Nairobi County, Kenya.

Owiye, Evans David 0.
Strathmore Business School
Strathmore University

Effects of Prepaid Electricity Metering System on Customer Satisfaction: A Case of Nairobi County, Kenya

Evans David O. Owiye

MBA/99300/17

A dissertation Submitted in partial fulfillment of the requirements for the degree of Masters of Business Administration (MBA) at Strathmore University

Strathmore Business School

Strathmore University

Nairobi, Kenya

MAY, 2019

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other university. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the thesis itself.

Evans David O. Owiye

May, 2019

Approval

The dissertation of Evans David O. Owiye was reviewed and approved by:

Dr. Christopher Ouma Onyango (Supervisor)
Strathmore Business School

Dr. George Njenga
Dean, Strathmore Business School

Prof. Ruth Kiraka
Dean, School of Graduate Studies
Strathmore University

DEDICATION

I dedicate this dissertation to my family for their love, support and above all, committed partnership for success in my life. A special mention of Patrick Owiye (my late dad) and Jedidah Owiye (My mum) for attaching value to acquisition of more knowledge through education, pushing us to always strive for the highest possible level in such pursuit.

ACKNOWLEDGEMENT

The completion of this dissertation could have not been possible without the expertise of my supervisor, Dr. Christopher Ouma Onyango who gave his undying support, encouragement, guidance and shown patience throughout the entire process. I also wish to acknowledge the immense support given to me by my research assistants, family and friends during the process of undertaking this study.

ABSTRACT

Prepayment electricity metering has been embraced in Kenya since the year 2008 by the sole electricity distributor in the country, Kenya Power & Lighting Company Limited. Nairobi County accounts for 50 per cent of electricity customers in Kenya. However, little information is available to ascertain the customer satisfaction levels regarding prepaid electricity service among customers in Nairobi County. This study explored the level of adoption for prepaid electricity meters. Further the study evaluated perceived efficiency levels and benefits among the prepaid electricity customers. The study adopted cross-sectional research design. The target population was selected prepaid electricity consumers in Nairobi County. Quota sampling technique was used to select respondents drawn from the county. Descriptive and inferential statistics were used to analyse the data collected. The results showed that that consumers prefer the use of prepaid electricity meters despite the fact that most of them are yet to apply for prepaid metering connection. Majority of the respondents were of the view that prepaid meters have helped them in managing their electricity consumption. The study also found that electricity consumers are satisfied with the services by Kenya Power on queries related to use of PPMs. The outcome of this study offers feedback to the KP on the need to connect more customers who require prepaid meters.

Key words: Adoption level, Perceptive effieiency level, Perceived benefits, Customer satisfaction.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

KEY DEFINITIONS

1. Adoption level

This study referred Adoption level as the extent or rate to which household have been incorporated in the electricity smart grid friendly solutions of using or being enrolled in the prepaid meter systems (Ganiyu & Lukman, 2015).

2. Perceptive Efficiency level

Efficiency signifies a level of performance that describes using the least amount of input to achieve the highest amount of output. Efficiency requires reducing the number of unnecessary resources used to produce a given output including personal time and energy enhanced by Kenya power (Obafeni and Eugene, 2013).

3. Perceived Benefits

Perceived benefit refers to the perception of the positive consequences that are caused by a specific action in this case the adoption and use of the prepaid meters (Kelsey & Gant, 2016).

4. Customer Satisfaction

Customer satisfaction (often abbreviated as CSAT, more correctly CSat) is a term frequently used in the energy sector to mean a measure of how consumer products such as prepaid meters and or post paid and other related services supplied by a meet or surpass customer expectation (World Banks' State of Electrification Access Report, 2017).

LIST OF ABBREVIATIONS AND ACRONYMS

CS	- Customer Satisfaction
ERC	- Energy Regulatory Commission, Kenya
KETRACO	- Kenya Electricity Transmission Company Limited
KP	- Kenya Power
PEM	-Prepaid Electricity meter
PPM	- Prepaid Meter
SEAR	- State of Electrification Access Report

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 Background of the study

In this chapter, the background of the study, problem statement, research objectives and scope of the study were presented. Several studies show that the long-term success of an organization is closely related to its ability to adapt to its customer needs and changing preferences. Ostrom and Iacobucci (2009) assert that the analysis of customer satisfaction in the energy sector and its comparison with the results is always important to policy makers for this provides them with a unique insight into the motivations and satisfaction of their consumers. Furthermore, customers have access to an educational level that allows them to judge any product or service they pay for, while they demand the best possible products and services at the lowest price. Consequently, a company that meets or even exceeds a customer's expectations has a significant competitive advantage. Therefore, it is important for every company to know who its customers are, what they expect and how adequately their expectations are met.

This process is of the same importance for both the retail and industrial consumers. According to Energy Regulatory Commission of Kenya (ERC) and the Energy Act 2016, Kenya Power (KP) Company Limited is the only company mandated with electric power distribution and retailing in Kenya. KP was formed in 1922 (then known as East African Power & Lighting Company) with the mandate to generate, transmit and distribute electrical energy. The transmission role has since been relinquished to newly formed entity referred to as Kenya Electricity Transmission Company (KETRACO) which is a government owned parastatals. Prepaid metering (PPM) service system is a phenomenon that has been developed mainly to deal with defaults of payment for utility bills (Mathenge, 2015).

According to Ostrom and Iacobucci (2009) customer satisfaction is a way to evaluate the gap between the expectations of a customer from a particular product or service, and what the customer receives after the use of said product. For the measurement of customer satisfaction certain indexes, Sustainability on price, efficiency or total performance of a company are being used. Woodside et al. (2010) considers customer satisfaction the main factor that affects their behavior. Yi (2011) defines customer satisfaction in two basic ways: either as a result or as a procedure. Furthermore, Yi (2011) considers that the definition of customer satisfaction varies, depending on a series of definitive factor.

1.1.1 Level of Adoption

Level of adoption in the energy sector refers to the percentage of the total households or consumers connected to a selected gridding system as set in the regulation act or policy of a given country Mathenge (2015). Kenya has doubled electricity access or connectivity over the last four years from a low of 25% in 2011 to 46% or 3.6million households in 2018, thus meeting best in class benchmarks globally. In GOK the pre-paid initiatives to increase power supply and lower the cost of electricity and eradicate the manual billing system seem to be paying dividends with costs dropping marginally thus improving the business environment. In Kenya, the prepayment system has been widely implemented in the telecommunication industry, in particular in the mobile telephone billing. Prepayment system has also been embraced in the energy sector through its adoption in electricity distribution billing. KP has been using prepaid meters to bill its' customers since year 2009 and has seen its use gain ground especially among the company's domestic consumers. KP made optional the use of prepaid meters to all consumers within its category of domestic tariffs apart from the pilot phase which covered selected electricity consumers. Ariel A. et al (2008) states that the same model of adoption was used by CELCA which is a power distribution company of Carmen de Areco in Buenos Aires, Argentina.

Historically, prepayment meters (PPM) go as far as back a hundred years with the very first manufactured meters coming from General Electric (GE) in 1899. These used coin for operations similar to the telephone booths that were operate in the same way. However, technology has resulted to the use of magnetic cards and even smart cards on PPM. The most recent ones make use keypad technology. The use of PPM is a global affair as they can be found in countries such as the UK and South Africa where the use of modern day PPM is prevalent. Other nations that use similar system to deliver power services include USA, Argentina, France, New Zealand, Poland, Israel, Malaysia, India, Bangladesh, Kuwait, Zimbabwe, Nigeria and Brunei (Eskom, 2002).

1.1.2 Efficiency Level

For utilities, there are six factors in customer satisfaction: power quality, reliability, billing and payments, communication, customer service, and then also corporate citizenship. These factors explain the efficiency level and all have a direct impact on customer satisfaction. Lauren et. al (2011) explains that efficiency is a customer centered

culture whose aim is to meet and exceed the expectations of clients and the creation of great value through provision of quality products and the use of performance skills. Faruqui et al., 2010 studies such competencies by stating that prepaid electricity meters (PEM) enables the customer to consume power by paying in advance through purchase electricity token and then loading into their meter hence enabling the electricity supply to flow as long as the meter is on debit. The electricity will automatically disconnect when the balance is zero. However, there are mechanisms that have been put in place to remind the customer when the balance in almost depleted such as unique lighting or specific audible sound. PEM has a visual display that shows the token balance in Kilowatt Hours (KWH) remaining in the meter. The PEM are usually located at easily accessible and secure areas such as inside the customer premises or the house. On the other hand, conventional or postpaid meter is where the customer consumes electricity and then the meter is read periodically. A bill is generated and sent to the customer after whom they are expected to pay, usually before a grace period offered by the utility company to pay has lapsed.

1.1.3 Importance of Prepaid Metering

Ariel A. et al (2008) states that the fact that under prepaid metering payment is made prior to the consumption, it can provide a means of providing flexible payment options to those customers who might have low or unreliable sources of income while minimizing the cost to the provider of the service. Additionally, the research pointed out that the use of this system can help the consumer know the amount of energy he or she uses making it easier to control; and budget for the needed energy (Ariel A. et. al., 2008) . Kenya Power (2017/2018) shows that it has slightly above five million customers out of which a third are on prepaid meters with the rest being on postpaid meters. PPM is only used for low energy consumption customers commonly referred as domestic consumers. The purpose of PPM is to increase accuracy in billing process thereby reducing losses and customer queries related to electricity billing. Mathenge, (2015) studied the impact of prepaid meters on customer satisfaction in Thika Sub-County. The findings of the study showed PPM enabled customers conveniently monitor their electricity consumption thereby avoiding erroneous billings.

1.2 Statement of the Problem

Yoon et. al. (2015) points out that most organization hope to satisfy their customers by provision of quality and improved products and services the electrical power provision firms included. Although different power companies globally may have different management structures, they should all strive to improve customer satisfaction levels by providing quality power services if they want to have a competitive and sustainable advantage (Sung-Yoon et. al., 2015). Kenya Power (KP) Company Limited solely used post-paid metering as the method of billing its customers until the year 2009 when it introduced the PPM system as part of the ways to improve on customer satisfaction and gain competitive advantage especially among its domestic consumers category. Previous studies on prepaid metering of electricity services have presented varied impact on electricity consumers' level of satisfaction. In Kenya, the studies have concentrated in peri-urban areas with demographic limitations (Mathenge, 2015). Such studies however do not adequately represent consumers' satisfaction level with the prepaid metering system in urban areas such as Nairobi County due to differences in demographics, socio-economic factors and number of customers connected to electricity power. According to Kenya Power (2017/2018), Nairobi County accounts for nearly 50 percent of the company's customers. This impact directly on the revenue stream for Kenya Power. This study sought to explore the effect of pre-paid electricity metering by Kenya Power on customer satisfaction in Nairobi County.

