EFFECT OF PREPAID METERS ON REVENUE COLLECTION AT KENYA POWER AND LIGHTING COMPANY

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DECLARATION

This research project is my original work and has not been presented for the award of a master degree course in this university or any other institution.

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This research project has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

I dedicate this project to my family, my children for tireless support from my formative years of my education.

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I thank everyone who assisted me in realizing my dream of doing MSc. Commerce. Special thanks go to my supervisor, Dr. Michael Njogo for his constant, incisive guidance. To my family and friends for being understanding during the period of my study. Many thanks also go to my Almighty God for the care and protection.

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LIST OF ABBREVIATIONS

ARM- Automatic Meter Reading

CIDP- County Integrated Development Plan

CS- Customer Service

ECH- Electricity Company of Ghana

EDT- Expectancy Disconfirmation Theory

EPRA-Energy and Petroleum Regulation Authority

ERC- Energy Regulatory Commission levy

FOREX- Foreign Exchange Adjustment

ICS- Integrated Customer System

ICT- Information and Communication Technology

INCMS-Integrated Customer Management System

IT- Information Technology

IPP- Independent Power Producers

ISO- International Organization for Standardization

KenGen-Kenya Electricity Generating Company Limited

KP- Kenya Power

KPLC- Kenya Power and Lighting Company

NSE-Nairobi Security Exchange

O&M- Operation and Maintenance

PPM-Pre-Paid Meters

REP- Rural Electrification Programme Levy

PPP-Public Private Partnership

UK- United Kingdom

VAT- Value Added Tax

WARMA- Water Resources Management Authority levy

LLC – Limited Liability Company

SPSS - Statistical package for social sciences

ABSTRACT

KPLC initiatedprepaidmeters'system in order to eradicate the challenges inthe post-paid system of billing, which included incompetent electricity usage monitoring, incorrect and estimated electricity meter readings, unsuccessful collection of revenue and unproductive consumption of energy.The reason of the study was to establish the effect of prepaid electricity meters on revenue collection at the Kenya Power and lighting company. Theobjectivesof the research study were; to determine the effect of prepaid meters' collection costs, prepaid meters' reliability and prepaid meters' flexibility on the revenue collection at KPLC. Descriptive research design was adopted and the target population was 240 KPLC employees working in seven sub regions in Kiambu County. The sample size was 140 respondents selected using stratified sampling technique. The researcher used descriptive statistics. SPSS was used to assist in data analysis.Regression model was used to determine the relationship between dependent and independent variables. The researcher established through inferential statistics that dependent variables were usefulpredictors of revenue collection at KPLC. The researcher recommends that KPLC should convert more prepaid meters which are reliable and with enhanced billing accuracy to improve on revenue collection. The analyzed data was presented using pie charts and frequencytables.

CHAPTER ONE

INTRODUCTION

1.1 Background tothe Study

Since 1975, Kenya Power and Lighting Company, Kenya's sole distributor of electricity has been operating on post-paid system to invoice and collect its billedproceeds from the consumers. This traditional system gives the consumers the opportunity to enjoy electric power first and pay for it when they receive their bills with another privilege of a grace period of 14 days. This is approximately after a month after meter readers reads the meters, readings keyed in order to generate an invoice and finally dispatching the bills to the customers (Ontomwa, 2014). Challenges encountered in the traditional post-paid system made the power company to experience high revenuecollection costs relating to reading of meters at site, disconnecting and reconnecting costs, wrong and estimated bills, tempering with meter by customers and staff upon collusion and a worse scenario bad debt risk,(KPLC, 2009). To counter these challenges, the power company established another department for collecting debt. This was another cost involved as more staffs were hired and professional debt collectors who earned a commission had to be contracted. There had to be a budget and funds allocated for department to run. These costs and other business expenses have a huge impact on the general and financial performance of the company, (Mwaura, 2010).

Continuous improvement in a business is of paramount importance. Implementing new technology is a major capital investment decision and can affect a business either positively or negatively. Therefore, an entity should consider many factors before making a major change and outline how to manage their operational expenses and revenue collection cost. Good management of revenue and expenses will result into a firm financial base andperformance ofa company. The human resource department should also to hire killed and resourcefulpersonnelin the organization in pursuit of goals attainment and bring in the much-wanted innovativeness to steer business ahead. Brigham*et al*. (2005), stresses that achievement in a modern company is brought about by several factors including talented employees, worth in long-term investment, being innovative, strong financial base, efficient and effective use of available resources, quality of management as well as of products and services.

Safaricom and Airtel companies adopted the new prepayment system in Kenya much earlier before other private and public companies followed suit. Customer to these and other

communication companies pays for airtime and data bundles up front before utilization. Ontomwa, (2014) notes that many research studies on the two communication companies have been done in Kenya to establish their effectiveness but none has been done on the effect of prepaid meters on revenue collection at Kenya Power and Lighting Company.

1.1.1 Kenya Power and Lighting Company (KPLC)

Kenya Power and Lighting Company is an LLC that distributes electricity at retail rate to its customers through transmission lines constructed for that purpose. The government of Kenya through the ministry of energy and ERC has licensed the power company the sole mandate to distribute electric power to its citizens. The Kenyangovernment holds more than 50% KPLC shares and therefore a major shareholder with great control on the business operations of the company. Kenya Power and Lighting Company should publish an audited financial statement on annual basis as required by law and which should be read to the shareholders during Annual General Meetings (Companies Act, 2015). It is also quoted at the Nairobi SecuritiesExchange.

Kenya Power and Lighting Company business is todistribute power generated from Hydropower supplementing it with geo- thermal power. The Power Company buys energy in bulk fromKenGenCompany, which is mandated by the Kenyan government to generate electricity, then distributes the same at retail to the public. According to KPLCreport (2013), when the country lacks rain and drought hits hard, water levels in the dams drop drastically, the power company buys electric power from Independent Power Producers (IPPs) so as to manage the demand of their customers. The IPPs use fuel to generate power and sell it to the Kenya Power and Lighting Company at higher rate depending many factors like the market price of fuel. The power company operates under ten regions. These include Nairobi North, Nairobi South, Nairobi West, Coast, Central Rift, North Rift, Mount Kenya, North Eastern, West Kenya and South Nyanza. They are each under a regional manager but all worktowards the same goal and objective and share mutual values which include; customer first, one team, passionate, integrity and excellence in order todeliver qualityservices the consumers (KPLC, 2017).

Kenya Power and Lighting Company has a commitment which includes; providing power that is of high quality, with reasonable rates of connection and usage as well as dependable. The outcomes are happy and settled customers because they will enjoy success and developments in their personal lives, at their business and the national economy of the nation will be positively impacted. In attaining all these, the utility company has embarked on

appropriate innovations withnew technologies like smart meters and prepaid meters. The management has also sensitized its employees on the need of good customer service with creating the latest department referred as customer experience, and by making better the company's core business of which is power network or connections, (Quality Policy, KPLC). The functions, the levels and the processes that matters within the utility company has been vigorously involved to aid in fulfilling this Quality objective as outlined in the Corporate Strategic Plans. All the stakeholders including the Board of Management, the highest level of management and the entire staffs of Kenya Power and Lighting Company are dedicated and are working together towards value implementation and constant betterment of the Quality Management Objective that is ISO compliant and meets other requirements, (KPLC, 2018)

Customer connection policy or a stipulated guideline according to KPLC (2017) mandates the utility company to connect power, which will bring value to the citizens to of this country at a friendly and affordable cost. Kenya Power and Lighting Company has stipulated in its targets to bring power to a million new consumers every year to its electricity network. This target is crucial to company's business goals and core objectives. This will lead to growth of business leading to overall development of the economy. Ontomwa (2014) in his study noted how KPLC has broadly applied new technology at different functions and sections. Some of these sections include engineering, finance, human resources, and transport among others. This is for strategic reasons in order to enhance operations within the country and move harmoniously with changes in the modern business environment. New technology assists the power business to gain competitive edge in the business world and at the same time to give quality service to their customers, (KPLC, 2010).

For more than four decades, Kenya Power and Lighting Company has been collecting revenue using traditional post-paid. The power company was experiencing operational and financial challenges as the postpaid system made revenue collection difficult with rise in collection costs. These risks and costs includes; debt and revenue collection department, disconnection and reconnection costs, arrears and lack of non-payment for outstanding amounts, metertamperingcases and meter reading costs. However, despite these enormous difficulties, the postpaid metering system give the consumers the opportunity to enjoy electric power and pay after meters have been read, billing has been done and bills dispatched to the customers, (KPLC, 2013). Complaints from customers were also too many especially relating to wrong meter readings resulting to estimated bills. The customer service staff in this case the meter readers were not reading most of the meters in their specified areas referred to us

itinerary. Reasons being postpaid meters are fixed within houses or a building that are normally gated and locked, while others are simply sluggish and therefore end up estimating readings in order to achieve their set target. This inefficiency to deliver quality goods and bad customer relation end up spoiling the public image of the entity, (Ontomwa, 2014).

Ontomwa (2014) in his research study continue to stresses that with the commencement ofa new technology in the market, Kenya Power and Lighting Company decided togo on board and install pre-paid electric meterson pilotbasis to test how effective this would be in relation to revenue collection hoping the system would lead to revenue increase. The expectations were control and reduction or elimination of overheadsassociated to revenue collection. The piloting of 174,000 postpaid meters were retrofitted to prepaid meters successfully in Nairobi County after which the company introduced the program to some major towns and finally the process spread countrywide. Kenya Power and Lighting Company took onto the new technology both in metering and other sections of the business in 2009, the objective was reducing operational costs, minimizing commercial losses, improvingon customerservice delivery and reducing customer defaults to enhance revenue collection, (Obura, *et al*, 2012). Kenya Power and Lighting Company also wanted their esteemed customers to have control of their electricity consumption.

In a press briefing on billing and prepaid meters, the management of the utility company reported that the process of billing is directed by the tariff and controlled by the Energy Regulatory Commission (ERC). This regulation of tariff applies to both prepaid and post-paid consumers. The cycle or the period of billing for customers under post-paid metering is monthly and the Company is committed to reading 100% of all the ordinary post-paid meters each month now that a good percentage has been converted to prepaid meters. However, Inaccessible premises (those permanently locked during the day) is one of the leading causes for meters that are not read as required. As at April 2018, 4,484,188 out of 6.66 million customers had been converted to prepaid meter system, (KPLC, 2019).

It was the company's intention to move to prepaid metering/billing set up from as early as 2004 and E.R.C approval was obtained in October 2005.The following were the corporate objectives; one was Loss reduction where the total loss in the 2009/10 financial year was 1068Gwhrs (i.e. KPLC revenue of ksh 7.5 Billion at a yield of ksh 7/=), second was to improve on Revenue collection and days receivables as the uncollected balances were still very still high. Thirdly was reduction of Operational costs, which includes high meter

reading, billing, dispatch, and revenue collection costs. Fourthly was reduce Congestion in banking halls where increased transactions in Mpesa offered the utility company a good experience that the ICT savvy clientele preferred a technology based solution. The Mpesa arrangement however was not real-time and there were delays in uploading of the payments, however, this has been improved. On the objective of Demand management, the management noted that increased connectivity demands increased generation from the available scarce natural resources and increased carbon dioxide and other greenhouse gases emissions. Prepayment makes the customers more conscious of energy conservation. Lastly, the company wanted to improve on Customer service because the experience in commercial cycle processes i.e. meter reading, billing, dispatch of bills and disconnection/reconnection is that customers were not satisfied with our services. The errors in billing, delayed postage, disconnection and delayed reconnection drove them to prefer not visiting the company's premises, (KPLC, 2011).