1.3 Research Objectives

1.3.1 General Objective

The core objective of this research was to deduce the impact of prepaid electricity metering system on customer satisfaction in Nairobi County.

1.3.2 Specific Objectives

The specific objectives of the study were as follows:

1. To explore the level of adoption of Pre-paid meters among electricity customers
2. To evaluate perceptive efficiency level of prepaid electricity metering system on customer satisfaction
3. To determine the perceived benefits of prepaid electricity metering system to KP customers

1.4 Research Questions

The study sought to answer the following questions:

1. What is the level of adoption of prepaid electricity metering system among KP customers?
2. What is the perceptive efficiency level of prepaid electricity metering system among KP customers?
3. What are the perceived benefits of prepaid electricity metering system to KP customers?

1.5 Significance of the study

The study provides an appreciation of the prepaid metering and in particular that for the electricity energy sector. In this case, the findings and recommendations of this study may be of importance in that the Kenya power and KPLC may be able to review policies or guidelines towards adoption and use of prepaid meters or improve the metering system to enhance customer satisfaction.

The results of this study maybe significant to the government especially through the ministry concerned with the regulation and/or consumption of electricity in Kenya, be it prepaid or post paid consumers. In this case, the results may help the government and

other policy makers draw up more policies towards enhancing adoption, efficiency and benefits of the products and services offered by the energy sector.

Study findings will be helpful to not only the electricity energy consumers to know the benefits that accrue through the use of PPMs but Kenya Power and similar utility companies may also use results of the study to improve on customer service in their prepaid billing system.

Other researchers and academic institutions may also use this study as a resource document through knowledge gaps proposed, to provide more insights on the proposed area of study. In this case, the findings may form the literature foundations or the background arguments in their research.

1.6 Limitation of Study

The study was limited to Nairobi County with the respondents being Kenya Power staff and electricity energy consumers in Nairobi County.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter gives the theories used for the study and also an empirical review of past studies related to the topic under study. Further, a conceptual framework is also presented.

2.2 Theoretical Literature

2.2.1 Service Loyalty Theory

The Service Loyalty Theory was proposed and crafted by Gilbert and Horsnell (1988). Loyalty is a word that defines a passionate devotion to a person, cause or country (Agyei & Kilika, 2013). Gilbert and Horsnell (1988) firms view loyalty to their service and products as important making it part of their strategic processes since it is easier and cheaper to retain an existing customer than to attract new ones. According to Caruana (1999), there has been debate on the level of customer repurchase behaviour based on past experiences as a means of ascertaining their brand loyalty. This has led to the evolution of the service loyalty theory which attempts to link the bottom line effect of the persuasion to repurchase based on the previous experience by a customer. Service quality results from the comparison made by the customer between their expectations when it comes to the product and what they find in reality. Caruana (1999) points out that previous research focused more on the behaviors outcomes of consumers and failed to look at the customer's considerations that happened in their minds. Caruana (1999) thus explains that service quality results from the comparisons made by customers between their expectations on a product and the reality of how the product performs.

This theory is applicable and informs this study because it supports the variable on adoption levels of the prepaid metering system. This study assessed how the customers have embraced the adoption of the PPM service and to this end gets their feedback on whether this has led to improved service quality. The level of adoption and the perceived benefits of the PPM services will be able to give an insight into the impact of service loyalty levels.

2.2.2 Theory of Planning Behavior (TPB)

The theory of planned behavior was proposed by Icek Ajzen in 1985 through his article "From intentions to actions: A theory of planned behavior." The theory was developed from the theory of reasoned action, which was proposed by Martin Fishbein together with Icek Ajzen in 1980. The model explains how a person continues to use online services and it gets its concepts from planned behavior and the expectation disconfirmation model. It explains that the behavior of the consumer on the use of technology depends on perceived ease of use, perceived usefulness and perceived enjoyment when it comes to the new product or service (Chen Chen Liao, et al.2007). The theory argues that both behavioral attitude and subjective norm affect behavioral intention, and this impact on the actual behavior.

This theory informs the need to consider and promote consumer behavior towards prepaid meters adoption, attitude towards the process and utility efficiency as well as the associated benefits as stipulated in the objectives. This study considered the efficiency levels and benefits of PPMs hence an opportunity to test the applicability and relevance of this theory in the study. It also examined and assessed the intentional and behavioural patterns of the electricity consumers in Nairobi County.

2.3 Empirical Literature

2.3.1 Adoption of Prepaid Electricity Meters

The World Banks' State of Electrification Access Report (2017) which examines critical role of energy towards attainment of Sustainable Development goals (SDGs), argues that the world is not moving fast enough towards reaching its universal electricity access by the year 2030. It points out that sub-Saharan Africa is one of the regions that lag behind in this ambition and in order to bridge this gap with the developed world, there is need to employ emerging and innovative service delivery models. Prepaid electricity metering is one of these models. Under electricity prepayment metering system, the consumer purchases the energy tokens beforehand by buying them from the power vendors. Once the bought units are over, the power disconnects. The customer gets the connection back when he buys more tokens and recharges the meter (Ogujor, 2007). As Ganiyu & Lukman (2015) explain, power is an important basic need by most people. It is not only used for domestic purposes but also in industries and in provision of agricultural products. According to Obafeni and Eugene (2013) most of the electricity meters are calibrated in

kilowatt hours, which is equal to the energy used per kilowatt for a period of one hour. Further, the study pointed out that the meters also constantly quantifies the instantaneous voltage (volts) and currents (amperes). Kelsey & Grant (2016) argue that PEM offer a technical solution to non-payment problem and its adoption in expanding across Africa and south Asia. They further state that several countries in Africa all new connections will use PEM while the same are already in use in developed countries such as New Zealand, the UK and Northern Ireland. In Kenya, the adoption of PEM has gained some ground with already over 3 million customers connected on this platform (KP Website). As per KP, new domestic consumer customers currently are being connected to both the prepaid and postpaid electricity meters. The question however remains as to how much PEMs has been embraced by the electricity customers in Kenya. Mathenge (2015) attempted to explore this in a study done in Thika sub-County in Kenya and came up with some level of appreciation by the customers. However, this represents a smaller number of customer currently connected to PEM in Kenya hence the need to have the same assertion tasted in Nairobi County which accounts for more than fifty percent of customers on PEM (Kenya Power, 2017/2018).

2.3.2 Benefits of Prepaid Electricity Meters (PEM)

Kelsey & Gant (2016) explains some of these benefits that come with the use of prepaid meters. The study argues that it generates revenue in advance of consumption hence cutting down on non-payment or late payment of electricity bills. The study further argues that PEM eliminates the need to send meter readers to take the actual reading besides reduced cases of bribery in South Africa. Further, the study established the relationship between the practice of project management and performance of PPMs. It was shown that like a typical project, proper execution is crucial to the PPM's success.

Eskom (2002) discussed the benefits that utility companies derive from the adoption of prepaid meters. The nature of customer base in South Africa is such that the numbers of domestic customers are more than the bulk power consumers. However, the large power customers are the main source of revenue. Consequently, Eskom (2002) argues that it makes more business sense to invest more resources in the bulk power consumers. This led to introduction of prepaid meters to address the challenges attributed to managing the domestic consumers such as cost of meter reading for postpaid meters, erroneous billings and delayed settlement of bills. These challenges have now been addressed by the

adoption of prepaid meters. In light of above literature, there is need to establish the advantages of using the prepaid electricity meters in Kenya.

A study conducted by Ganiyu & Lukman (2015) reported that consumers were happy that modern prepaid electricity meters offer benefits to both tenants and landlords and property managers. There is a major drive by Eskom throughout South Africa, to get more properties and households fitted with prepaid meters, and to educate consumers on the great advantages that these meters offer. With regards to tenants, prepaid electricity meters help them to monitor their electricity consumption, by checking the easy to read monitor and adjusting their consumption as required. They are also able to budget in advance, so that there is never an instance where consumers are surprised by a large electricity bill at the end of the month.

According to study by Malama, Mudenda, Ng'ombe & Makashini (2014), tenants indicated that they were assured of a continuous supply since one only pays for the correct amount of electricity they are consuming. Using a prepaid meter allowed one to save electricity, which in -turn leads to saving money: tenants will never get an unexpected, exaggerated electricity bill! Therefore, one of the big advantages of prepaid electricity is that it enables to manage one's cash flow and allocate costs properly.

2.3.3 Customer Satisfaction

Energy is one of the key regulators of the interaction between nature and humans. Many environmental issues that lead to negative consequences for society, the economy and the sustainability of the environment are connected with the production, transformation, and use of energy (World Bank, 2017). The report further states that efficient treatment of these issues is a vital necessity. Therefore, the need for ecologically friendly and cleaner forms of energy is becoming more and more imperative. As a result of the big changes in the global energy system coming from the above needs—which will take place in the following decades, renewable sources of energy are expected to be the grand victors in the race for the increasing energy demand supply. Despite the fact that natural gas is not a renewable source of energy, it is relatively cleaner than its alternatives. Thus, during the last decades, the demand for both renewable and cleaner sources of energy has increased considerably both on the retail and industrial customer level. The quality of the services provided by the clean energy supply companies and the satisfaction of their customers, have been particularly important for them during the last few years. Therefore, for the

energy supply companies, the measurement of their customers' satisfaction is a contemporary tool for strategic planning, capable of creating the necessary conditions for their survival and development.

It is widely known to both the companies and the consumers, that customer satisfaction is one of the most significant factors that can guarantee success. Day by day, consumers become increasingly more demanding for the quality of products and services they receive. They demand that the product or the service they pay for, fulfills their needs, is of high quality and is also offered at an affordable price. Furthermore, it is a fact that every company, regardless of the field in which it operates, must find ways to keep its customers and attract new ones, while at the same time being competitive and profitable. As customers have access to more information nowadays, they become more flexible in their decisions and have more choices than ever before, it is even more important for companies to earn their trust. Furthermore, today's consumers have an educational level that allows them to judge any product or service they pay for, while they demand the best possible products and services at the same time. Consequently, a company that meets or even exceeds their customers' expectations has a significant competitive advantage.

2.3.4 Effect of Prepaid Meters on Customer Satisfaction

According to Mohammad & Mohammed (2012), Customer satisfaction (CS) has been an essential concept since the 1950s to modern day. For most of the studies CS is not evaluated but the researchers seek to understand the rationale behind the retention of customers since the observation has been that, satisfied customers are more loyal which means they are likely to buy the same product again and will keep on coming back to the same service provider. On the other hand, customers whose expectations are not met will stop buying the product or seek for an alternative substitute (Mohammad & Mohammed, 2012).

Taylor & Francis (2008) studied the effects of prepaid meters on consumers by describing the reaction of a protester at Civic Centre in Braamfontein near the center of Johannesburg in which pointed out that consumers had to prepay for almost all services from electricity to water to telephone services and the protesters complained that it may come a time when they would have to prepay for the sun too. The protest was against the construction of an urban prepaid water project in the city. On the other hand, In-home Displays (IHDs) is hailed as revolutionary in terms of the feedback in electricity market

in the United States of America by the consumers (Ahmed Faruqui, et. al). IHDs give real time feedback on how the use energy in terms of energy and monetary units. These two scenarios depict the extreme or diverse impact of prepaid meters across different geographical set ups and variety of utilities.

Tewari and Tushaar (2003) enumerate several benefits enjoyed by electricity energy consumers metered through the prepayment system. These benefits include the ability of users to be able to monitor consumption using prepaid meters and to avoid wastage of electricity through careless use of electrical appliances. This leads to lower costs of expenditure on electricity. Malama, et.al (2014) studied the effect of PPM on the behavior of electricity consumers in the second largest city in Zambia, Kitwe. The study acknowledged change in consumer behavior with the introduction of electricity prepaid metering system. The study shares the challenges and benefits of using PPM in Zambia which indicates that whereas there are several benefits of the system, it does come with its fair share of challenges such as electricity theft hence occasioning losses to the utility company.

In some instances, there could be indirect and direct monetary cost to the customer. Quayson-Dadzie (2012) discusses the scenario where customers changing to the PEM are required to pay for the same hence being a direct cost to them. The study also argues that there could be savings if patterns of use change due to the ability to monitor consumption. Also, customers shifting from postpaid platform are used to making once end of month payment, PEM may imply frequent and several payments within the month. In the research, customer satisfaction was quantified by a review of the perceptive efficiency levels, perceived benefits and adoption levels. The customer satisfaction level was brought out by the view expressed by respondents on the three variables.

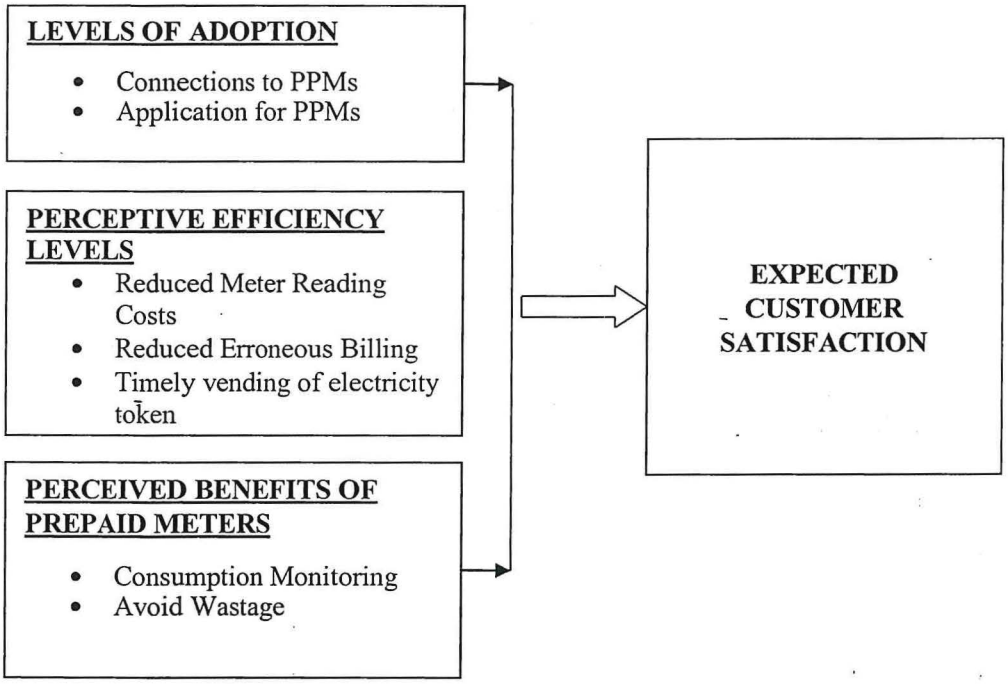
2.4 Research Gap

Previous studies carried out have considered the benefits enjoyed by the consumers of electricity (Tewari & Tushaar, 2003) and the utility company on history of PPM system (Eskom, 2002).This study explored if similar benefits like those cited in the literature review are enjoyed by the KP consumers in Kenya and also pick out any other more benefits that consumers enjoy through use of prepaid electricity meters. The study also explored if KP customers have had the advantages as discussed in the literature review.

Most studies have been outside Kenya while those done locally had not been carried out in Nairobi County which accounts for over fifty percent of KP business.

2.5 Conceptual Framework

The conceptual framework for this study considered levels of adoption, efficiency levels and benefits to electricity consumers derived from prepaid metering system and how these independent variables impact on customer satisfaction as shown in figure 2.1 below.



Independent Variables **Dependent Variable**

Figure 2.1: Conceptual Framework
Source: Researcher, 2019

2.6 Definition of Measurements and Variables Framework

The table 2.1 below presents the definition variables and their respective measurements as used in the study.

Table 2.1: Summary of Variables and Measurements

	Variable	Measurement
1	Expected Customer Satisfaction	Extent to which it is affected by levels of adoption, efficiency levels and accruing benefits
2	Connections to PPMs	Percentage of total electricity customers connected to PPMs since its introduction in Kenya
3	Application for PPMs	Percentage of existing electricity customers who have applied for conversion to PEM
4	Reduced Meter Reading Costs	Amounts saved on meter reading expenditure
5	Reduced Erroneous Billing	Percentage of accuracy in the billing process.
6	Timely Vending of Electricity token	Turnaround time from purchase to generation of electricity token.
7	Consumption monitoring	Percentage of electricity energy customers who are able to know their monthly usage.
8	Extent of wastage	Percentage of electricity energy customers able to use energy saving appliances.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives the methodology the research used to do the study. It consists of different sections including the design of the research, sampling and study population, the collection of data and its analysis, the quality of research and the ethical consideration adhered to.

3.2 Research Design

Research design explains the strategic plan used in the answering of research questions (Mark et. al., 2016). The researcher comes up with a strategy and a plan on how he is going to choose the sources and data that will help in answering the research questions and meeting the goal of the study. This study used descriptive research design approach. Descriptive research responds to questions that relates to when, where, who, what and how they are linked to specific research questions. Therefore, it attempts to assemble irrefutable and quantifiable information that can statistically analyze a set of predetermined subject or audience. Descriptive research is helpful when describing and observing a phenomenon or a research subject without altering the variable(s) in any case. Descriptive research design approach help in gathering information about the impact of prepaid electricity metering system on customer satisfaction in Nairobi County.

3.3 Population and Sampling Design

3.3.1 Population

A population is made up of the total persons or elements in a given unit that the researcher intends to get the study data from (Mark et. al., 2016). The study's population was the domestic electricity consumers in Nairobi County, Kenya. KP has a total of 2,235,010 electricity customers in Nairobi (Kenya Power, 2017/2018).

3.3.2 Sampling Design

This is the choosing of a sample that represents the total population (Mark et. al., 2016). The study's target population was Nairobi county based electricity consumers. The non-probability sampling method in two stages helped choose the study sample. The study used purposive and random sampling techniques in selecting specific respondents for the survey. According to Kenya Power (2017/2018), Nairobi County is divided into three KP

regions hence the sample was drawn from each of the regions to increase the participation rates. The Three KP regions in Nairobi County are Nairobi North, Nairobi South, and Nairobi West. In order to determining the sample size for large populations sizes, (Cochran, 1977) developed a formula for determining a representative sample for population proportions using a 95% degree of confidence and a ±5% margin of error. The aim of calculations shown below was to determine an adequate sample size which can estimate results for the whole population with a good precision.

$ME = z\sqrt{p(1-p)/n}$

Where: n = the desired sample size

ME= desired margin of error

z = the standard normal deviate at the required confidence level. z is the z-score 1.96 for a 95% confidence interval

p = the part of the population that is estimated to contain the traits being quantified. Estimated at 50%.

q = 1 – p.

e = Margin of error

$ME = 1.96\sqrt{0.5\ (1-0.5)/n}$

$n = (0.5)^2/1.96$

$= 0.065077$

$= 0.5 \times 0.5/0.065077$

$= 3.8416$ (multiply by a 100)

$= 384.16 \cong 385$ Persons.

The representative mean sample population size is established to be 385 persons. As depicted in Table 3.2 in next page, the 385 that are to be randomly selected are clustered and proportionally distributed across the study area KP regions. In other words, the study was to draw inference or generalize about the population from the sample data.

Table 3.2: Sample Electricity Consumers Cluster Distribution

Region	Total population	Sample Target Population Distribution
Nairobi North	759,903	131
Nairobi South	819,603	141
Nairobi West	655,504	113
Total	2,235,010	385

Source: Author, 2019

Thus, our sample size representing the population under study was 385 residential and non-residential electricity consumers. The consumers from industries were not included in this sample since their energy use is too high and they do not use the prepaid meters as part of their power consumption.

3.4 Data Collection

A questionnaire was the research tool that helped collect raw data (see attached Appendix I). The research tool was divided into three sections. The first section sought demographic data from the participants while the subsequent sections sought data related to the study's research questions. The questionnaires were either completed by the interviewer or the respondents depending on convenience to the respondents and also their literacy level as assessed by the research assistants. The use of the two methods provided in depth data on customer satisfaction when using prepaid meters. This research also review KPs strategic reports and annual financial statements since the implementation of prepaid meters to determine the number of customers connected to PPMs as part of addressing level of adoption. The researcher made use of 3 research assistance who were first acquainted on the need and importance of the study as well as the queries the respondents were answer as the only method for data collection.

3.5 Data Analysis

This is the interpretation of data into information that can be understood. Both inferential and descriptive statistics helped analyze the raw data. Exploratory data analysis was carried out using tables and graphs to present data. In particular, to achieve the objectives, descriptive statistical methods were used to analyze the level of adoption of the prepaid meters among KPs domestic customers. In instances of nominal scale questions, the data analysis was done with the help of bar graphs, pie charts and frequency tables. In case the

Likert scale was used for the questions answers, the results from the different questions answers was evaluated. For instance the percentage number of participants who agreed with a certain statement and this data presented in form of a pie chart. The open ended questions results were coded and divided into different categories and similar themes and patterns were provided from the data results. Besides the inferential statistics like regression analysis, other forms of analysis such as KMO Bartlett test and Factor analysis were computed to establish the association between the dependent and the independent variables. The efficiency levels of and perceived benefits prepaid meters have been measured using KMO Bartlett test and Factor analysis.