1.1.2Prepaid Electricity Billing Meters

The prepaid electricity metering is relatively a new billing or metering system especially in the energy sector of the economy. The system comprises of an advanced electronic consumer management systems account that has been linked to the electricity meter apparatusand with smartcard new skills. It provides utility as well giving significant reserves in resources such as work force and funds. The prepaid metering system has provided new payments and flexible options for the clientele. Through researches, the system has seen company's operational costs going down since it has adopted paperless era of collecting revenue in the important sectors of the economy by replacing prepaid meters which has many challenges the market (Hangzhou Pax Electronic Technology, 2012). The system has eliminated meter reading visits, there is no bills preparation and dispatch costs, no disconnection and reconnections cost, de- congesting of banking halls, no more revenue holding due to delayed payments, energy conservation, no more revenue loss to fraud and illegal connections.

Ariel and Luciana (2009) pointed out how the new technology of prepaid metering came to Africa. They discovered that South Africa was the first state in Africa to adopt the system in the late 1980's. Their main goal was to supply power to its many citizens in remote areas who earned very little and could not afford the cost of electricity connection. The system was expected to assist in lesseninguneven incomes problems as well as limited infrastructural development in bills dispatch to power consumers, (Ontomwa, 2014). In USA,

it was reported that 55 percent of residential customers opted to use the prepaid system. According to Anderson and Bezuidenhoudt, (2010) revenue collection levels in United Kingdom significantly rose with the adoption of prepaid meters Casarin and Nicollier, (2009) established that Australia's customers prepaid meters in electricity reduces overheads and thus leading to increased profitability in organizations. In China electricity is reported that consumers on prepaid metering system make use of 24.2% power which is less electricity compared to the standard or ordinary consumer were using before the prepaid metering systems. Waddams*et al.*, (1997)notes that prepaid billing system in GreatBritain couldbe at its peak in growth and development. Prepaid meters were first introduced in 1993 in Argentina,Energía Mendoza Sociedad del Estado (EMSE). By the late 1990s, prepayment systems were very popular in India and in some other countries (Estache*et al.*, 2000). Misra and King, (2012) noted that prepaid technology will help to eliminate inaccuratebilling processes to prevent fraud and billing errors. Research done by World Bank (2012) on revenue collection revealed that the metering and billing have increased from 2% of consumers who comprise of 34% of electricity proceeds. The research noted that revenue proceeds rose by US$ 72 million as a result of putting in the prepaid billing meters. The utility sector now ensures a 100% prepaid metering on all power links or connections to customers, (World Bank, 2012). In Ghana, prepaid electricity metering was adopted by the country's monopoly power distributor, Electricity Company of Ghana (ECG) among other things to deal with supply side challenges such as reduction in collection expenses, eliminate bad debts, efficient cash flows with an overall aim of improving the financial position of the company.

Malawi, Africa introduced prepaid water meters in the year 2016 with the aim of improving revenue and efficient working for the Water Boards. Out of the of five Water Boards in the country, three of them has already installed the prepaid water meters for pilot with the 2nd and 3rd phase being underway, (Laison Group, 2019). For easy water purchase and avoidance of extra costs to establish vending points, they have implemented the integration with the local E-payment platforms like Airtel money and online Banks among others. The same technology has been adopted in other African countries like Zambia, Mozambique, Angola among others. In Egypt, Africa the President give a notice to reform the country by switching all the energy, water and gas meters from post-paid to prepaid in order to improve the working efficiency and reduce labour cost, (Laison Group, 2019)

Despite the benefits enumerated by the power provider in convincing consumers in accepting the new policy, paradoxically, anecdotal evidence points to the fact that, majority

of consumers have contrary opinion regarding the usage of prepaid meters (Ackah, 2015). Energy companies are also facing some setbacks. According to Metering. Dom, most of African countries are still lagging behind in terms of improving its energy billing systems through the use of advanced metering technologies. Countries like Nigeria, South Africa and Zimbabwe have amongst other African states begun engaging in pilot projects and installation prepaid meters while European and American countries are in full scale roll out of advanced metering technologies. This is due inadequate financial resources to complete full-scale rollout of prepaid electricity meters. A number of challenges including lack of foreign currency and some technical issues have stood as barriers to the successful installation of prepaid metering systems. Other challenges include lack of Inadequate Installation staff, Extensive refurbishment of the infrastructure particularly replacement of terminal poles, stepped domestic tariff among others, (KPLC, 2011). Ndehe, (2017) notes that Zimbabwe Electricity Supply Authority (ZESA) was reported to have failed in meeting its target due to lack of funding to buy the meters. Zimbabwe launched the prepaid electricity meter project in 2013 with a target 800,000installation by year 2018.

Prepaid meter system is a success story for low cost of operation and has improved customer service delivery in the developed nations. In states such as South Africa, Egypt and Nigeria among others, prepaid system is explicitly used in water, energy distribution among others. Sub –Saharan Africa trails other regions in providing access to electricity for poor urban and rural residents, linking this poor performance various factors such political interference in utility policy, higher investment costs and lower profitability of extending service to rural areas. However, a major obstacle to wider access is high charges consumers must pay to connect to the electricity network. Kenya Power and Lighting Company introduced the pre-paid electricity meters' systemfor domestic users in the year 2009. This was done within Nairobi area and later on in some other bigger towns like Kisumu and Nakuru. The power utility company had installed 164,117 prepaid meters, representing 8 per cent of its 2.03 million customers with a noted decrease in power bill of Sh2billion since its adoption (KPLC, 2012). The power company as indicated by other researches was facing many difficulties with postpaid meter system in area of revenue collection. Meter reading costs werehigh, wrong meter readings, estimation of bills, and ineffective revenue collection are some of the issues.

Gomez and Contreras (2003)define prepayment as a system where the consumer pays for goods or service before utilization.The meter has a customer interface unit with a mobile phone like screen that enables consumers be involved and control their electricity usage just

in a similar manner they manage credit units loaded in their cell phones. This is a special type of power meter fixed inahouseholdandinsmall micro-enterprises (SMEs). With Prepaid meters, the company through high technology system is better placed to record and analyze the active energy consumers. With this information, the power company too is able to estimate demand load,therefore, plan well on what and how much to purchase from the generating company, that is Kengen or the IPPs if need be in order to meet power demand.

Ontomwa, (2014) notes that theprepaymentmetering systems are mostly applied in either electricity, water or piped gas.The main purpose of installing them is enhancing efficiency in revenue collection by reducing or eliminating costs. Affordability to consumers is also a projected concern for the companies when adopting the system as it ensures equal power distribution to the citizen and geographical development. Customers are required to pay in advance in order to enjoy goods or services, they feed and use the credit or token purchased for the service until it is exhausted (Tewari and Tushaar, 2003). Customers can purchase tokens from their phones through mpesa and airtel money using a pay bill number.

Investment decision is one of the roles of management; an investment like a modern technology requires finances or cash outlay for purchasing the additional assets needed in terms of machinery acquisition and expansion. Mclaney, (2009), in his study urges that an increase in operationsmean an equivalent a need for higher amount of cash. The developed and the developing countries have embraced the system of prepaid billing according to research. South Africa initiated the system of prepaid meters in 1980s followed other countries like Nigeria, Zimbabwe,Ghana Uganda among others. KPLC adopted the prepaid meter system after a period of almost three decades.

Tewari, and Tushaar (2003), did a study reviewing the economics, logistics and technology underlying the South African experiment of prepaid billing meters. They noted that the programme was a success in that it benefitted a large mass of small and dispersed customers. This was attributed to good marketing campaign, innovative tariff schedules with better planning and management. This and other lessons learned from this experiment have proved very useful for policy making purposes in other developing countries in Africa and Asia continents.

1.1.3 Revenue Collection

Collection of revenue can either be manual or through use of a technology. Manual is this research study refers to traditional postpaid system of revenue collection that carry with it several operational and administrative costs. Deliberate introduction of modern technology in

revenue collection as compared to the old system is expected to reduce some of these operational costs and administrative expenses. Sales level may rise leading to increase in cash flow in a business and improved revenue collection levels. Revenue growth in an organization goes together with operational cost that is either high or low. This may depend on the level of technology organization is using and the impact is on a firm's earnings (Obura*et al.* 2012).

Kenya Power and Lighting Company main source of revenue is from sales of electricity to its clientele (CasarinandNicollier, 2008). Mwaura (2010) in his study showed that revenue in Rwanda rose from US$ 261,000 in 1996 to US$ 22.9M in 2008 due to installation of prepaid electricity billing system.Increased and timelycollection of revenue and improved service delivery to electricity users are other advantages of the prepaid system. Gitman, (1986), notes that many organizations employ theobtainable technology ensure effective and efficient cash collection for a super working capital. Indeed, the installation of prepaid billing system appeared to show promise to Kenya Power and Lighting Company, with unpaid bills dropping from Sh10 billion in 2010 to Sh8 billion in 2012 (Achuka, 2015).

The subject of bad loans and debts affects all the sectors of the economy with more impact felt on service firms that normally have large loan portfolios, (Bloem and Gorter, 2001). This results in lack of confidence on the part of shareholders, foreign investors and funding entities. Their withdrawal from the firm can lead to liquidity problems. According to Kioko, (2013) the utility firm must find an alternative way to cover payroll, employees benefits and other operating expenses for any bill that remains unpaid. Even with the increasing implementation of prepaid metering system in the African countries, it has been noted that power consumers owe a lot of money to the energy companies in terms of bill arrears hindering their collection of revenue in an efficient manner as well as the provision of quality services. (Annon, 2001) recommends use of Revenue collection cycle that involves use of private companies to collect owed money by customers but this has proved expensive to the utility company.

Kenya Power and Lighting Company engaged several methods over the years in an attempt to ensure efficiency in revenue collection. These include cash offices and pay points, banks, supermarkets, postal corporation of Kenya, and use of mobile providers among other methods. These strategies have not been successful and effective in preventing payments evasion, revenue leakages, and numerous challenges that consumers face such as; untimely delivery of bills and crediting of bills paid to customers' accounts, delivering of bills to wrong persons, and inconvenience of travelling long distances to make payments (Mensah

and Adu 2013). The utility company believes that use of prepaid electricity metering will be a long-time solution to all revenue collection challenges.

1.2 Statement of the Problem

Globally,thepower companies have over the years been working towards improvement in their revenue collection, financial performance and good customer service. However, rampant cases of power theft and nonpayment of monthly bills have been on the rise. The power companies anticipate that system change over from post-paid meters to prepaid meters and ultimately automatic meter readingwill prevent revenue leakage, (KPLC, 2012). The prepayment system reassures the power company of guarantee revenue collection since it is an advance payment with little or no cost of collection, this means adoption of revenue management system that is effective and efficient. This benefits the service sector to enjoy guaranteed advanced payment for power sold to customers and costs involved in collecting revenue are reduced or eliminated altogether. On the other hand, the system allows the customers to plan for usage of power in their premises, at homes and in businesses (KPLC, 2012).

From the Kenya Power and Lighting Company Annual reports, there was an outstanding unpaid bills of ksh10b as at year 2009 while in 2014 it was Ksh8b and by year 2018 it was Ksh 5b. Thus, there was a significant decline in outstanding unpaid bills (50% decline). This is an indication that revenue collection improved between year 2009 and year 2018. Revenue collection capabilities in a business entity can be improved by adopting prepaid meters. The business of the power company will eventually transfer to pre-paid system once all the post-paid meters are retrofitted to pre-paid meters where the clientele will have to pay for electricity in advance (Obura *et al.* 2012). The overheads linked to collection of revenue are expected to reduce or eliminated with efficient revenue collection.

Chiwadali, (2019) notes in The Citizen that Tanzania Electric Supply Company (TENESCO), hadreported a loss of shs 349 billion in 2017, which dropped to shs 122 billion in 2018 and finally they were expecting to report shs 9 billion operating profit in 2019. Tenesco had up toshs 330 billion by year two thousand and nine of unpaid bills but after adopting prepaid meter system the unpaid electricity bills decreased to Sh104billion as at 2014 (KPLC, 2013). A survey by OgujorandOtosowie (2010) in Nigeria were in agreement that introduction of the prepaid meters has increased revenue collection and has led to reduction and elimination of some costs.