3.6 Research Quality

3.6.1 Validity

It is the ability of a research tool to quantify what it is expected to quantify. A pilot test was done to ensure the validity and reliability of the research instrument. The sample for the pre-test was made up of 50 KP members of staff who were used to help improve on internal and face validity of the constructed questions. Concerning, content validity, the researcher sought the opinion of the immediate supervisors and experts in the area of study. In this case the validity, relevance and suitability of the queries asked on the research instrument and how effective they were in meeting the objectives of the study were determined and the researcher advised accordingly.

3.6.2 Reliability

According to Donald (2006) a pilot study, is a pre-test research carried out in small scale to assess time, feasibility, cost, and difficult scenarios and also to allow improvement on the validity and reliability of the research before the main study can be conducted. Reliability is the measure of the provision of consistent outcomes by a research tool. To improve the questionnaire reliability, the queries were clear and if there was need for an explanation it was given. This allowed the participants to be well versed with the expectation of the researcher. Reliability test was conducted where the Cronbach alphas were computed to attest for the raised questions in Likert scale for objectives 1 and 2. A reliability coefficient r=0.78 was achieved which is acceptable as pointed out by Kothari (2011). Cronbach alpha also helped quantify the reliability of the measures used for the constructs of the research. Reliability is the extent to which similar measures produce consistent and the sane outcomes. The alpha lies between 0 & 1. The rule of thumb for

the coefficients; $\alpha > 0:9$, Excellent, $\alpha > 0:8$, Good, $\alpha > 0:7$, Acceptable, $\alpha > 0:6$, Questionable, $\alpha > 0:5$, Poor and $\alpha < 0:5$, Unacceptable. A higher alpha denotes a good internal consistency of the measures. In this case, all Cronbach values obtained were above 0.7 for all the multiple Likert Scale questions. The Table 2.3 below presents a summary of the questions reliability test conducted.

Table 2.3: Reliability Statistics

Reliability Statistics	Cronbach's Alpha	N of Items
Perceived Benefits	0.865	5
Perceptive Efficiency	0.781	4

3.6.3 Objectivity

Objectivity is the extent of the results being free from bias. The objectivity of the study was improved by conducting the research using different research assistants and participants. In addition, one on one interview was conducted to approve or disapprove data obtained through use of the questionnaires.

3.7 Ethical Consideration

Any ethical issues arising from this study were considered. Behavioral standards were adhered to and used as a guide when it came to ensuring the participants' rights were met. The data collection, analysis and reporting processes were done with a lot of accuracy and the respondents were made aware of the goal and the process of the research. Permission was sought from KP as may be required in order to give access or permission to access or have any data required for the purposes of this study from its staff especially those that may not already be in the public domain.

CHAPTER FOUR: DATA ANALYSIS, INTERPRETATION AND PRESENTATION

4.1 Introduction

This chapter presents the data analysis, presentation and of findings on the effects of prepaid electricity metering system on customer satisfaction in Nairobi County. The specific objectives of the study were: to explore the level of adoption of Pre-paid meters among electricity customers, to evaluate perceptive efficiency level of prepaid electricity metering system on customer satisfaction; and; to determine the perceived benefits of prepaid electricity metering system to KP customers. The analysis was done in tandem with the research objectives.

4.2 Response Rate

The Table 4.4 below presents the response rate of the study.

Table 4.4: Response Rate

Status	Frequency	Percentage
Responded	308	80
Not responded	77	20
Total	385	100

The researcher distributed a total of 385 questionnaires. Out of these, a total of 308 respondents filled in and returned the questionnaires whereas 77 questionnaires were never returned or were returned in a faulty mode. This gave the study a response rate of 80% which is adequate according to Kothari (2011) who advocates that a response rate of 75% or above is adequate for a given research.

4.3 General Information of the Respondents

The section below presents the general information of the respondents with regard to gender, age, level of education and so on.

4.3.1 Gender of the Respondents

The researcher sought the participants' gender.

Table 4.5: Gender of Respondents

Gender	Frequency	Percentage
Male	181	59
Female	127	41
Total	308	100

The outcome showed that, 59% of the respondents were male while 41% were female respectively. This was a clear indication that the researcher tried as much as possible to reach out to both genders to avoid gender bias in the research as well receive divergent views related to the raised research questions. The data is as shown in the figure below;

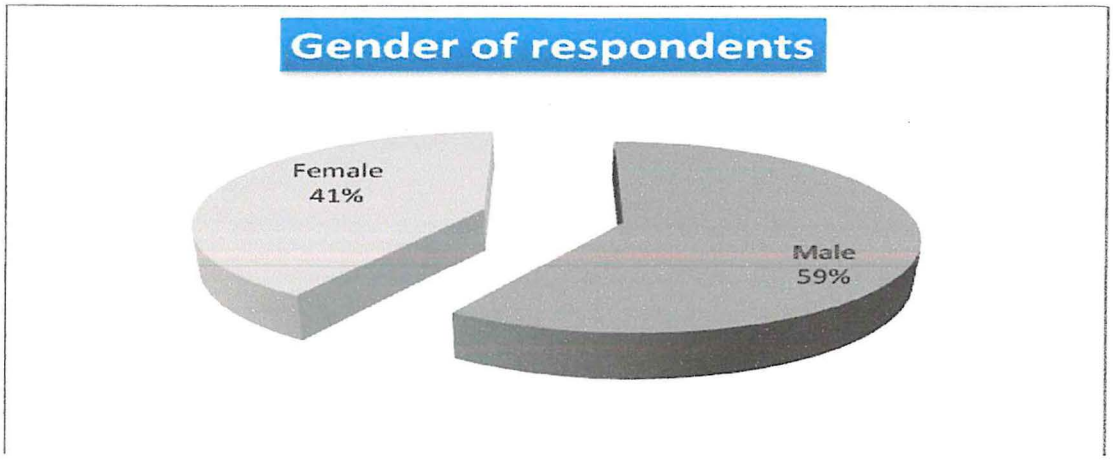


Figure 4.2: Gender of the Respondents

4.3.2 Age bracket of the respondents

The study sought the age bracket of the participants. The results are displayed in the Table 4.6 below;

Table 4.6: Age bracket of Respondents

Age bracket of respondents	Frequency	Percentage
18-30 years	110	36
31 -40 years	180	58
41-60 years	18	6
Total	308	100.0

The results revealed that, 58% of the respondents were aged between 31-40 years, 36% said between 18-60 years, whereas 6% indicated that they were aged between 41-60 years.

4.3.3 Education level of Respondents

The researcher was interested in finding out the respondents' level of education. The results are shown in the Table 4.7.

Table 4.7: Education level of Respondents

Level	Frequency	Percentage
Secondary	241	78
Diploma	31	10
Undergraduate	28	9
Postgraduate	8	3
Total	**308**	**100**

According to the findings displayed in Table 4.7, 78% of the respondents indicated that they had secondary level education, 10% said they had diploma certificates, 9% had undergraduate degrees whereas a few as shown by 3% indicated that they had postgraduate degrees respectively. This was a clear indication that most of the citizens reached were adequately educated to understand and express their level of satisfaction relative to the raised research questions. The same information is presented in the Figure 4.3 below;

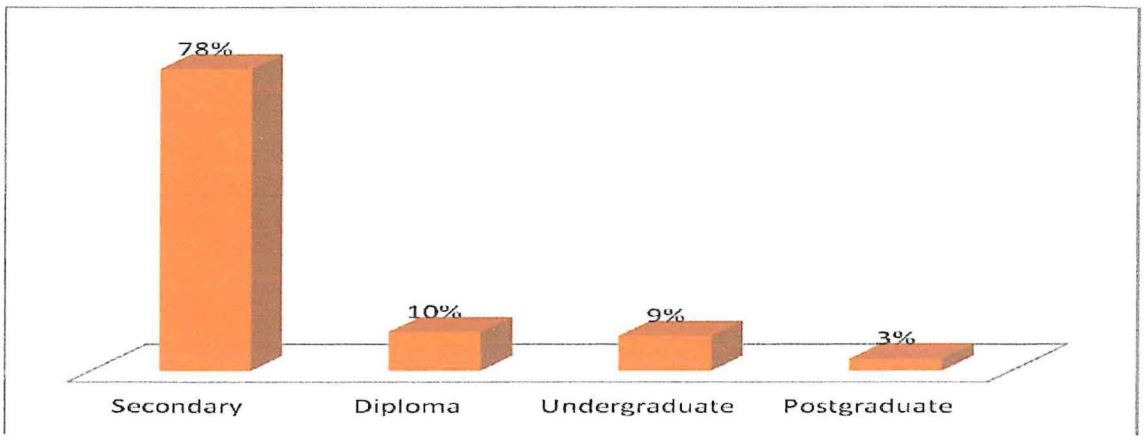


Figure 4.3: Education level of Respondents

4.3.4 Occupation of the Respondents

The table 4.8 below presents the results on the occupation of respondents sampled in the study.