A local study done bySathyamoorthiandMburu, (2014) investigating the perception ofcustomers' and management roles in handling the change from post-paid to pre-paid models and the conclusions was that Kenya Power and Lighting Company's improved service deliveryand has enabled customers' to buy electric power at affordable prices. The customers can also buy token units and 'sambaza' it to a someone who cannot access KPLC's pay points, they are able to plan for and regulate their electricity consumption on monthly basis, and they are contented with most of the services given in prepaid platform. Mathenge, (2015) study recommended training of customer service staff by the power facility for them to be in a better position to resolve complaints in relation to the prepaid meter. Ontomwa, (2014) study noted that introduction of pre-paid meters has helped reduce collection of revenue costs. These and other studies failed to look at the effect of the prepaid electricity metering system on revenue collection at Kenya Power and Lighting Company in Kenya. Therefore, this study was done to establish the effect of prepaid electricity metering system onrevenue collection at Kenya Power and Lighting Company.

1.3 Objectives of the Study

1.3.1 General Objective

To ascertain the effect of prepaid electricity meters on revenue collection at Kenya Power and Lighting Company.

1.3.2 Specific Objectives

i. To determine the effect of prepaid electricity-metering system collection costs on the revenue collection at Kenya Power and Lighting Company.
ii. To assess the effect of prepaid electricity metering-systems reliability on the revenue collection at Kenya Power and Lighting Company.
iii. To investigate the effect of prepaid electricity metering systems flexibility on the revenue collection at Kenya Power and Lighting Company.

1.4 Research Questions

i. What is the effect of prepaid electricity-metering system collection costs on the revenue collection at Kenya Power and Lighting Company?
ii. What is the effect of prepaid electricity metering systems reliability on the revenue collection at Kenya Power and Lighting Company?

iii. What is the effect of prepaid electricity metering systems flexibility on the revenue collection at Kenya Power and Lighting Company?

1.5 Justification of the Research

Kenya Power Company is the sole distributor of electric power across the country. Much resource in terms of funds is needed for this major role. The government of Kenya supports and regards the company as a vibrant public sector. KPLC has functional offices in most of the countiesin the country and constitute a major component under the Constitution of Kenya, (2010), and plays a key role in meeting the government's Big 4 Agenda. The County ofKiambu and its seven sub regions has demonstrated its great potential and knowledge of prepaid meters with influence worth replication by other counties. The research study has generated a lot of information on revenue collection efficiency because of prepaid electricity metering services and how operational and administrative expenses have been controlled. Evidence-based collection costs and billing accuracy process by the public sector has strengthened the overall management efforts. The findings also highlighted on the reliability and flexibility of prepaid meters and their effects on revenue collection efficiency. The additional knowledge will provide the foundation for future studies and analysis by scholars in the ongoing quest for modern technology in all sectors of the economy.

1.6 Significance of the Study

The study was to establish the effect of prepaid meters on revenue collection at Kenya Power and Lighting Company and determine how revenue collection cost, reliability and flexibility of prepaid meters has influenced revenue collection at KPLC. The findings help to determine the state, gaps, challenges, opportunities and future planning. It also clarified on the value of making major capital investment decisions such as installing and retrofitting of the prepaid meters beforehand. The study findings gave recommendations on collections cost, reliability and flexibility in relation to revenue collection efficiency at KPLC. The benefits accrued with implementation of prepaid meters by Kenya Power and Lighting Company can act as a basis for overall tangible public sector growth and development for the power generating companies globally. The study also provided a platform for future studies and a source of reference for researchers especially those in the field of revenue collection through prepaid system by public and private sector.

1.7 Scope of the Study

The study addressed the topic ‘the effects of prepaid meters on revenue collection at Kenya Power and Lighting Company’. The study was limited to examining the role of Kenya Power and Lighting Company as the only power distributing company in Kenya. The core respondents were the customer service staff within Kiambu sub counties who are always busy in the field connecting customers or maintaining power and electric lines or at the offices resolving customers queries and complains. The researcher endeavored to explain the importance of the research as increasing knowledge towards reducing the challenges by use of prepaid electricity meters. The researcher used a representative sample within Kiambu County to ascertain a generalized perspective on the variables under examination because the study did not reach all stakeholders in Kenya Power and Lighting Company.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter covers the theoretical and empirical review of the study and supports the literature behind prepaid meter system and the role it plays in implementation of the public sector companies. This is through the selected study variables flexibility, reliability and collection costs on revenue collection efficiency. It also gives a background on how prepaid systems act as a modulator of these independent variables.

2.2 Theoretical Review

Theoretical review helps in actual scrutiny of a subject of the accumulated theories concerning a subject, idea, an assumption or phenomena. It brings in and illustrates the theory that explains why the research problem under the study exists (Labaree, 2009). This section analyzes how the selected suitable theoriesaddress the topic of prepaid meters as a new technology.

2.2.1 Technology Acceptance Theory

Davis (1989) developed the Technology Acceptance phenomenon. This theory in particular agrees with the forecasting of the acceptability of an information system. It purposesto predict the adequacy of aninstrument and to recognize anynecessary amendment, for the users to accept the system. In the basic Technology acceptance theory, the use of a system is normally fixed on by theapproach or feelings of a person to the scheme. Davis, (1989) asserts that Technology acceptance theory is a theoretical model that explains how users come to accept and use a technology, this model appreciates that the acceptability of an information system is determined by two main factors, which are the perceived usage and perceived effortlessness of use and are significant features for approval of a new technology. According to Igbaria*et al.* (1997), this technology is on the fact that apparent usage and perceived effortlessness are important parameters, which shows reactions and acceptance of new system and behaviors. Technology Acceptance theory acts as a practical view to any other technological improvement in the context of insight and adequacy, the attitude of a person largely determines the use of a system or adoption of the same. Technology acceptance theory mainly isthe applied model of users' acceptance and usage of new technology (Venkatesh, 2000).

McFarland and Hamilton (2006) in their study on adding contextual specificity to the Technology Acceptance Model indicated that system usage was directly and significantly affected by task structure, prior experience, other's use, organizational support, anxiety, and system quality. The mediation effect was also shown as predicted, however, for some relations, the effect went in the opposite direction from expected, like other's use lowering computer efficacy or high quality systems linked to low frequency of use. Although the initial model technology acceptance or its extension does not completely account for the observed variance in system usage, Kioko, (2013) agree that computer efficacy affects perceived ease of application, which in turns is connected robustly to apparent employment of the same. Scherer, Siddiq and Tondeur (2019) conducted a research on meta-analysis and indicated that technology acceptance model remains a good choice for explaining teachers' adoption of digital technology in education.

The perceived usefulness has been defined as being the degree to which a person believes that the use of a system will improve his or her performance while perceived ease of use has been defined as the degree to which a person believes that the use of a system will be effortless. Perceived usefulness and perceived ease of use has been considered and demonstrated as two different dimensions in several factorial analyses which has been carried out, (Hauser et Shugan, (1980); Larcker et Lessig, (1980); Swanson, (1987). Technology acceptance theory advocates forusers' choice on how and when to use a product or service. Lu *et al.* (2004) agrees that, prepaid meters' consumers adopts perceived usefulness or believes that with a thorough arrangement it would be liberated from the influence of outside parameters that have been in pre-existence, for example, safety issues andhandiness as a main determinant for implementation of a latest technology. This is because practically there are many challenges and many barriers restricting free will to take action (Bagozzi *et al* 1992).

Many researchers prefer this model in their studies as it explains how consumers accept and use a new technology or accept a change in the market. Therefore, apparent effortlessness toemploy technology may have express consequence on perceived usefulness and both agree on the user's approachto the use of prepaid electricity metering. Suitability in use of prepaid meters is because of the efficiency achieved through adoption of new technology. Eventually the outcome is behavioral and concrete utilization of the method. This study assumed that the convenience and efficiency achieved by adopting modern technology; in this research study the prepaid electricity meters will be the basis of reducing all costs associated to demand and supply of electricity and impact positively on profitability. With

two systems offering the same features, in this case post-paid and prepaid electricity metering system, a consumer will prefer the one, which is easier to apply and use (Dillon and Morris, 1996). With the new technology, there will be no hassles of paper bills, disconnections and reconnections. The customer just buys a credit token or voucher from an endorsed dealer alternatively they can use their cell phone to purchase token by use a pay bill number provided.

From these discussions and from previous studies, technological acceptance theory significant to the researcher because the technology under study is prepaid electricity meter that Kenya Power and Lighting Company adopted. This strategic decision was made with the aim of improving its services from manual way to digital method, which is post-paid to prepaid models. How the power consumers accept and use this technology matters a lot to the company being a service industry. Prepaid billing system is convenient and efficient which in the longer end reduces all costs associated to supply and demand of electricity by Kenya Power and Lighting Company. It further increases income to the power provider and offer straight insight of usefulness on consumers' contentment by use of the new expertise.

2.2.2 Expectancy Disconfirmation Theory

Oliver (2007) developed the Theory of Expectancy Disconfirmation (EDT). According to Oliver (2010), thetheory of expectancy disconfirmation states that consumers pay for goods and services with pre- purchase prospect against the expected performance. The expectation level is used as a standard against which the product or service is judged. That is, once the product or service has been consumed, the results are compared alongside expectations. Expectancy disconfirmation theory came up as a way to clarifymaking of decisions by consumers, Oliver, (1997); Oliver (1980) the theory too has been established and made functional in public management.

The expectancy disconfirmation theory has proved as leading theory of explaining fulfillment of the consumers in the public sector (James 2009; Morgeson, 2012; Van Ryzin 2004, 2006). The model points that fulfillment on the side of consumers largely depend on implied previous performance anticipated and the result of the targets set on government use of a good or service. If for example, the perceived presentations of a service positively surpassearlierprospects, theoutcome in positive disconfirmation, leading to consumers that are more content. Hence, different anticipations of the presentation of a community service will take part of a vital task in explaining fulfillments differences in consumers.

Liao and Cheung (2002) in their theoretical study recognize expectancy as an essential attribute in the apparent value of prepaid electricity meters. This expectancy absolutely influences consumers' eagerness to utilize prepaid metering. Wan*et al.* (2005) agrees that expectancy has a major impact on customers' adoption of prepaid metering in Hong Kong, Lee *et al*. (2005) find that consumers recognize expectancy to be a key determinant with intention to appreciate the benefits of prepaid metering services. Similarly, Yu and Lo (2007) ascertain that perceived expectancy significantly influences consumers' actual behavior to prepaid metering.

The expectancy disconfirmation hypothesis is explained within two parameters, which includes anticipation or longing and experience or apparent action. This anticipation or longing is connected to the outcome of the pre purchase episode that consumers had originally had predictedregardinganexplicitpresentation onproducts or services quality. The occurrence ofapparent performance relates to the after purchase period where the consumers gets the know how after perceiving anactual performance such as quality of a particular product or service. Disinformation of expectation or desire is the difference between initial expectation or desire and perceived experience or performance (Oliver 1980; Patterson and Johnson 1997). In general, the results could be positive or negative. It is positive or favorable if the anticipated performance of the valueof product or service in this case prepaid electricity meter exceeds thewishes and anticipation of consumers. Otherwise, it will be negative disconfirmation if the consumers' anticipation on performance on the use and quality of prepaid electricity meter is worse of or not met. Yi, (1990) notes that favorable disconfirmation brings fulfillment in a customer while and unfavorable disconfirmation means unsatisfied consumers on the anticipated performance of products or services rendering it an unattractive.