Table 4.8: Occupation of Respondents

Occupation	Frequency	Percentage
Self Employed	216	70
Employed	74	24
Students	18	6

According to the results, 70% of the respondents indicated that they were self-employed, 24% said that they were employed whereas the rest as shown by 6% said that they were students respectively. This was a clear indication that the researcher was able to balance between employed and self-employed in analyzing divergent views or opinions with regard to the raised research questions. The same information on education level of respondents is presented in the figure 4.4 below;

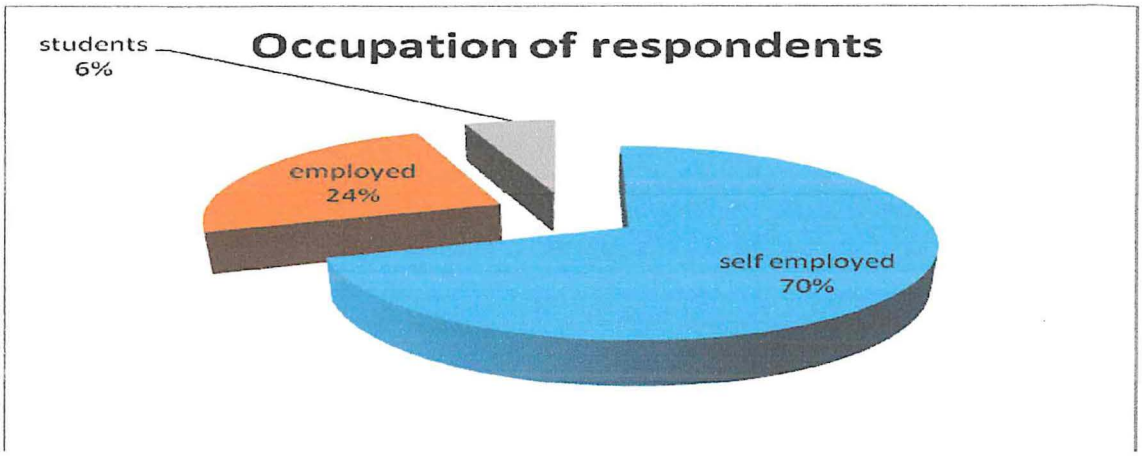


Figure 4.4: Occupation of Respondents

4.4 Level of Adoption of Pre-Paid Electricity Meter

The researcher wanted to establish whether the respondents ever used prepaid electricity meter. The findings are displayed in the table 4.9 below;

Table 4.9: Whether respondent ever used Prepaid Electricity Meter

Response	Frequency	Percentage
Yes	279	91
No	29	9
Total	308	100.0

According to the findings, 91% of the respondents indicated that they ever used electricity meters in the recent past. Only a few of the respondents as shown by 9% said they had never used pre-paid electricity meters. This information is also as shown in the Figure 4.5 below;

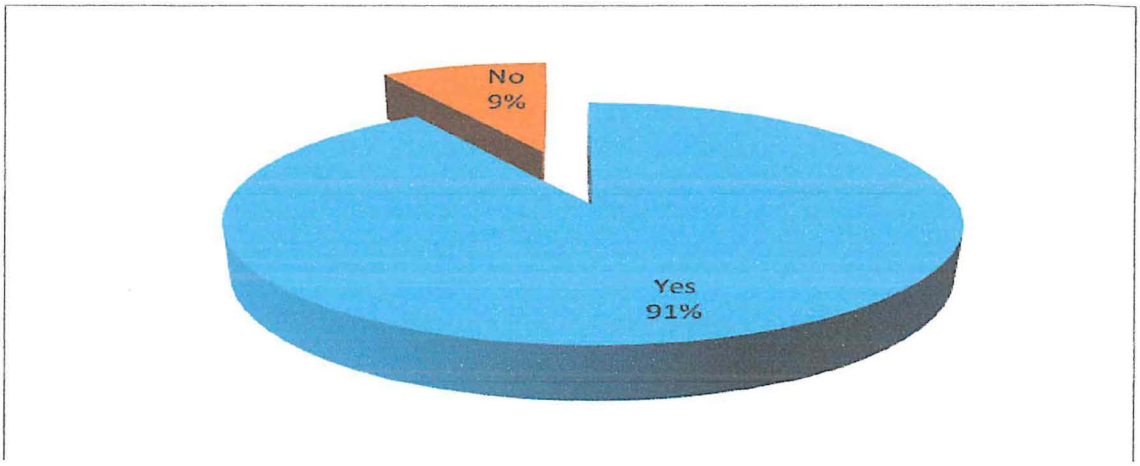


Figure 4.5: Whether respondent ever used Prepaid Electricity Meter

The Table 4.10 above depicts findings on monthly average electricity consumption (in Kshs) according to respondents.

Table 4.10: Monthly average electricity consumption (in Kshs) according to respondents

Monthly average electricity consumption (in Kshs)	Frequency	Percentage
Ksh 500 and below	72	23
Ksh 501-2500	146	47
Ksh 2501-4500	72	23
Above 4500	18	6
Total	308	100

According o the results, 47% of the respondents said that they consumed as average of between Ksh 501-2500, 23% said Ksh500 and below, 23% said Ksh 2501-4500 whereas 6% said above Ksh4500 respectively. The same information is displayed in the figure below;

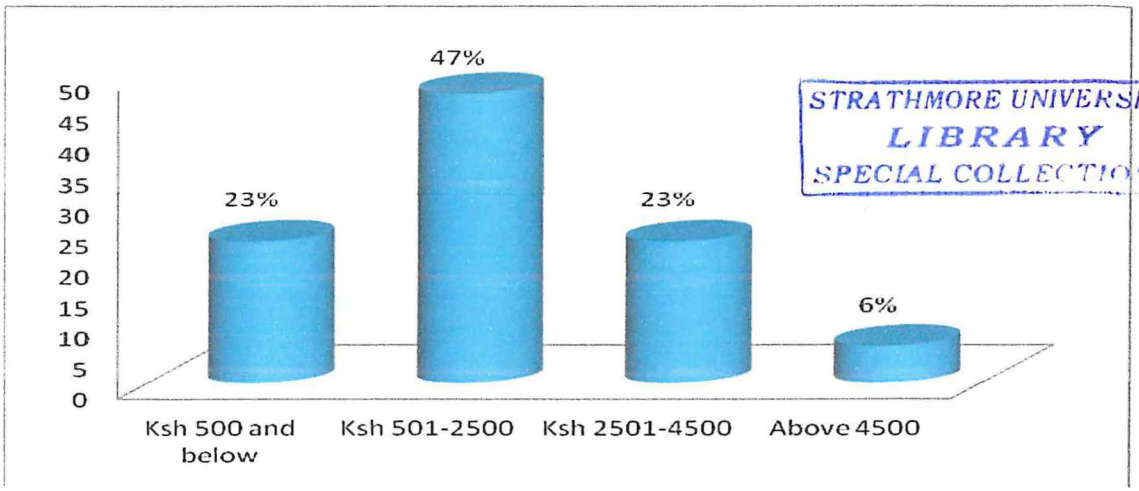


Figure 4.6: Monthly average electricity consumption (in Kshs) according to respondents

The Table 4.11 above depicts findings of a cross tabulation between *Occupation of the respondent * monthly average electricity consumption (Ksh).

Table 4.11: Cross tabulation between *Occupation of the respondent * monthly average electricity consumption (Ksh)

		Monthly average electricity consumption (Ksh)				Total
		Ksh 500 and below	Ksh 501-2500	Ksh 2501-4500	above 4500	
Occupation of the respondent	self employed	54	73	72	18	217
	Students	0	18	0	0	18
	Employed	18	55	0	0	73
Total		72	146	72	18	308

According to the results displayed, it was clear that majority of the respondents who were self-employed had a monthly average electricity consumption of between Ksh 501-2500. This is well reflected by the high Chi-Square value of 73.409 shown in the Table 4.12 below.

Table 4.12: Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	73.409[a]	6	.000
Likelihood Ratio	99.483	6	.000
Linear-by-Linear Association	19.813	1	.000
N of Valid Cases	308		

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is 1.05.

The study wanted to establish whether respondents would like to continue using prepaid electricity meter.

Table 4.13: Whether respondents would like to continue using prepaid electricity meter

Response	Percentage	Frequency
Yes	271	88.0
No	37	12.0
Total	308	100.0

According to the findings, majority of the respondents as shown by 88% said that they would like to continue using prepaid electricity meters. Only a few 12% who indicated otherwise implying that the adoption and use of prepaid electricity meters was adequate. Respondents added that there were complains that most of the consumers had not yet applied for connection. The same information is also presented in the figure below;

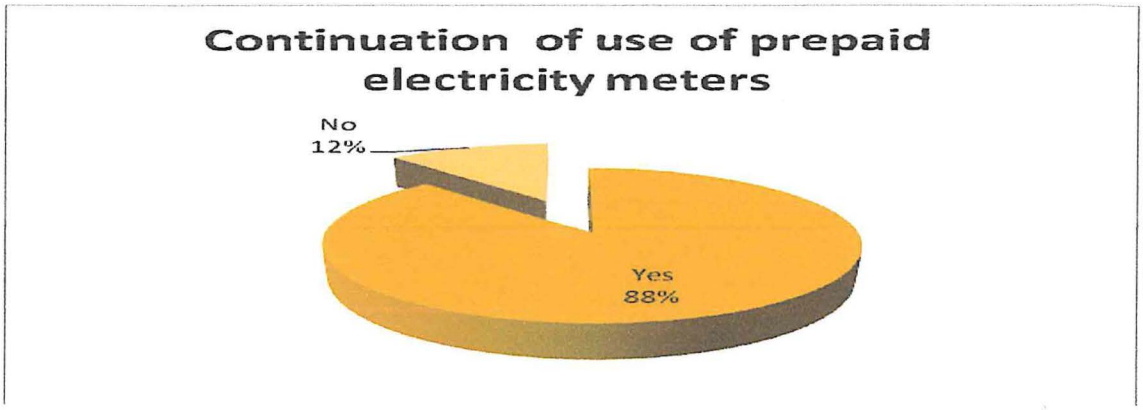


Figure 4.7: Whether respondents would like to continue using prepaid electricity meter

The study wanted to find out the duration respondents had used prepaid Electricity meter. The results are shown in the Figure 4.14 below;

Table 4.14: Duration respondents had used prepaid Electricity Meter

Duration of use of the Prepaid Electricity Meter	Percentage	Frequency
1-2 years	91	29.5
4-6 years	217	70.5
Total	308	100.0

According to the findings, majority of the respondents as shown by 71% indicated that they had used prepaid electricity for a period of 4-6 years while a few as shown by 30% had used the meters for a period of 1-2 years respectively. This information is also as shown in the Figure 4.8 below;

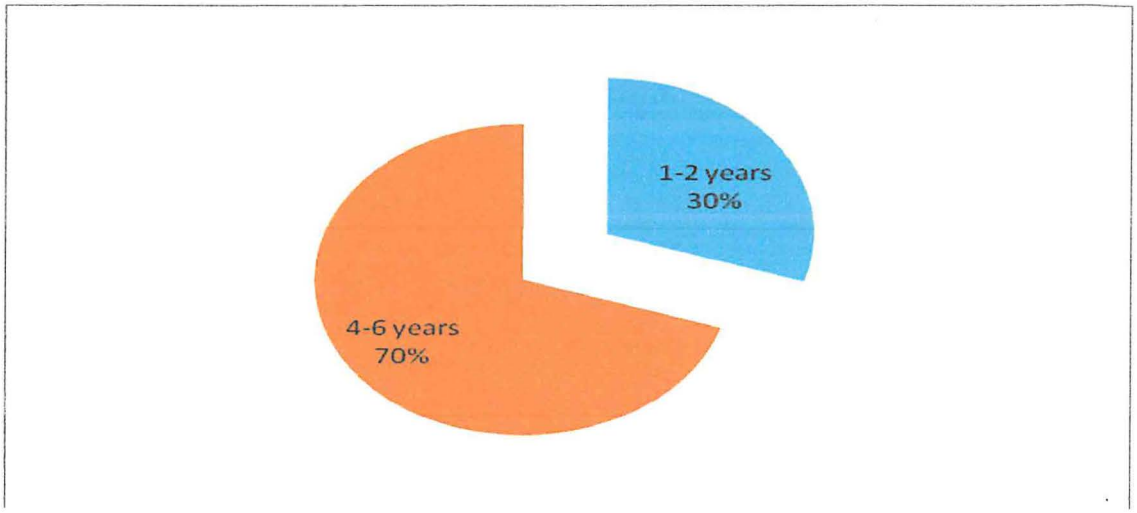


Figure 4.8: Duration respondents had used Prepaid Electricity Meter

The researcher sought the participants' frequency of buying prepaid tokens. The results are as shown in the Figure 4.15;

Table 4.15: How often respondents Buy Prepaid Electricity Token

Response	Frequency	Percentage
Weekly	92	30
Monthly	216	70
Total	308	100

The outcome showed that, majority of the respondents 70% indicated that they often buy tokens monthly whereas others indicated that bought tokens on weekly basis respectively. This data is also displayed in the Figure 4.9 below;

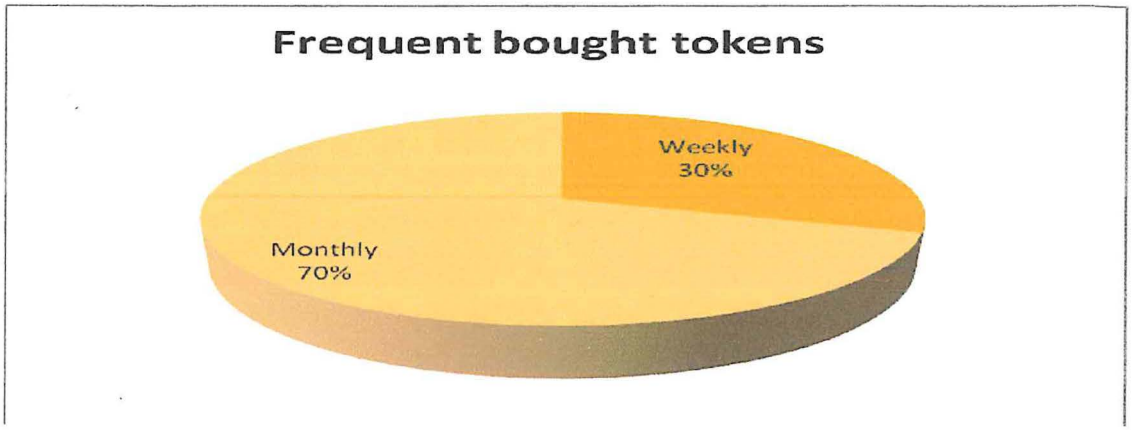


Figure 4.9: How often respondents Buy Prepaid Electricity Token

4.5 Perceptive Efficiency Level of Prepaid Electricity Meters

The second objective of the study was to "To evaluate perceptive efficiency level of prepaid electricity metering system on customer satisfaction". In this objective, frequency tables was used to describe the responses and explorative factor analysis was deployed to determine the main determinants that contribute to perceptive efficiency level of prepaid electricity metering system on customer satisfaction.

4.5.1 Descriptive Statistics

A set of five questions addressing perceptive efficiency levels was asked to the respondents and they were required to give their perception whether they, strongly agree, Agree, moderate agree, disagree or strongly disagree.

Table 4.16: Respondents' extent of agreement with statements describing the efficiency level of prepaid Meters

Statements	Strongly Agree (%)	Agree (%)	Moderately (%)	Disagree (%)	Strongly Disagree (%)	Mean scores	Std .Dev
Prepaid electricity meter is accurate compared to postpaid meter	1	11	88	0	0	3.130	0.03254
Prepaid electricity meter failure rate is lower compared to postpaid meter	1	15	84	0	0	3.170	0.03259
Using of prepaid electricity meter has improved management of my monthly power consumption	2	15	79	2	0	3.110	0.03257
Kenya Power responds to my queries on prepaid electricity meter promptly	12	18	70	0	0	3.420	0.03258
I get prepaid electricity token promptly on purchase	4	24	66	6	0	3.260	0.03257

The Table 4.16 above depicts findings on respondents' extent of agreement with statements describing the efficiency level of prepaid Meters. The results show that most of the participants were in moderate agreement that prepaid electricity meter is accurate compared to postpaid meter as shown by 88%, prepaid electricity meter failure rate is lower compared to postpaid meter as shown by 84%, using of prepaid electricity meter has improved management of my monthly power consumption as shown by 79%, Kenya Power responds to consumers queries on prepaid electricity meter promptly as shown by 70% and that consumers get prepaid electricity token promptly on purchase as shown by 66% respectively.

4.5.2 Exploratory Factor Analysis

To evaluate perceptive efficiency level of prepaid electricity metering system on customer satisfaction, factor analysis was used to determine the most important factors on perceptive efficiency level of prepaid electricity metering system on customer satisfaction. The factors identified were used to evaluate perceptive efficiency level of prepaid electricity metering system on expected customer satisfaction. Factor analysis is a data reduction technique which is carried out using a correlation matrix of variables of interest. A set of variables are combined to a new smaller set of variables called factors. This factor represents a weighted mean of the original data which are latent variables, that is variables which cannot be observed. Factor analysis which uses principal component analysis and varimax rotation was used to extract factors subject to KMO, Barlett tests and an Eigen value cut off of 1.0 as shown in the diagnostics above,

4.5.3 Factors Extraction

Principal component analysis was used to identify variables that accounts for more variability and extracted new factors based on the total variance explained as shown in the table below.

Table 4.17: Total Variance explained

Total Variance Explained						
	Initial Eigen values			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.277	65.550	65.550	3.277	65.550	65.550
2	0.684	13.670	79.220			
3	0.506	10.116	89.336			
4	0.358	7.150	96.486			
5	0.176	3.514	100.000			
Extraction Method: Principal Component Analysis.						

In Table 4.17 above, the first columns depicts the factor analysis variables. The first Eigenvalues show the factors to be extracted variances. The first factor has the most variance that's why its Eigenvalues are the highest. The second variance takes up most of the remaining variance and this trend continues until we reach the last factor. The variance percentage is the variance total for each factor and the cumulative percentage is

the total variance percentage at present. The Table 4.17 indicates the extracted factors. The part written "Rotation Sums of Squared Loadings," indicate the factors that met the criterion of the extraction method. The results show only one factor had an Eigen value that was higher than 1. Factor 1 accounted for 65.55% of the variability in all the 5 variables; this factor explains 65.55% of the total variability. Since factor 1 accounts for most variability it meant that it constituted the main variables that influence of perceptive efficiency level of prepaid electricity metering system on customer satisfaction. From PCA were able to extract one component hence factor rotation wasn't necessary. The variables in the factor are shown in the Table 4.18 below.

Table 4.18: Component Matrix[a] by extraction Method

Component Matrix[a]	
	Factor 1
Prepaid electricity meter failure rate is lower compared to postpaid meter	0.843
Using of prepaid electricity meter has improved management of my monthly power consumption	0.838
Kenya Power responds to my queries on prepaid electricity meter promptly	0.817
Prepaid Electricity Meter is accurate compared to postpaid meter	0.808
I get Prepaid electricity token promptly on purchase	0.739
Extraction Method: Principal Component Analysis.	
a. 1 Components extracted.	

From Table 4.18 above, all the factors were found to be greater than 0.4, meaning that all the variables belonged with that factor. Therefore, it was concluded that all variables were key in accessing efficiency level of prepaid electricity metering system on expected customer satisfaction. Prepaid electricity meter failure rate is lower compared to postpaid meter was considered most important factor because it had the highest correlation with factor 1. Descriptive statistics based on variables in factor 1, were used to provide further perception of the respondents as shown in the Table 4.19 below.

Table 4.19: Descriptive statistics on variable in factor 1

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Prepaid electricity meter failure rate is lower compared to postpaid meter	308	1.00	5.00	2.9481	1.25971
Using of prepaid electricity meter has improved management of my monthly power consumption	308	1.00	5.00	3.2403	1.39359
Kenya power responds to my queries on prepaid electricity meter promptly	308	1.00	5.00	3.2922	1.17756
Prepaid electricity meter is accurate compared to postpaid meter	308	2.00	5.00	3.5422	1.02803
I get prepaid electricity token promptly on purchase	308	2.00	5.00	3.7662	0.93983
Valid N (listwise)	308			**3.3578**	**1.1597**

The average response for Prepaid electricity meter failure rate is lower compared to postpaid meter was 2.948 with a standard deviation of 1.26 which implies that most of the respondents moderately agreed that prepaid electricity meter failure rate is lower compared to postpaid meter. The average response for using of prepaid electricity meter has improved management of consumer's monthly power consumption was 3.24 with a standard deviation of 1.39 which implies that most of the respondent moderately agree that using of prepaid electricity meter has improved management of my monthly power consumption. The overall mean was 3.36 with a standard deviation of 1.16. This means that most of the respondents on average moderately agreed that expected customer satisfaction is dependent on efficiency level of prepaid electricity metering system.

4.6 Perceived Benefits and Use of Prepaid Electricity Meters

The third objective of the study was "To determine the perceived benefits of prepaid electricity metering system to KP customers" In this objective, frequency tables was used to describe the responses and explorative factor analysis was deployed to determine the main determinants that contribute to perceived benefits of prepaid electricity metering system to KP customers.

4.6.1 Descriptive Statistics

A set of five questions addressing perceptive efficiency levels was asked to the respondents and they were required to give their perception whether they, strongly Agree, Agree, Moderate Agree, Disagree or Strongly Disagree.

Table 4.20: Respondents' level of agreement on statements describing the benefits of use of Pre-paid Meters

Statements	Strongly Agree (%)	Agree (%)	Moderately agree (%)	Disagree (%)	Strongly Disagree (%)	Mean score	Std, Dev
Prepaid electricity meter is easy to use	2	6	88	2	2	3.04	0.03257
Prepaid electricity meter rates have no hidden charges	10	16	74	0	0	3.36	0.03257
Prepaid electricity token is easy to buy	10	23	66	1	0	3.42	0.03257
Use of prepaid electricity meter met my expectations	2	10	82	2	2	3.02	0.03257
I would recommend use of prepaid electricity meters to other electricity consumers not yet using the same	10	11	79	0	0	3.31	0.03257

The Table 4.20 above shows the results when it came to agreement levels to the statements on the benefits of use of prepaid meters. According to the findings, majority of the respondents moderately agreed that; prepaid electricity meter is easy to use as shown by 88%, prepaid electricity meter rates have no hidden charges as shown by 74%, prepaid electricity token is easy to buy as shown by 66%, use of prepaid electricity meter met consumer expectations as shown by 82% and that consumers would recommend use of prepaid electricity meters to other electricity consumers not yet using the same as shown by 79% respectively.