The theory of Expectancy disconfirmation explains the relationship between pre-purchase expectation disconfirmation and customer satisfaction. The theory suggests that by evaluating actual performance of a product or service, the consumer forms their judgments. The theory is in line with the prepaid meters' system which is either advantageous to both the Kenya Power as well as the consumers of electricity or for disadvantage when comparing between the post and prepaid system. They both had an expectation of prepaid meters' performance and later on the intensity of perceived worth that is persuaded by expectations when using or having an experience with the prepaid meters. This implies assessing the outcome of putting the prepaid billing system in place, (Ekinci and Sirakaya, 2004). The theory of helps in measuring the customers' satisfaction from perceived quality of services

offered through adoption of pre-paid metering system by the power company. The power provider will be better placed in identifying the areas to improve on in order to supply cost effective power, which is dependable, accessible and of the best quality power in order to exceedcustomers' expectation and make their lives betters at homes and in businesses, Quality Policy (KPLC).

2.2.3Value-Percept Disparity Theory

Locke (1967, 1969) originally formulated this theory. Locke (2007)revisits the theory and confirms that customer's fulfillment or discontentment is an emotional response. The argument being whether a product or service satisfaction is based on what consumers' value most. This is brought about by likening the evaluative process in which the perceptions of or beliefs about a condition, deed or object are compared to one's desires, wants, needs and values. KPLC seeks recognition of values that is; the reliability and flexibility of prepaid metering system of electricity, and therefore, these events are simply tested against the extent to which the customer's values are met rather than confirmation of their expectations. According to Day, (1977); Oliver, (1980); Swan and Martin, (1981); Westbrook, (1980); an understanding of consumer satisfaction and dissatisfaction has been of much interest recently. There is need to put great emphasis or attention to the specification of the construct. The product or service could have more of a characteristic or result than the preferred and this has no force on satisfaction unless this aspect causes an obstacle in the realization of another value (Ontomwa, 2014).

The lesser the difference among percepts of the object, action, or condition, and one's values the more favorable the evaluation and the greater the generation of affirmative outcome linked with goal attainment, that is; contentment as Locke (2009), argues. On the other hand, the larger the value-percept disparity, the less favorable the assessment, the less the generation of affirmative outcome, and the larger the generation of negative effect related with objective is appointment (Griffin andHauser 2006).

The significance of this theory to the study is its valuesto attainment. This is appreciated on evaluation of the numerous challenges facing Kenya Power and Lighting Company while using post-paid billing system. The researcher noted that high revenue collection costs, lack of reliable and flexible power could have resulted to inefficient revenue collection and poor services the electricity customers. In pursuit of overcoming these challenges, the Kenya Power and Lighting Company have embraced on a suitable technology and innovation in order to improve the power network and customer service. The researcher

has emphasized on prepaid billing system, which is perceived to be more reliable, and flexible, adding value to the power provider in terms of increased revenue with minimal costs.

2.2.4 Cognitive Dissonance Theory

Festinger, (1957), originally stated the phenomenon of cognitive dissonance theory. The consumer behavior study describes it as an uncomfortable sentiment caused by holding opposing thoughts at the same time. Thomas & Monika, (2010) in their study explain that cognitive dissonance discovered examining influence in explaining the state of discomfort consumers experience after a purchase. The suggestion given in cognitive dissonance theory is for consumers to change their approach and way of thinking, and action behaviors, or by justifying or rationalizing them and in this way they will have a driving power to reduce discord. Kenya Power Annual Report, 2009), points out that many complaints in regard to prepaid meters are from tenant consumers particularly the ones sharing a common meter.They argue that they spend more than usual and they feel that consumption while using the prepaid meter is twice as much as what they used to consume on the postpaid meter. Consumers on monthly payroll too feel overwhelmed because unlike in postpaid where they could settle bill in parts or at month end, they now need to carry cash and budget for power on daily basis.

Mathenge (2015) did a research on the influence prepaid electricity meters' implementation on the level of consumer fulfillment and the findings were that there were problems of payments and she recommended more pay points. There is also lack of understanding regarding the prepaid billing system and recommended for more information to be shared to customers as well as trainings of the customer service staff to enlighten them with knowledge and fully equip them with skills to deal with the dissonance experienced by the customers in the new technology of prepaid meters.

Cognitive Dissonance Theory according to Festinger, (1957) is a broadly recognized construct in behavior research but has been criticized in that application in the current market research projects has been scarce. He explains that dissonance is a merely a transitory phenomenon and second is problems with measures and data collection administration affects the empirical address of the theory. Customer's satisfaction in power supplied by Kenya's only distributor of Electricity Company on how to use the prepaid metering system is based on the theory of cognitive dissonance. Theperception of the prepaid metering system was that

it would be very cost effective, reliable and flexible when the decision to install was made. In relation to the theory, KPLCs management's expectations of prepaid metering system adoption were very high in that it was help reduce unpaid bills and increase revenue. Customers too expectation was that the prepaid metering system would be effective and it would be cheaper than prior metering system. This theory is significant to the study in that we are comparing two systems simultaneously. KPLC should ensure a very reliable and cost effective billing system because the perception was that prepaid system would give maximum satisfaction as compared to the post- paid system. Kenya power should justify this phenomenon byproviding quality services to the client and in return more sales and revenue as well.

2.3 Empirical Review

This involves gaining knowledge by means of direct and indirect observation or experience and can be analyzed quantitatively or qualitatively.

2.3.1 Prepaid Meters Collection Costs and Revenue Collection

Internationally, empirical literature concerning effectiveness of prepaid billing meters is available and more so about supply and demand of electricity with a special focus on revenue collection. The changing times have brought forth new business challenges in the electricity energy distribution and sales sector which has prompted players in this dynamic sector world-over to consider more effective metering strategies to address the emerging revenue collection challenges, hence the dawn of prepayment metering. To counter the challenges, Kenya Power and Lighting Company is introducing Pre-paid metering concept not only as a business strategy but as a way of empowering customers to control their electricity consumption in wider energy conservation campaign.

According to Shah and Tewari (2003) prepaid billing system is a modern technology various economicbenefits to both the power company and its customers. Chandler (2005) in his study views prepaid metering system as having positive outcome to energy provider and consumers. As of the power providers, since the payment is made prior to consumption, this has brought down operational cost, which relate to reading of meters, invoicing (billing) and dispatch of bills, disconnection and reconnection costs among others. This has resulted in a notableimprovement in revenue collected and an operating capital decline. The energy provider can easily identify the number of active customers or how much to buy from KenGen in a given period. From the customer's point of view, they have more control of energy. They no longer get wrong and estimated bills. Therefore, the use of prepaid system

has enhanced their knowledge of how much power they are consuming and more significantly in their budget management.

Dadzie (2012) did a research study on the awareness and acceptability on the usage of prepaid meter in Accra Ghana, the research objective was to help better the fulfillment level of consumers and the adequacy of prepaid billing meters. The researcher analyzed the factors consumerscontemplatebefore accepting the use of prepaid billing meters. He also wanted to establish management strategy in indorsing prepaid practice. The conclusion of study was thatcustomers consider a number of issues prior to accepting the use of prepaid meter. Some of these factors include billing accuracy and flexible payment options available to consumers with prepaid meters as compared to an ordinary credit meter where paying of bills is in arrears. As much as the quantity of power purchased through these payment alternatives and leveled consumers' payments, the researcher notes that it is indirectly linked to the power use. These disbursement alternatives do not offer similar and direct link connected to powers and choice quality and regular use of power and quantity of prepaid sum. Prepaid billing meters also altered the connection, which existed among consumers and electricity retailers, but placing them in a better position to plan for their own power use thus empowering them.

Dadzie (2012) recommended the management to improve access to reliable vending points to make it easier for customer to accept the use of prepaid meters. The management of the power company had to undertake this bearing in mind minimal or no transactions costs were involved. It is also necessary to share important information with customers, like how and when to obtain credit and how to feed the same on the prepaid meter.

A research conducted by the Allen Consulting Group (2009) on the aspects of prepayment meters which make them unique as compared to the normal credit meters, specified that consumers are required to pay for power prior to consumption. Prepaid meters involved customers more actively in their electricity supplies and utility. The special features of prepaid billing meters have significant inferences on electricity for residential customers and small micro-enterprises.

Pamela and Salihu, (2010) in their research assessing the outcome of ICT on expansion focusing on prepaid electricity billing. The researchers stressed the degree to which the prepaid electricity system backed people's lives and freedom to participate in expansion activities and then derived some implications on financial growth. A study conducted by Nicollier and Casarin, (2008) a survey among local electricity users found an

improvement in welfare through use of prepaid meter system. In addition, the study establishes extra benefits of the prepaid system, which include; reduction of outstanding amounts or bills in arrears, operational and financial costs on the Kenya Power Company and improved allocation of funds for the consumer. Estache, *et al*. (2000) concludes with benefits of the prepaid billing system as decreasing organizational collection costs accuracy, which would lead to lower tariffs and improve the profit margins.

All the same some factors that affect the cost of electricity are difficult to control (Reuters, November 23, 2009) thus hard to regulate the cost of electricity internally. In a Business Daily, a local newspaper, Njiru, (2013) reported that the cost of connecting new customers in Kenya has really gone up since it was last reviewed in 2004 deterring prospective clienteles and thus reducing the company's proceeds. Further report indicate that Kenya Power and Lighting Company lose some money on every new connection, but failing to connect would leave tariff increase as the only source of revenue for the company. It is also a policy and the business of the company to connect a minimum number of customers in a given financial year, which should be reported to the shareholders during annual general meetings.

Shaw, (2011) states that modern technology reduces corruption within ranks. Prepaid meters are accurate and allow customers trust the electricity companies and manage their own consumption. Customers will pay for their bills upfront and therefore corruption in terms of collecting bribe to connect defaulting customers is slowly ending, though a very low pace. Corruption slows down thepace of development and should be fought at the national and at individual level. The Kenya Power and Lighting Company staff should observe integrity as one of the KPLC's core values in order to meet the set goals and targets.

The modern energy meters have the ability of automatically switching off consumers once they exhaust of energy credit. However, the meter gives a warning when the credit falls below 20Kwhrs. The consumer should prepare to purchase tokens to avoid power disconnection when warned. Bell, (2004) agree with most studies prepaid billing meter is more precise to the consumer as they have more control on their consumption. Energy consumers budget for consumption say on monthly or annual basis and are free to adjust on the same.

Some local studies done by Electricity Regulation of Uganda (2011 concluded that the prepaid metering system employed by Umeme has played significant role in that it has

significantly reduced losses in the company. In its loss reduction strategy for 2006-2009, Umeme, recognized that non-technical losses would be reduced after the implementation of prepaid system (Ontomwa, 2014). The study findings were that the billing efficiency ratio is a vital factor on determining the impact of the prepaid system analysis on loss reduction on which Umeme performance can be monitored.

Mwaura (2010) is interrelated prepaid billing system adoption with the aim of reducing non-technical energy losses in Uganda. The study established that the prepaid system condensed electricity theft and the benefits exceeds cost. Although the study by Mwaura compared Rwanda's experience with that of Uganda, the findings indicated that non-technical losses like power theft and financial losses such as revenue collection losses including bad debts were reduced. Ontomwa (2014) conducted a research on the prepaid billing system effects on costs of revenue collection costs and concluded that there is a reduction of revenue collection costs and further suggest that Kenya Power Company should convert more meters into prepaid, as it will boost its revenue collection proficienciesas wellas reduce costs allied to revenue collection.

Moki (2012) study on the relationship between prepaid electricity billing and working capital management at Kenya Power and Lighting Company between 2009 and 2012was executed on a three-year period data and established that both negative and positive relationship between prepaid billing system and working capital management exists. It also revealed that prepaid billing system has a substantial negative relationship with the average collection period. The average payment period and cash conversion cycle have a negative but non-significant relationship with prepaid billing system. His general and theoretical expectations of a positive non-significant connection as regard to turnover of inventory in days brought conflict his with empirical findings. He concluded that prepaid billing system be introduced as a way of revenue collection or debt management until a considerable number is attained. This is untilthe correlation with other working capital elements such as; cash conversion cycle and average payment period are perfected.

Many power companies in most states introduced prepaid electricity billing system with the objective of increasing electricity energy connection to low income households and importantly to improve on revenue collection. This is because connecting people with power is their core business and most had bill arrears affecting their revenue. In spite of these objectives in to change from postpaid meters to prepaid billing system, there are no clear

guidelines on whether the same has ever been achieved, and if not, reasons given, and this applies to Kenya Power and Lighting Company.

Barsky, (2010) indicated that use of postpaid electricity meters in a state like South Africa in the period of two and a half decades showed probable challenges that may have pushed the country to implement prepaidelectricity meters. Thus, Rogers (2005) in his view, agrees with Barsky on a wholesome cost effective system to facilitate placement in bulk. The aspect of collection cost is relatively a positive relationship to the researcher. Subsequently, prepaid system has effects on the Kenya Power and Lighting Company economic viability by reducing operating costs like meter reading, disconnection and reconnection costs for the utility, upfront cash collection. Therefore, no more pain of unpaid bills, reduction in customer complaints which even go to odd hours, failure rate decrease of meters which is an economical and easy way to start and scale in an area sale.

2.3.2 Prepaid Electricity Meter Reliability and Revenue Collection

Prepaid meter reliability means upholding satisfactory resources to supply customers with electricity at the proper voltage and frequency at all times. It is a measure how electricity network can endure the unforeseen or unanticipated losses in a system that is caused by natural or manmade events. System losses in this study means the percentage loss of power during transmitting it across the country and distributing it to specific customers. The National grid is the setup, which is abit complex to the ordinary person. It is the system on which electrical energy is transmitted through distribution wires or lines termed as electric cables and used in the transportation of electrical energy. These should be of good quality reliable to minimize wastage, loss and injuries. Bateson (2011) defines power supply reliability as the capability to satisfy the electricity needs of consumers regardless of failing apparatus or other circumstancesdiminish the quantity of accessibleelectricity supply. Reliability likewise encompasses rapid response to power outages.

Consumers have the right; to goods and services of reasonable quality; to the information necessary for them to gain full benefit from goods and services; to the protection of their health, safety, and economic interests; and to compensation for loss or injury arising from defects in goods or services. The Constitution of Kenya, (2010). Parliament shall enact legislation to provide for consumer protection and for fair, honest and decent advertising. (Consumer protection Act, 2012 enacted). This Article applies to goods and services offered by public entities or private persons. In line with this, it is therefore mandatory for Kenya

Power and Lighting Company to ensure they offer reliable and quality power to their customers.

It is the policy of Kenya Power and Lighting Company to ensure affordable, competitive, sustainable and reliable supply of energy at the least cost in order to achieve the national growth and development requirements and at the same time caring and conserving the surroundings for inter-generational benefits, (Energy Policy Objective, 2019). The Ministry of Energy and the Energy Act is mainly responsible for policy formulation and implementation of Kenya's energy sector and the law that provides legal basis for implementing the power industry structure and its operations respectively. In Energy Act Part 4, 'The Authority shall in consultation with the Cabinet Secretary review the electricity market on a regular basis with a view to enhancing competition, improving efficiency, increasing reliability and security of supply and improving the quality of service by all licensees. Provided that the first review of the electricity market shall be performed within three years from the day when this Act comes into force and not more than five years shall elapse between one review and the next'. The Act also states that the Cabinet Secretary shall, on the recommendation of the Authority, publish regulations for operations of the electricity market. Therefore, Kenya Power is mandated to work in line with this policy to ensure reliable power supply to the citizen of Kenya as it is their right and are protected by the Constitution of Kenya.

According to Rajkot (2004), reliability refers to the ability of the utility service provider to perform the promised service accurately and dependably to meet the product or service end users' expectations such as ease of use, safe operation, quality products, durable goods, and easily maintained products, etc. All these enhance better functional performance and or greater ease of use compared to other competing products/services. For the prepaid electricity meter to be adopted it must be tangible, able to give prompt service, trustworthy and the utility service provider must be competent in advising the customer (Jun & CAI, 2001). This involves giving quick response to customers' issues and sensitizing them on the advantages of using the prepaid metering system.

Besterfield *et al*. (2010) argued that supplying reliable electricity supply is though challenging and necessitates continuous control of many generators. Ireland (2007) indicated that an energy source is considered reliable if it generates electrical output and meets demand even at peak time. Peak or climax demand is the highest quantity of electric power needed to

satisfy all consumers at peak time. However, all energy sources have weaknesses and strengths and therefore electricity utility companies need to have different sources of energy to enhance electricity reliability. Kenya Power and Lighting Company has in the recent past faced some challenges in guaranteeing reliable electricity supply as the customer base widens and demand of electricity rises. This has caused into energy mixture of alternate energy sources such as wind, gas, solar, nuclear, coal and hydro.

Agreeing with (Kenya Power Annual Report, 2013) electricity industry in Kenya depends on renewable energy sources like hydro, oil and geothermal power. The power company has also been replacing overhead lines in the central business districts and environs with underground cables because they are less vulnerable to faults caused by strong winds, theft of electricity cables, heavy rains and fallen trees, to improve on the electricity reliability on the consumers. The cost of electricity varies from month to month also due to changes in the levies such as WARMA, ERC, REP Levies, fuel cost charges, foreign adjustments (FOREX), VAT among others. These are usually included in the monthly bills and many affect the reliability of bills and quality of power. In the year 2007, rural electrification Authority (REA) was established to help speed up the implementation pace of the rural electrification programme.

Kenya Power and Lighting Company did a piloting on the prepaid meters in major towns to weigh the efficiency of the prepaid system based on its execution on some selected customers. Ontomwa, (2014), notes that the prepaid billing system for a period of time was running parallel with prepaid system in order to eliminate teething problems and ensuring that the prepaid system was without errors was resourceful. The expectations were that the prepaid system upgrade should be resourceful and competent, should eliminate errors related to billing and importantly better customer service delivery. However, this has not been fully achieved but I believe that by the time the programme will be completed, the power provider company will have gone a milestone in providing reliable and quality power to the customers.

In supporting the government's Big 4 Agenda, Kenya Power and Lighting Company is committed to; provide affordable & reliable energy to industries to enhance manufacturing; Provision of competitively priced energy to local manufacturers to facilitate development of affordable housing; Provision of affordable power for irrigation water pumping to promote food security; Facilitate universal access to quality health services through supply of electricity to health facilities. This is as stipulated in the company's Corporate Strategic Plan

(2016/17- 2020/21), (KPLC, 2018). The Kenya Power Company is also upgrading existing and constructing new substations to take power nearer to the consumer (KPLC, 2014). Conferring with the empirical studies cited, there is a negative correlation on providing reliable electric power. Kenya power energy resources have weakness and strengths. Otherwise, Kenya power is improving on the alternative sources of energy or simply the renewable energy sources in order to provide reliable electricity to its customers. The government of Kenya in collaboration with ERC is promoting its development since it is a key energy sub sector that considerably add to the overall energy mix in Kenya, (EPRA, 2019).

2.3.3 Prepaid Electricity Meter Flexibility and Revenue Collection

Agreeing with Stoner (2009), prepaid electricity meteringwas first applied in South Africa in the mid-1980s with the intention of providing electric power to low income and remotely disbursed citizens. Driven by a concern for collective service in utilities, firmsand regulators are inspired to identify technological and regulatory opportunitiesmeant to encourage access and make it easier for consumers to control and pay for their services. Prepaid electricity system calls for the consumers to use electricity only when they have credit in the meter account and the supply disconnects automatically when such credit is drained. At the convenient, the customer tops up to enjoy the service. The credit is obtained inform of tokens conveniently from existing Kenya Power company banking halls, from third party vendors, Airtel money and Safaricom (Mpesa).

According to Ondari (2009), the prepaid system offers Kenya Power and Lighting Company some position developments as for its economic and ability to attract funding. Prepaid system will increase cash flow as consumers pay in advance and risk of bad debts is reduced or eliminated altogether. Prepaid meters have greatly helped overcome the limited infrastructure development required to dispatch and receive power bills. Kebeya, (2015) notes that the prepaid billing system as well encountered challenges in the pilot stage of this major capital project adopted by KPLC. Quite a number of consumers already installed with prepaid billing meters are unable to comprehend Kenya Power and Lighting Company's complex domestic tariff (DC). Tariff is the measure of electricity and it is stepped up nature in the prepayment system with various taxes and levies charged, (Kebeya, 2015). Though, there has been no increase in charges or tariffs since Kenya Power meets the cost of installing the prepaid meters, the only difference is that the customer pays in advance. Tariff in this

refers to the charge levied by Kenya Power and Lighting Company for growth and expansion, for operation and maintenance of the complex power network.

In 2009, the Kenya Power and Lighting Company launched on a pilot basis installation of pre-paid electricity meters for domestic users within Nairobi area and Kisumu town with an initial connection to 24,000 households (Ogujor, 2007). Flexible prepaid billing system is advantageous both to the customer and to the company because certain costs such as costs linked to bad debts can be shunned by paying in advance. This can lead to growth of revenue as well as saving in some operational costs for organizations Otosowie, (2010). Kenya Power gives the customer the opportunity to clear their bills before conversion to the prepaid meters, otherwise the bill is transferred to the prepayment system. If the transfer is effected, a certain percentage of purchase made as determined on regular basis by the management will be used to offset and reduce the arrears on each subsequent purchase of tokens. This will continue until the debt is fully paid, this agreement is flexible and customer friendly and advantageous to the utility company as a means of debt collection. It also reduces chances of electricity theft.

Prepaid meter billing was adopted in 2009 as one of the methods of retailing electricity to customers. The system relies on a flexible network of vending channels supporting vending operations. Prepaid tokens are purchased through KPLC offices, mobile money platforms, other Point of Sale kiosks & banks. The management of the utility company reported that there were 4.5 million customers are on prepaid metering as at 3rd quarter of year 2018 having grown from 268,569 five years ago. The rapid growth necessitated the adoption of the multiple channels for purchase and delivery of electricity tokens. Kenya Power and Lighting Company contracted third party Payments with the intention of creating a wide presence for their customers in all regions of the country for their convenience. This was also important in order to enhance service delivery beyond the banking halls and commercial offices. The multiple vending channels provide customers with ease of access to services and also reduce the cost of business, (KPLC, 2018). To enhance customer experience, the utility company instituted the following measures: Taking advantage of technology to drive their business i.e. Integrated Payment System, Continuous improvement of their IT systems e.g. the company is reaping the benefit of the new INCMS, the adoption a new Mobile and Web-based Self- Service App which allows self-meter reading, bill querying etc.