4.6.2 Exploratory Factor Analysis

To determine the perceived benefits of prepaid electricity metering system to KP customers, factor analysis helped evaluate the most essential factors on the perceived benefits of prepaid electricity metering system to KP customers. The factors identified were used to determine the perceived benefits of prepaid electricity metering system to KP customers.

4.6.3 Factors Extraction

Principal component analysis was used to identify variables that accounts for more variability and extracted new factors based on the total variance as shown in Table 4.21 below.

Table 4.21: Total Variance Explained

Total Variance Explained						
Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.468	49.365	49.365	2.468	49.365	49.365
2	1.115	22.299	71.665	1.115	22.299	71.665
3	0.650	12.998	84.663			
4	0.426	8.515	93.178			
5	0.341	6.822	100.000			
Extraction Method: Principal Component Analysis.						

In Table 4.21 above, there were two factors with Eigen-value greater than 1. Factor 1 accounted for 49.365% of the variability in all the 5 variables and factor 2 accounted for 22.299%. These factors explain 71.605% of the total variability. From PCA were able to extract two components hence factor rotation was performed. The variables in the factor are as shown in the table below.

Table 4.22: Component Matrix[a] by extraction Method

Rotated Component Matrix[a]		
	Factor 1	Factor 2
Use of prepaid electricity meter met my expectations	0.820	-
Prepaid electricity toke is easy to buy	0.810	-0.276
Prepaid electricity meter rates have no hidden charges	0.763	0.136
I would recommend use of prepaid electricity meters to other electricity consumers not yet using the same	0.734	0.331
Prepaid electricity meter is easy to use		0.964
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

The above Table 4.22 provides the variables correlation in relation to every one of the extracted factors. In most cases each variable is more loaded to one factor and less loaded to the other factors. To pinpoint the variable to be included in every factor, the variable with the highest value in each of the rows is chosen and included in the respective factor. These values are highlighted in every row to help group the 5 variables into 2 core factors. Therefore, the study concluded that factor 1 had use of prepaid electricity meter meet expectations, prepaid electricity token is easy to buy, prepaid electricity meter rates have no hidden charges and consumers would recommend use of prepaid electricity meters to other electricity consumers are not yet using the same and factor 2 which has only one component, contributes less. A summary of the two factors is provided in the table below. Descriptive statistics based on variables in factor 1, were used to provide further perception of the respondents as shown in the Table 4.23 below.

Table 4.23: Descriptive Statistics based on Variables in Factor 1

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Perceived Benefits Of Prepaid Meters	308	2	5	3.94	0.724
Prepaid electricity meter is easy to use	308	1	5	4.12	0.961
Valid N (listwise)	308				

The average response for perceived benefits of prepaid meters was 3.948 with a standard deviation of 0.726 which implies that most of the respondents agree that expected customer satisfaction depends on perceived benefits of prepaid electricity metering system to KP customers.

4.7 Respondents preference of prepaid meter to Postpaid Meter

In an open ended question, the study was to establish whether respondents prefer a prepaid meter to postpaid meter. According to the findings, most (88%) preferred and continued use of pre-paid meters) of the respondents said that they preferred a pre-paid meter more than a postpaid meter for the former had advantages related to cost saving, time, quantity among other benefits.

CHAPTER FIVE: DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusions and recommendations on the effects of prepaid electricity metering system on customer satisfaction in Nairobi County. The specific objectives of the study were; to explore the level of adoption of Pre-paid meters among electricity customers, to evaluate perceptive efficiency level of prepaid electricity metering system on customer satisfaction; and; to determine the perceived benefits of prepaid electricity metering system to KP customers.

5.2 Summary of findings

The following sections presents summary of findings based on the research objectives;

5.2.1 Level of Adoption of Pre-Paid Electricity Meter

The first objective of this study was to explore the level of adoption of Pre-paid meters among electricity customers. The study found out that majority of the respondents moderately agreed that; prepaid electricity meter is accurate compared to postpaid meter as shown by a mean score of 3.130 and a standard deviation of 0.03254, Prepaid electricity meter failure rate is lower compared to postpaid meter as shown by a mean score of 3.170 and a standard deviation of 0.03259, using of prepaid electricity meter has improved management of their monthly power consumption as shown by a mean score of 3.110 and a standard deviation of 0.03257, as shown by a mean score of Kenya Power responds to my queries on prepaid electricity meter promptly as shown by a mean score of 3.420 and a standard deviation of 0.03258 and that consumers get prepaid electricity token promptly on purchase as shown by a mean score of 3.260 and a standard deviation of 0.03257. According to the findings, majority of the respondents as shown by 71% indicated that they had used prepaid electricity for a period of 4-6 years According to the findings, majority of the respondents 70% indicated that they often buy tokens monthly whereas others (30%) indicated that bought tokens on weekly basis respectively. The results confirms the literature assertions that Obafeni and Eugene (2013) most of the electricity meters are calibrated in kilowatt hours, which is equal to the energy used per kilowatt for a period of one hour. Further, the study pointed out that the meters also constantly quantifies the instantaneous voltage (volts) and currents (amperes). In the

literature Kelsey & Grant (2016) argue that PEM offer a technical solution to non-payment problem and its adoption in expanding across Africa and south Asia.

5.2.2 Perceptive Efficiency Level of Prepaid Electricity Meters

The second objective of the study was to evaluate perceptive efficiency level of prepaid electricity metering system on customer satisfaction. The study found out that majority of the respondents were in agreement that; prepaid electricity meter is accurate compared to postpaid meter as shown by a mean score of 3.130 and a standard deviation of 0.03254, prepaid electricity meter failure rate is lower compared to postpaid meter as shown by 3.170 and a standard deviation of 0.03259, using of prepaid electricity meter has improved management of my monthly power consumption as shown by a mean score of 3.110 and standard deviation of 0.03257, Kenya Power responds to consumer queries on prepaid electricity meter promptly as shown by a mean score of 3.420 and a standard deviation of 0.03258, consumers get prepaid electricity token promptly on purchase as shown by a mean score of 3.260 and a standard deviation of 0.03257 respectively. According to the literature by Mohammad & Mohammed (2012) customer satisfaction (CS) has been an essential to understand the rationale behind the retention of customers since the observation has been that, satisfied customers are more loyal which means they are likely to buy the same product again and will keep on coming back to the same service provider and therefore efficiency aspects must be enhanced.

5.2.3 Perceived Benefits and Use of Prepaid Electricity Meters

The third objective of the study was to determine the perceived benefits of prepaid electricity metering system to KP customers. The study found out that majority of the respondents were in agreement that; Prepaid electricity meter is easy to use as shown by a mean score of 3.04 and a standard deviation of 0.03257, prepaid electricity meter rates have no hidden charges as shown by a mean score of 3.36 and a standard deviation of 0.03257, prepaid electricity token is easy to buy as shown by a mean score of 3.42 and a standard deviation of 0.03257, use of prepaid electricity meter met consumer expectations as shown by a mean score of 3.02 and a standard deviation of 0.03257 and that consumers would recommend use of prepaid electricity meters to other electricity consumers not yet using the same as shown by a mean score of 3.31 and a standard deviation of 0.03257respectively. On satisfaction levels, the study found out that 88% of the respondents said that they preferred a pre-paid meter more than a post paid meter for the

former had advantages related to cost saving, time, quantity among other benefits. The results concurs with the literature by Eskom (2002) discussed the benefits that utility companies derive from the adoption of prepaid meters. The nature of customer base in South Africa is such that the numbers of domestic customers are more than the bulk power consumers. However, the large power customers are the main source of revenue. Consequently, the results concur with literature by Eskom (2002) who argues that it makes more business sense to invest more resources in the bulk power consumers. This led to introduction of prepaid meters to address the challenges attributed to managing the domestic consumers such as cost of meter reading for postpaid meters, erroneous billings and delayed settlement of bills.

5.3 Conclusions

5.3.1 Levels of Adoption of Prepaid Meters

On levels of adoption of pre-paid meters, the study concludes that most consumers ever used prepaid electricity meters in the recent past consuming an average of between Ksh 501-2500. On the same note, the study concludes that found consumers would like to continue using prepaid electricity meters despite there being complaints that most of the consumers had not yet applied for connection. The study concluded that most consumers had used prepaid electricity for a period of 4-6 years and that they often buy tokens monthly.

5.3.2 Perceptive Efficiency Level of Prepaid Electricity Meters

On perceptive efficiency level of prepaid electricity meters, the study concludes that majority of the respondents were in agreement that prepaid electricity meter is accurate compared to postpaid meter, prepaid electricity meter failure rate is lower compared to postpaid meter, using of prepaid electricity meter has improved management of my monthly power consumption, Kenya Power responds to consumers queries on prepaid electricity meter promptly and that consumers get prepaid electricity token promptly on purchase.

5.3.3 Perceived Benefits and Use of Prepaid Electricity Meters

On perceived benefits and use of prepaid electricity meters, the study concludes that; prepaid electricity meter is easy to use among the consumers prepaid electricity meter rates have no hidden charges; prepaid electricity token is easy to buy, use of prepaid

electricity meter met consumer expectations and that consumers would recommend use of prepaid electricity meters to other electricity consumers not yet using the same. On satisfaction levels, the study concludes that most of the respondents said that they preferred a pre-paid meter more than a post paid meter for the former had advantages related to cost saving, time, quantity among other benefits.

5.4 Recommendations

The study recommends that Kenya Power address complaints related to the use of pre-paid electricity meters since this was found to affect the expected consumer satisfaction to some extent given that only 88% of current PPM users would love to continue its usage. In this regard, adequate measures that will increase consumer trust relative to prepaid meters adoption and usage levels should be put in place to enhance satisfaction levels. The study also recommends that the Kenya Power continue with registering and installation of prepaid meters as well as enlighten the customers on how to use, buy tokens for this was found to have a direct positive effect on consumer satisfaction. The 66% level for those who indicate that the receive electricity tokens promptly can be improved by enhancing existing systems or acquisition of efficient ones. The study calls for a harmonized structure in the management of Kenya Power to make sure that all departments carry out their duties well with regard to creating trust and improving satisfaction levels of consumers on the use of prepaid electricity meters. This will improve on the finding that not all users believe there are no hidden charges under prepaid metering.

5.5 Recommendation for further studies

The study noted that most of the studies on PPMs have been done in the peri-urban areas and now in Nairobi (urban area) which accounts for more than 50% of electricity consumers in Kenya. In this regard, there is need to carry out a similar study in other areas other than urban and peri-urban areas. The study also recommends that further research be done to establish whether there are other determinants to improving consumer satisfaction levels with regard to electricity prepaid meters adoption and use.