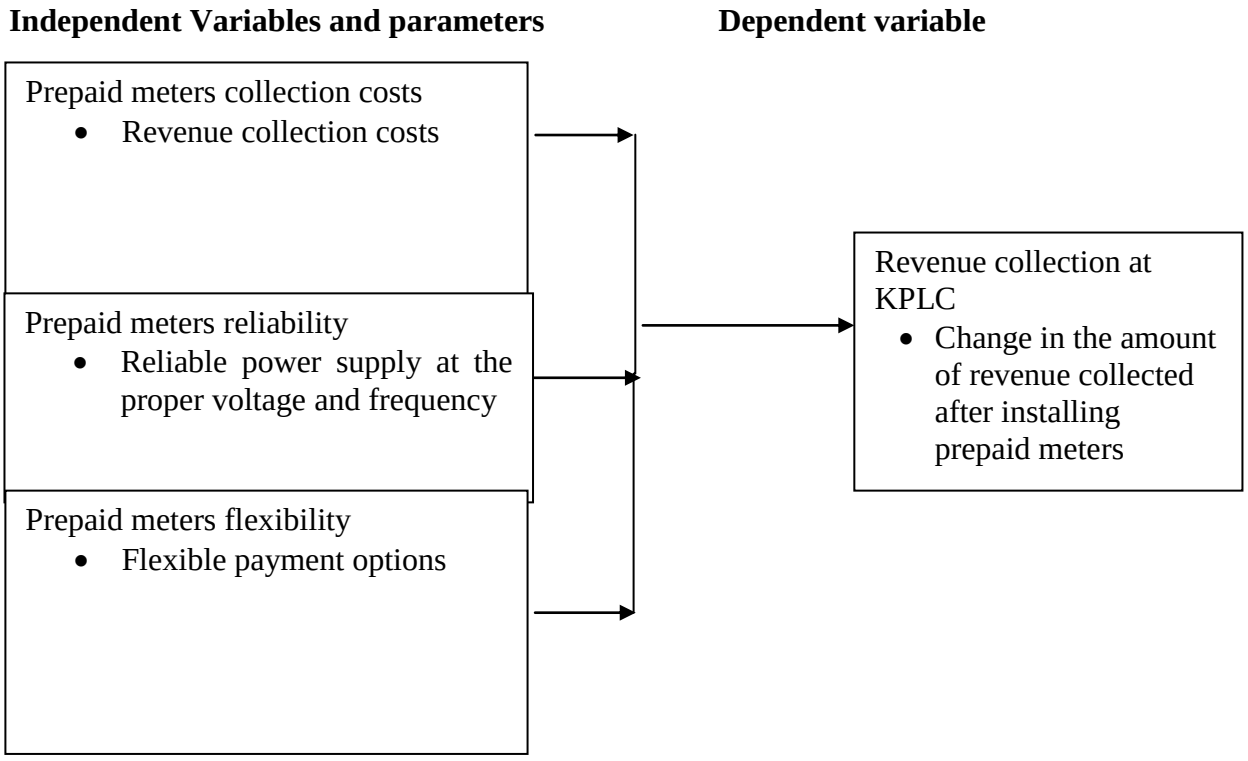
Kioko, (2012) notes that the prepaid billing systems comprise ofa method that enables customers with little or unreliable sources of income like casual laborers to access flexible payment options to ensure they are powered and without raising transactional costs to the power company. On the other hand, power customers already installed with prepaid billing system are better placed to plan for their electricity consumption. The outcome is understanding and quantifying how much energy they consume in a given period; say monthly or annually. This brings in a sense of control of energy use and budget management, (Tewari and Shah, 2003). Related studies and statements have indicated that an approach of revenue collection in organizations depends on its management's plans, strategies and capabilities. In its revived quality objectives, Kenya Power and Lighting Company is dedicated to supply quality and reliable power at reasonable cost which will exceed the expectation of consumers and enhance their personal lives and bring economic prosperity. The company an only execute this by adoption flexible and technologies that are appropriate like prepaid meters and be at par with the changing market needs by being innovative. The management has also embarked to better power network system by upgrading the existing and building new systems, processes and good customer service, Quality Policy, (KPLC). These studies are demonstrating positive relationship to the researcher since provision of flexible electricity in the prepaid meter system by Kenya power provide good services to the customer and also for great benefit to KPLC which includes improving revenue collection among others.

2.4 Conceptual Framework

This part represented how the researcher appreciated the relationship the selected variables to each other. Therefore, it recognized the essential variables in the research study. Conceptual framework is the researcher's "map" or the ''rudder'' that guides the researcher towards realizing the objectives or intent of the study. Conceptual framework guides the researchers on how the particular variables in her study relate with each other. The conceptual framework "sets the stage" for the presentation of the research question that drives the investigation being reported based on the problem statement of the study presenting the circumstance and the underlying issues, which prompted the researcher to carry out the study, (McGaghie *et al*. 2001). The researcher uses the conceptual framework to describe some phenomena through support of theories that have been tested and exemplify the findings of others researchers with related parameters, (Regoniel, 2015).In pursuing this study, the conceptual framework helped in identifying the independent variables including

the numerous effects of prepaid electricity meters on revenue collection at Kenya Power and Lighting Company.

FIGURE 2.1: Conceptual Framework



Source: (Researcher, 2019)

2.5 Summary of Literature Reviewed and Gaps

The concept of prepaid billing system is relatively new in Kenya and this includes the prepaid electricity meters. Several studies have been carried out in reference to prepaid meter system but from the view of local literature, little has been done in Kenya showing the effects

of prepaid meters' system on revenue collection. Ontomwa, (2014) in his study notes that most of the international and local studies focuses on the qualitative aspects of prepayment, for instance; opinion and perceptions of the prepaid users and customer acceptability of the prepaid system, but the quantitative aspects of prepaid billing system have not been sufficiently researched on. To the best of my knowledge, no such work has been done regarding the effect of prepaid meter system on revenue collectionandhenceforth, no such research has been done on the effect of prepaid electricity meter system on revenue collection, at all. Therefore, this study seeks to establish the effect of prepaid electricity meters on revenue collection at Kenya Power and Lighting Company and disclose the relationship that may exist between the selected parameters.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The methodology for the research took into considerations all the procedures and processes that were selected. This chapter covered the research design, the population study, and sample procedures, sampling procedure, data collectioninstruments,sourcesof datacollection procedure and data analysis procedure. The chapter also gave an in-depth analysis on methods applied in the research work.

3.2 Research Design

Cooper and Schindler (2014) define research design as a structured plan of data collection, measurement and analysis. It is the plan, organization and structure of examination geared getting suitable replies to research questions. It is merely a framework controlling analysis of information gathered from the respondents (Otieno, 2018). Research design or plan is simply a master program of a research study and covers a framework of whatever the researcher engages in from the start of writing of research proposal with specific objectives and research questions to analysis of data and conclusion of final report. Descriptive research design was employed in this research study. Descriptive research design entails describing the state of affairs or things as they are. Martyn, (2008) defines Descriptive research design as a method that comprise of observation and behavior description of a subject matter in a scientific way. This research design does not influence the

formalized substantial research structure or the answered research questions. Descriptive research study describes the phenomena related with a subject population or to lay an estimate proportion of the population that has certain characteristics (Cooper & Schindler, 2014).

3.3 Targeted Population

The researcher targeted a population of240 Kenya Power and Lighting company personnel working in the customer service division in seven sub regions withinKiambuCounty. Otieno, (2018) defines population as events, people or things of interest that the researcher desires to study in an all-inclusive manner and covers all the basics that the researcher is intending to make some interpretations established on sample statistics. Population is a group covering a set of potential measurements encompassing studies under investigation as well as the ones that are potentially observable. Population therefore is the entire collection of interest individuals, proceedings and objects with distinct and common characteristicthat are observable, Kithae, (2012), Sekaran&Bougie, (2013). The target populationwill be stratified into seven sub-regions in Kiambu County as shown in table 3.1 below.

TABLE 3.1: Targeted Population (KPLC- Kiambu County Sub Regions)

Stratum	**Targeted population**
Thika town	72
Kiambu town	48
Ruiru town	43
Limuru town	39
Githuguri town	18
Gatundu town	13
Kikuyu town	7
Total	**240**

Source (Researcher, 2019)

3.4 Sample Size and Sampling Technique

The aim of sampling is to appreciate some qualities or attributes of a huge population basing it on the features of the sample identified. Respondents were stratified into seven sub regions, these are; Thika town, Kiambu town, Ruiru town, Limuru town, Githunguri town,

Gatundu town and Kikuyu town. A sample size of 140 respondents were selected using stratified sampling technique as shown in the table below:

TABLE 3.2: Sampling size (Kiambu County, KPLC Sub Regions)

Stratum	**Population size**	**Sample size**
Thika town	72	42
Kiambu town	48	30
Ruiru town	43	25
Limuru town	39	20
Githuguri town	18	10
Gatundu town	13	8
Kikuyu town	7	5
Total	**240**	**140**

According to Gay (1992), stratified random sampling is ideal as it ensures that the sub-groups include the all population that can easily be omitted by other sampling methods of because of a small population.

3.5 Instrumentation

The researcher used a self-administered questionnaire to gather primary data from the respondents. The questionnaire comprised of open and closed ended questions. Sekaran&Bougie(2013) defines a questionnaire as structured set of questions written and printed for respondents to records or fill in their responses.

3.6 Validity and Reliability Tests

Pilot test on some Sample questionnaire was done few weeks prior to administration. According to Cooper&Schindler (2014),” conducting a pilot test assists the researcher to detect any limitation in design and instrumentation and also in providing alternative information in selecting of probability sample”. Approximately, fifteen copies of printed questionnaires were distributed to a few Kenya Power and Lighting company sub regions within Nairobi County for pilot testing before the actual data collection time. It was discovered that the respondents were not comfortable to length of questionnaire and progress related questions regarding the three variables of the study were not quite clear. The researcher was now ready to answer queries or clear any doubt that would arise during actual data collection. Thereafter, copies of the questionnaire were taken to the seven sub regions of the study and distributed directly to the Kenya Power and Lighting company customer service staffs who are also customers using prepaid system as well equipped with knowledge of the prepaid system.

SekaranandBougie (2013), argue that a personally administered questionnaire is advantageous because the researcher can gather all completed responses within a short time. Any query or doubt from the respondents can be clarified at the spot. To measure the validity of the data collection instruments and internal consistency technique using Cronbach's alpha was applied. According to George &Mallery, (2003) Cronbach’s alpha of 0.7 or above is reliable. To test the reliability of the research instruments, test re-test technique was used.

3.7 Data Analysis

Questionnaires collected from the respondents were checked for consistency or reliability, entirety as well as correctness. The questions were then coded and stored into a computer database. Data was analyzed using descriptive statistics, correlation analysis and multiple regression analysis. The multiple regression model is specified as follows;

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

Where Y= Revenue collection

β_0 = intercept

$\beta_1, \beta_2, \beta_3$ = coefficients

x_1 = Prepaid meters collection costs

x_2 = Prepaid meters reliability

x_3 = Prepaid meters flexibility

ε = error term

The Analyzed data was presented using frequency TABLEs and pie charts.

3.8 Diagnostic Tests

A diagnostic test was conducted and subsequently regression analysis executed. This was done to test whether the data gathered appreciated the assumptions of regression analysis. The tests applied aremulticollinearity and normality of residuals.

3.8.1 Multicollinearity Test

Multicollinearity or simply collinearity is an occurrence in statistics, where one predictor variable in a multiple regression model is linearly projected from the other with a lot of precision. Multicollinearitycommonly happens when there are high correlations amongst two or more predictor variables. Meaning that one predictor variable can be used to foretell the other creating unnecessary information and skewing the results in a regression model. Examples include; weight and height of a person, sale of a car and year of manufacture or an individual ‘s level of education and income. Multicollinearity is calculated and detected by using correlation coefficients for all sets of predictor variable. Perfect multicollinearity is when correlation coefficient r is exactly +1 or -1, if r is close to or exactly -1 or +1, one of the variables should be removed from the model if at all this is possible. Therefore, before the regression analysis was conducted, multicollinearity of the variables was tested.

3.8.2 Normal P-P Plot

The normal probability plot, according to (Chambers et al., 1983) is a graphical technique for assessing whether or not a data set is approximately normally distributed. The points should form a straight line when plotted against theoretical normal. The P-P plots are vastly used to evaluate the skewness of a distribution. After the regression model is run, normality of errors was tested to see if the study applied the Normal P-P plot of regression standardized residual.

3.9 Ethical Consideration in Research

The researcher observed all fundamental clauses in social research ethics. Confidentiality guaranteed for all respondents, permission sought from the necessary authorities that is; from KCAUniversityand Kenya Power and Lighting Companybefore fieldwork.

CHAPTER FOUR

DATAPRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

The chapter focuses on data analysis and interpretation of underlying effect of prepaid meters on revenue collection at Kenya power and lighting company. Regression model was applied in data analysis to determine relationship between dependent and independent variables. tables and bar graphs were used to present the analyzed data.

4.1.1 Response Rate

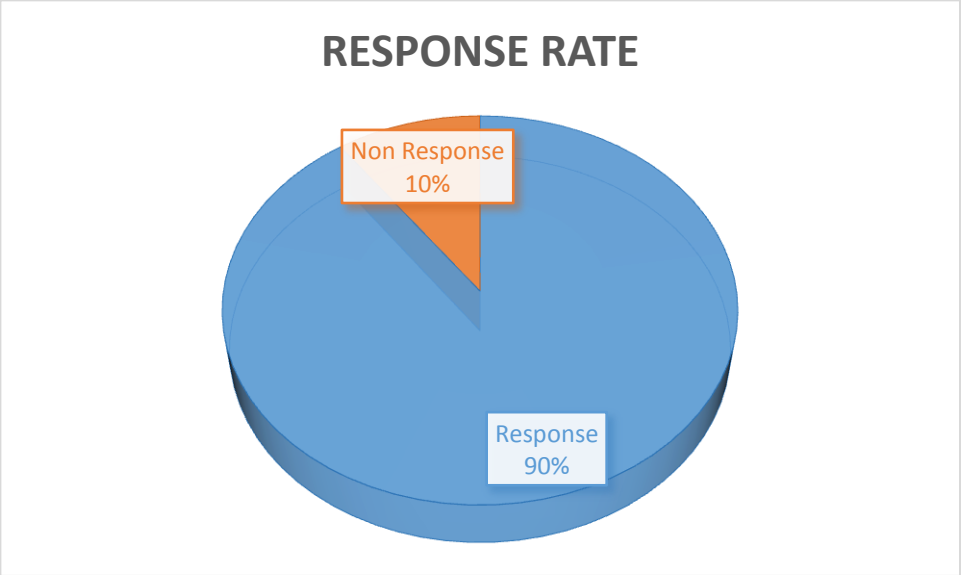
There were 126 respondents and the study provided a presentation on the response rate as shown on thetable.

TABLE 4. 1; Response Rate

Category	Frequency	Percentage
Response	126	90
Non Response	14	10
Total	**140**	**100**

Source: Author (2019)

FIGURE 4. 1:Response Rate



Source: Author (2019)

The response rate in this study was presented on thetable 4.1 and figure 4.1. 90% of questionnaires were returned whereas only 10% of the total number of questionnaires was not returned. The response rate realized in this study is considered sufficient for data analysis (Mugenda and Mugenda, 2003).

4.2 Demographic Characteristics

This segment consists of evidence that defines basic physiognomies such as gender, age, marital status, years worked in current position and level of education of the respondents.

4.2.1 Gender of the respondents

The respondents specified their gender. The females were the majority (61%) of the respondents whereas 39% were male as shown in table 4.2. This implies that majority of Kenya Power and Lighting Company (KPLC) employees in Kiambu County are female.

TABLE 4. 2; Gender of the Respondents

	Frequency	Percent
Male	49	39
Female	77	61
Total	**126**	**100.0**

4.2.2 Age of the respondents

Respondents indicated their age brackets with the majority of the respondents being the bracket of 31-40 years (32 %) followed by the age bracket of 41-50 years (26%), the age bracket of 21-30 years (22%), 50 years and above (17%) and the least was 20 years and below (3%). This implies that most of the KPLC employees inKiambuCountyare in the age bracket of 31-40 years and are well experienced on the operations of KPLC. The employees in the age of between 31-40 years are still more energetic. This is as shown in table 4.3 below.

TABLE 4 3:Age of the Respondents

	Frequency	**Percent**
20 years & below	4	3
21-30 years	28	22
31-40 years	40	32
41-50 years	33	26
51 years & above	21	17
Total	**126**	**100**

4.2.3 Marital status

This study gathered data on marital status in these sub-counties under KPLC. The findings show that most of the respondent were married (58%) followed closely by those respondent who were not married (27%). Separated were 9 % and those who had divorced were 6%. Thus, majority of the respondents embraced family life and there are few cases of separated individuals as well as cases of divorcees as shown in table 4.4.

TABLE 4. 4: Marital status of the Respondents

		Frequency	Percent
	Married	73	58
	Single	34	27
	Separated	11	9
	Divorced	8	6
	Total	**126**	**100**

4.2.4 Level of Education

Highest level of education was one of the parameters in the questionnaire. As shown in table 4.5, majority of the respondents had a diploma level of education (36 %) followed by

undergraduate degree (28%), postgraduate qualification (23%), professional qualification (7%) and secondary qualification (6 %). The study outcome means that, the respondents could understand the questions and fill the questionnaire with ease. It is also a confirmation that KPLC employees are well educated.

TABLE 4: 5: Level of Education of the Respondents

		Frequency	Percent
	Secondary	7	6
	Diploma	45	36
	Undergraduate	35	28
	Postgraduate	30	23
	Professional	9	7
	Total	**126**	**100**

4.2.5: Length of service

The research shows that 23%, 24%, 21%, 11 %, and 21 % had worked for KPLC below 6 years, 7- 10 years, 11-15 years, 16-20 years and above 20 years respectively. This is an indication that the respondents were knowledgeable and experienced on the operations of KPLC.

TABLE 4: 6: Length of Service

		Frequency	Percent
	Below 6 years	29	23
	6 -10 years	30	24
	11-15 years	27	21
	16-20 years	13	11
	Above 20 year	27	21
	Total	**126**	**100**

4.3: Descriptive Statistics

This division represents the descriptive outcomes on revenue collection, Prepaid Meters Collection Costs, Prepaid Meters Reliability and Prepaid Meter Flexibility. The use of prepaid system was undertaken in order to determine the extent to which it affects the revenue collection in a five point Likert scale. The range was ‘strongly disagree (1)’ to

'strongly agree' (5). The scores of not agreeing have been taken to represent a variable, with a mean score of less than 2.5 on the continuous Likert scale. The scores of 'Neutral' have been taken to represent a variable with a mean score of 2.5 to 3.4 on the continuous Likert scale while the score of both agree and strongly agree have been taken to represent a variable which had a mean score of 3.5 to 5.0 on a continuous Likert scale. A standard deviation of > 0.9implies a significant difference on the impact of the variable among respondents.

4.3.1 Revenue Collection

The determination of the amount of revenue collection was the major objective of the study on KPLC revenue collection by employee working in customer service. The respondents responded to statements on revenue collection. Rated on a five Likert scale, the responses were as obtainable in table 4.7. The respondents agreed that introduction of pre-paid meters improved the revenues collection with mean agreement score of 4.1508. The low standard deviation of 0.849 indicates that the variation among the respondents was low. The respondents were further in agreement that Revenue collection have improved due to avoidance of hiring staff and using contracted debts collectors (mean=4.1032); Prepaid system is a quality of management as well as quality of product and services (mean=3.9603) and Prepaid system has improved company's' strategy on sales, cash collection and its cash disbursement (mean=3.8492). The high standard deviation of 1.10872 indicates that there was high variation among the respondents.

TABLE 4. 7: Revenue collection descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Modern technology is likely to improve on financial status and demands efficiency and effectiveness in the company	126	1.00	5.00	4.1508	.84916
Revenue collection have improved due to avoidance of hiring staff and using contracted debts collectors	126	1.00	5.00	4.1032	1.10872
Prepaid system is a quality of management as well as quality of	126	1.00	5.00	3.9603	1.05376

product and services.					
Prepaid system has improved company's' strategy on sales, cash collection and its cash disbursement	126	1.00	5.00	3.8492	.93010
Valid N (list wise)	126				

4.3.2 Prepaid Meters Collection Costs

The first objective of the study was to establish impact on prepaid system on collection costs at KPLC. The results were that KPLC Prepaid meters reduced meter reading costs, disconnection and reconnection costs with a mean of 4.3651 and that there is flexiblePrepayment options which consumers have access to with prepaid billing meters as compared to paying bills in arrears with a mean of 3.9683. The standard deviation of 0.94604 indicates that there was low variation among the respondents. The respondents further noted that Prepaid system can reduce operating cost as well as commercial losses associated with customer defaults (mean=4.2698) and Prepaid systems reduced corruption within ranks thus are more accurate (mean=2.6508). The high standard deviation of 1.45502 indicates that there was high variation among the respondents.

TABLE 4. 8: Prepaid Meters Collection Costs

	N	Minimum	Maximum	Mean	Std. Deviation
Prepaid meters reduced meter reading costs, disconnection and reconnection costs	126	1.00	5.00	4.3651	.96832
Prepaid system can reduce operating cost as well as commercial losses associated with customer defaults	126	1.00	5.00	4.2698	.99126
Prepayment options available to customers with a standard credit	126	1.00	5.00	3.9683	.94604

meter other than paying bills in arrears.					
Prepaid systems reduced corruption within ranks thus are more accurate	126	1.00	5.00	2.6508	1.45502
Valid N (list wise)	126				

4.3.3 Prepaid Meters Reliability

The second objective of the study was to determine the effect of prepaid meter reliability on revenue collection. The respondents agreed that prepaid meter aims at facilitating affordability and reduction in utility costs as well as being among the innovative solution with a mean score of 4.2778. The low standard deviation of 0.79218 indicates that the variation among the respondents was low. The respondents further noted that there has been an improvement in access to electricity. This is for the residents in both formal and informal settlements as prepaid meter is equitably distributed (mean=3.8889); Involvement in sensitizing the consumers on the advantages of using the prepaid meters (mean=3.6587) and the believe that customers are most often satisfied with the quick response from KPLC any time they encounter challenges (mean=3.4921). The high standard deviation of 1.01321 indicates that there was high variation among the respondents.

TABLE 4. 9: Prepaid Meters Reliability

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Prepaid meter aims at facilitating affordability and reduction in utility costs as well as being among the innovative solution.	126	1.00	5.00	4.2778	.81622
There has been an improvement in access to electricity for the residents in both formal and	126	1.00	5.00	3.8889	.79218

informal settlements as prepaid meter is equitably distributed					
We were involved in sensitizing the consumers on the advantages of using the prepaid meters	126	1.00	5.00	3.6587	1.01321
I believed that customers are most often satisfied with the quick response from KPLC any time they encounter challenges	126	1.00	5.00	3.4921	1.00197
Valid N (list wise)	126				

4.3.4 Prepaid Meter Flexibility

The third objective of the study was on how Prepaid Meter Flexibility affects company revenue collection. Results in table 4.10 show that (mean=4.4365) of the respondents agreed that Prepaid meters overcame limited infrastructural development required to dispatch and receive credit slip (bills). (mean=4.3571) of the respondents agreed that The tokens are easily accessible whenever needed, (mean=4.2460)of the respondents agreed that Prepaid meter system was to help tackle difficulties arising from irregular income while (mean=3.9762) of the respondents indicated that they now consume less power since they moved to prepaid billing. The low standard deviation of 0.95913 indicates that the variation among the respondents was low.

On an average Likert scale the responses had an overall mean of 4.2542 which indicated that the respondents agreed to the majority of the questions asked. The high standard deviation of 1.10769 indicates that there was high variation among the respondents.

TABLE 4. 10: Prepaid Meter Flexibility

	N	Minimum	Maximum	Mean	Std. Deviation
Prepaid meters overcome limited infrastructural development required	126	1.00	5.00	4.4365	.95913

to dispatch and receive credit slip (bills)					
The tokens are easily accessible whenever I need them	126	1.00	5.00	4.3571	1.09883
Prepaid meter system was to help tackle difficulties arising from irregular income	126	1.00	5.00	4.2460	1.10769
I now consume less power since I moved to prepaid billing	126	1.00	5.00	3.9762	.96718
Valid N (list wise)	126				

4.3: Diagnostic tests

The study used Ordinary least squares method for linear regression analyses and pre and post examination tests were performed to examine the model assumptions.