REFERENCES

Agyei Paul Mensah & Kilika James M (2013). The Relationship between Service Quality and Customer Loyalty in Kenyan Mobile Telecommunication Service Industry. *European Journal of Business and Management. 5(6):* pp. 25-27

Arie A. Casarin & Luciana N. Collier (2008). *Prepaid Meters in Electricity. A Cost-Benefit Analysis.* Available at: https://www.researchgate.net [Accessed on 11 February 2019]

Caruana Albert, (1999). *The effects of Service Quality and the Mediating role of Customer Satisfaction.* Available at: http://www.emaraldinsight.com. [Accessed 15 December 2018]

Chen Chen Liao, Jain-Liang Chen and David C Yen (2007). Theory of planning behaviour and customer satisfaction in the continued use of e-service: An integrated model. *Computers in Human Behaviour. 23(6):*pp. 2804-2822

Cochran, W. G. (1977). *Sampling techniques (3rd ed.).* New York: John Wiley & Sons.

Energy Act, 2016. *Government of Kenya publication.* Available at: kenyalaw.org. [Accessed on 15 February 2017].

Eskom (2002). .*History of pre-paid electrification*. Available at: www.eskom.co.za/electrification/history.htm. [Accessed 10 May 2017]

Faruqui, A., Sergici, S., Sharif, A., (2010). Impact of Informational Feedback on Energy Consumption- A Survey of the experimental evidence. *Energy Journal.* 35: pp. 1598–1608

Ganiyu Adedayo Ajenikoko & Lukman O. Adelusi (2015). *Impact of Prepaid Energy Metering System on the Electricity Consumption in Ogbomoso South Local Government Area of Oyo State*. Available at: www.iiste.org. [Accessed 15 August 2018]

Kelsey Jack B. & Grant Smith (2016). *Charging Ahead: Prepaid Electricity Metering in South Africa.* Available at http://www.nebr.org/papers/w22895. [Accessed 10 December 2018]

Kenya Power (2016). *Five Year Corporate Strategic Plan 2016/17 to 2021/22*. Available at: www.kplc.co.ke. [Accessed 20 October 2018]

Kenya Power (2017/2018). *Annual Report & Financial Statements.* Available at: www.kplc.co.ke. [Accessed 17 February 2019]

Kothari, C. (2011). *Research Methodology; Methods and Techniques*. New Delhi: New Age International Publishers.

Lauren Skinner Beitelspacher, Glenn Richey R., Kristy Reynolds E., (2011). Exploring a new perspective on service efficiency. Service culture in retail organizations. *Journal of Services Marketing.* 25(3): pp. 215-228

Malama A., Mudenda P., Ng'ombe A., Makashini (2014). The effects of Introduction of Prepayment meters on Energy Usage Behaviour of Different Housing Consumer groups in Kitwe Zambia. *AIMS Energy*. 2(3): pp. 237-259.

Mark Saunders, Philip Lewis, Adrian Thornhill (2016). *Research Methods for Business Students.* United Kingdom (London): Pearson Education Limited.

Mathenge P (2015). *Influence of prepaid meters adoption on the level of customer satisfaction*: *A case of Thika sub county, Kenya*. Nairobi: University of Nairobi. pp. 65-67

Mohammad Almagir H. & Mohammed Quaddus (2012). *Information Systems Theory.* Available at https://www.researchgate.net [accessed 13 February 2019]

Obafemi F.N. and Eugene O.L. (2013):"Non –Technical losses, Energy Efficiency and conservative methodology in Electricity sector of Nigeria: The case of Calabar, Cross River State". *International Journal of Energy Economics and Policy.* 3(2): pp. 57-62.

Ogujor, E.A. (2007). Reliability Assessment of Electric Power Distribution: A Case Study of 2 15MVA, 33/11kV Ugbowo Injection Substation. *The Pacific Journal of Science and Technology*. 11(1): pp. 138-142

Ostrom, A.; Iacobucci, D. (2009). *Consumer trade-offs and the evaluation of services*. J. Mark., 59, 17–28.

Quayson-Dadzie, John (2012). *Customer Perception and Acceptability on the use of prepaid metering system in Accra West Region of Electricity Company of Ghana.* Ghana: Kwame Nkrumah University of Science and Technology. pp. 53-60

Sung-Yoon Huh, JongRoul Woo, Sesil Lim, Yong-Gil lee, Chang Seob Kim (2015). *What do customers want from improved residential electricity services? Evidence from a choice experiment.* Available at: www.elsevier.com [Accessed 14 February 2019]

Taylor & Francis Group (2008). The Power of Water. *Journal of South African Studies.* 34(4).

Tewari, D.D. and Tushaar Shah (2003), *An Assessment of South African prepaid Electricity experiment, lessons learned, and their policy implications for developing Countries.* Elsevier Science Ltd. pp. 911-927

Woodside, A.G.; Frey, L.L.; Daly, R.T. (2010). Linking service quality, customer satisfaction and behavioral intention. J. *Health Care Mark.* 9, 5–17.

World Bank (2017). *The State of Electricity Access Report (SEAR) 2017.* Available at: www.worldbank.org. [Accessed 5 January 2019]

Yi, Y. (2011). A critical review of consumer satisfaction. In Review of Marketing; Zeithaml, V.A., Ed.; *American Marketing Association*: Chicago, IL, USA,; pp. 68–123.

APPENDICES

Appendix I: Research Questionnaire

Dear respondent,

I am a student at Strathmore Business School, Nairobi undertaking a course in Masters of Business Administration. As part of the academic requirement, I am undertaking a research study on "Effects of Prepaid Electricity Metering on Customer Satisfaction in Nairobi County". I hereby request your participation in this research by filling in the questionnaire below. Kindly note that your responses will be used for the purposes of this study only and highest level of confidentiality will apply to any information provided.

The questionnaire will take approximately **8 minutes** to fill.

Please give your response (s) in the spaces provided and tick the space or box that matches your answer.

PART A: BACKGROUND INFORMATION

1. **What is your Gender?**

   [ ] Male [ ] Female

2. **Please indicate your age.**

   [ ] 18-30 [ ] 31-40 [ ] 41-60 [ ] 61 and Above

3. **State the highest level of your education.**

   [ ] Primary [ ] Secondary [ ] Diploma [ ] Undergraduate [ ] Postgraduate [ ] Other.....

4. **What is your occupation?**

   [ ] Employed [ ] Self Employed [ ] Student

   [ ] Other (please specify).....

Part B: Adoption of Pre-Paid Electricity Meter

5. **Have you ever used prepaid electricity meter?**

   [ ] Yes

   [ ] No

   If yes proceed to question 8, if NO proceed to question 7

6. **Kindly indicate your monthly average electricity consumption (in Kshs)**

   [ ] Kshs 500 and below

   [ ] Kshs 501-2,500

   [ ] Kshs 2501-4,500

   [ ] Above 4,500

7. Would you like to use prepaid electricity meter?

   [ ] Yes

   [ ] No

   If YES, please state if you have already applied for connection.....

8. How long have you used prepaid electricity meter?

   [ ] Less than 1 year

   [ ] 1 – 2 years

   [ ] 2 – 4 years

   [ ] 4 – 6 years

   [ ] Above 6 years

9. How often do you buy prepaid electricity token?

   [ ] Daily

   [ ] weekly

   [ ] monthly

   [ ] Other

Part C: Perceptive Efficiency Level of Prepaid Electricity Meters

10. **On a scale of 1–5, where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree, indicate the extent to which you agree with the following statements as they describe efficiency level of prepaid meters**

		1	2	3	4	5
(a)	Prepaid electricity meter is accurate compared to postpaid meter					
(b)	Prepaid electricity meter failure rate is lower compared to postpaid meter					
(c)	Using of prepaid electricity meter has improved management of my monthly power consumption					
(d)	Kenya Power responds to my queries on prepaid electricity meter promptly					
(e)	I get prepaid electricity token promptly on purchase					

Part D: Perceived Benefits and Use of Prepaid Electricity Meters

11. **On a scale of 1–5, where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree, indicate the extent to which you agree with the following statements as they describe benefits and use of prepaid meters**

		1	2	3	4	5
(a)	Prepaid electricity meter is easy to use					
(b)	Prepaid electricity meter rates have no hidden charges					
(c)	Prepaid electricity token is easy to buy					
(d)	Use of prepaid electricity meter met my expectations					
(e)	I would recommend use of prepaid electricity meters to other electricity consumers not yet using the same					

12. **In your opinion, do you (in overall) prefer a prepaid meter to postpaid meter?** (Briefly explain)

.....

.....

Thank you very much for your time and participation in this study.

Appendix 11: Ethics Approval Letter

Strathmore UNIVERSITY

12th March 2019 SU-IERC0326/19

Evans Owiye
P.O BOX 20237- 00100
Nairobi

Email: evans.owiye2014@gmail.com

Dear Joseph,

REF **Protocol ID:** SU-IERC0326/19 **Student Number:** MBA/99300/17
EFFECT OF PREPAID ELECTRICITY METERING SYSTEM ON CUSTOMER SATISFACTION: A CASE OF NAIROBI COUNTY, KENYA.

We acknowledge receipt of your application documents to the Strathmore University Institutional Ethics Review Committee (SU-IERC) which includes:

1. Research Proposal version date March 8, 2019
2. Participant Information Sheet and Consent form version date March 8, 2019
3. Research Questionnaire version date March 8, 2019
4. Research Budget
5. CV

The committee has reviewed your application, and your study *"Effect of Prepaid Electricity Metering System On Customer Satisfaction: A Case of Nairobi County, Kenya."* has been granted approval.

This approval is valid for one year beginning ***12th March 2019 until 11th March 2020***

In case the study extends beyond one year, you are required to seek an extension of the Ethics approval prior to its expiry. You are required to submit any proposed changes to this proposal to SU-IERC for review and approval prior to implementation of any change.

SU-IERC should be notified when your study is complete.

Thank you

Sincerely,

Amina Salim
Regulatory Affairs Fellow

STRATHMORE UNIVERSITY INSTITUTIONAL ETHICS REVIEW COMMITTEE (SU IERC)
12 MAR 2019
TEL: +254 (0)703 034 000
P. O. Box 59857 - 00200
NAIROBI - KENYA

Appendix 111: Research Permit Letter from NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/91808/28963**

Date: **12th April, 2019**

Evans David Owiye
Strathmore University
P.O. Box 59857-00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Effect of prepaid electricity metering system on customer satisfaction: A case of Nairobi County, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **12th April, 2020.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.