4.3.1.: Pre-estimation tests:

This is carried out to ensure normality and multi-collinearity of results before fitting the model. This procedure is carried out using two tests, which are explained in detail below.

4.3.2: Schapiro Wilk test for normal data

The Schapiro Wilk test results for normal data are presented in Appendix 111:The findings indicate that all variables in the study had a p-value less than 0.05; hence, the study data follow a normal distribution making the (OLS) method suitable for analysis of the data.

4.3.3: Pearson Correlation test for Multi-collinearity

To avoid a high correlation of the variables used, multi-collinearity test was carried out using the Pearson correlation techniques shown in table 4.11 below.

TABLE 4. 11: Pearson Correlation test for Multi-collinearity

		Prepaid meter collection cost	Prepaid meters reliability	Prepaid meter flexibility
Prepaid meter collection cost	Pearson	1		

	Correlation			
	Sig. (2-tailed)			
	N	126		
Prepaid meters reliability	Pearson Correlation	.334**	1	
	Sig. (2-tailed)	.000		
	N	126	126	
Prepaid meter flexibility	Pearson Correlation	.298**	.564**	1
	Sig. (2-tailed)	.001	.000	
	N	126	126	126

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

The three independent variables were moderately correlated to each other and none had a correlation exceeding 0.7. Therefore, there were no presence of Multi-collinearity among the independent variables

4.3.4: Post estimation tests:

Other assumptions can only be determined after running the regression of model. These post estimation tests include Heteroscedasticity – (non-uniformity of errors) and the general characteristic behavior of residuals variables. These tests are crucial to ascertain that the data used in the study followed normal distribution or whether some transformation is required in running the regression in the final model. The following were the post estimation tests performed and the results thereof:

4.3.5: VIF test for multi-collinearity

This test is carried out after regression to confirm the pre-test indicated earlier on normality and multi-collinearity of data as shown Appendix IV. The results of the tablegive a mean VIF of 1.39, which is less than the set threshold of 10 when the variables are perfectly collinear. This therefore confirms that there is no multi-collinearity in the data used in line with the pre-test done on the data.

4.3.6: Test for Heteroscedasticity

OLS results are rendered biased if the pattern of errors does not remain constant throughout the observations (Gujarati 2003). This is referred to Heteroscedasticity problem, and to minimize these, the residuals were subjected to graphical and non-graphical Breusch-Pagan test after regression. The Breusch-Pagan test tests that the null hypothesis that the error variances are constant throughout the observation unless the results prove otherwise. The results are presented below in Appendix V. The results in the table posted a p value of 0.0008 at 95% confidence level hence the study failed to reject the null hypothesis that the errors were homogeneous and therefore the study concluded that there was presence of Heteroscedasticity in the model.

4.4 Regression Analysis

The results in table 4.12 represent the fitness of model used of the model regression in explaining the study phenomena. Coefficient of determination of the study explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (revenue collection) that is explained by all the three independent variables (Prepaid meters' collection costs,Prepaidmeters' reliability and Prepaid Meter Flexibility). The three independent variables studied explain only 29.2% of revenue collection by Kenya power and lighting company that comprise of domestic and small commercial customers. This therefore implied that other factors not studied in this research contribute 70.8% of the corporation revenue collection who comprise of large power and corporate customers. KPLC manages these account using automatic meters while others are still on postpaid meters

TABLE 4. 12: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.541[a]	.292	.275	.66869

a. Predictors: (Constant), Prepaid meter flexibility, Prepaid meter collection cost, prepaid meters' reliability

4.4.1 Analysis of Variance

In statistics significance, testing the p-value indicates the level of relation of the independent variable to the dependent variable. If the significance number found is less than the critical value also known as the probability value (p) which is statistically set at 0.05, then the conclusion would be that the model is significant in explaining the relationship; else the model would be regarded as non-significant.

TABLE 4. 13:Anova

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.542	3	7.514	16.805	.000[b]
	Residual	54.551	122	.447		
	Total	77.093	125			

a. Dependent Variable: Revenue collection

b. Predictors: (Constant), Prepaidmeter flexibility, Prepaidmetercollectioncost, prepaidmeters reliability.

Table 4.13 provides the results on the analysis of the variance (ANOVA). The results indicate that the overall model was statistically significant. Further, the results imply that the independent variables are good predictors of revenue collection by Kenya power and lighting company. This was fully supported by an F statistic of 16.805 and the reported p value (0.000) which was less than the conventional probability of 0.05significance level.

4.4.2 Regression Coefficients

Regression of coefficients results are as shown in table 4.14. As regards Prepaid meter collection cost, the results show that; T=2.402 and` p-value =0.000 since $p<0.05$ at the $\alpha=0.05$ level of significant there exist enough evidence to conclude that the Prepaid meter collection cost is less than 0.005, hence, that appreciating the study conclusion that Prepaid meter collection cost is useful as a predictor of revenue collection by Kenya power and lighting company.

Prepaid meters reliability was equally tested and from these result T=3.298, p-value=0.001 atα =0.05 level of significant; there exist enough evidence to conclude that the

Prepaid meters' reliability is not zero and hence, that Prepaid meters' reliability is useful as a predictor of revenue collection by Kenya power and lighting company

As regards, Prepaid Meter Flexibility, the results show that; T=1.929 and p-value =0.0.056 since p>0.05 at 0.05 level of significant there exist enough evidence to conclude that the Prepaid Meter Flexibility c is great than 0.005, hence, that appreciating the study conclude that Prepaid Meter Flexibility is not useful as a predictor of revenue collection by Kenya power and lighting company.

TABLE4.14: Regression Coefficients

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.919	.445		2.063	.041
Prepaid meter collection cost	.227	.094	.196	2.402	.018
Prepaid meters reliability	.385	.117	.311	3.298	.001
Prepaid meter flexibility	.178	.092	.180	1.929	.056

a. Dependent Variable: Revenue collection

From the data, the established regression equation was

$Y = 0.919 + 0.227x_1 + 0.385x_2 + 0.178x_3$

The model shows Prepaid meter collection cost as having a positive coefficient, which showed that they were directly proportional to revenue collection. This mean that a unit increase in Prepaid meter collection cost increases the revenue collection with 0.227 unit. And a unit increase in Prepaid meters' reliability will increase the revenue collection p by 0.385 The results obtained in table indicted that when all the variables are zero, that is prepaid meter collection cost =0, and prepaid meter reliability then the revenue collection will increase by unit. 0.919

On prepaid meters' collection costs, the study's regression results showed a coefficient of 0.0227, with a p value of 0.018 therefore implying that there was a positive significant relationship between the prepaid electricity-metering system collection costs of

Kenya power and lighting company and revenue collection. The implication of this finding was that prepaid electricity-metering system collection costs tend to positively impact the revenue collection of the firms. As such, in order for the Kenya power companies to optimize their revenue collection, they should have maintained and managed what they had in terms of the stipulated prepaid electricity-metering system collection costs.

The study was in agreement with Shah and Tewari (2003) and Chandler (2005) who concluded that the prepaid electricity-metering system collection costs resulted in a significant improvement in revenue collection. Additionally, the study of Dadzie (2012), found that customers consider a relative number of factors before accepting the use of prepaid meter, one of these factors been billing accuracy which resulted in a significant improvement in revenue collection.

The studies of Pamela and Salihu, (2010); Nicollier and Casarin, (2008); Barsky, (2010) and Estache, *et al*. (2000) highlighted a positive relationship between the prepaid electricity-metering system collection costs and revenue collection, they have enhanced people's freedom to participate in development activities resulting to improvement in welfare as well as increasing organizational collection costs accuracy.

The findings of Shaw, (2011); Bell, (2004) and Mwaura (2010) also agreed with the results of this study that prepaid electricity-metering system collection costs had a positive relationship with the revenue collection of KPLC because prepayment meters reduce corruption within ranks thus are more accurate and have reduced electricity theft and the benefits exceeds cost. However, the study was not in agreement with Ontomwa (2014) who concluded that there was a reduction of revenue collection costs and further recommended that Kenya Power and Lighting Company should convert more postpaid meters into prepaid metering system. This will go a long way in improving revenue collection as well as reducing collection costs associated with collection of revenue.

On prepaid meters' reliability, the results of this study highlighted the coefficient of 0.385, which was statistically significant at 5 percent level with a p-value of 0.001 that was less than 0.05. The results indicated that there was a significant positive relationship between the prepaid electricity metering systems reliability and the revenue collection at Kenya Power and Lighting Company.

The findings of this study are in alignment with Besterfield et al. (2010) argued reliable electricity supply provision is however very trickyand may require constant control and management of a large number of generators. Ireland (2007) noted that a source of

energy is considered reliable if the electrical output generated meets peak time demands. Nevertheless, all sources of energy have strong and weak points too and hence electricity utility companies should ensure different sources of energy to enhance electricity reliability. One of the major challenges faced by Kenya Power is lack of reliability of electricity supply, which has resulted in looking energy mixture combination of alternate energy sources such as wind, gas, solar, nuclear, coal and hydro.

Regarding prepaid meters' flexibility on revenue collection, the results of this study highlighted the coefficient of prepaid electricity metering systems flexibilityto be 0.178 which was not statistically significant at 5 percent level with a p-value of 0.056 which was greater than 0.05. The results indicated that there was an insignificant positive relationship between the prepaid electricity metering systems flexibility and revenue collection.
The study was in agreement with Ondari (2009) and Kebeya, 2015) who concluded in their studies that there was an insignificant positive relationship between prepaid electricity metering systems flexibility and revenue collection. Additionally, the studies of Otosowie, (2010) and Tewari and Shah, (2003) proved a positive insignificant relationship to the researcher since provision of flexible electricity in the prepaid meter system by Kenya power provide good services to the customer and also increase in levels of revenue as well as great benefit to KPLC.

In conclusion, the inferential statistic showed that revenue collection in Kenya power and lighting company was explained by independent variable; prepaid meter collection cost and prepaid meter reliability, therefore appreciating that prepaid meter collection cost and prepaid meter reliability were the predictor of that revenue collection in Kenya power and lighting company

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to establish the effect of prepaid meters on revenue collection at Kenya power and lighting company. Therefore, this chapter presented the summary of results of the study, conclusions and recommendations in line with the objectives of the study. It also compared and contrasted the results with existing extant literature. In addition, the chapter

also presented policy implications and recommendations made to various stakeholders. Various limitations of the study were highlighted and areas for further research were as well suggested.

5.2 Summary of Findings

The main objective of the study was to establish the effects of prepaid metering system on revenue collection at Kenya Power and Lighting Company. The researcher used descriptive research design to describe the outcomes on revenue collection, collection costs, reliability and flexibility of prepaid meters. 126 respondents out of a sample size of 140 were selected using stratified sampling technique. The researcher used a self-administered questionnaire to collect primary data from the respondents which was analyzed using statistical packages for social science(SPSS).

5.3 Conclusions

The objective of the study generally was to ascertain the effect of prepaid meters on revenue collection at Kenya Power and Lighting Company. Additionally, the specific objectives were to establish the effect of prepaid electricity-metering system collection costs, prepaid electricity metering-systems reliability and prepaid electricity metering systems flexibility on revenue collection at KPLC. The results of this study showed that all the specific objectives had a special individual relationship with the revenue collection at Kenya Power and Lighting Company. The study appreciated that the independent variables were useful predictors of revenue collection at KPLC.

Prepaid electricity-metering system collection costs is crucial on the revenue collection at Kenya Power and Lighting Company since it exhibited a positive significant relationship with the revenue collection in the study and contributed much on the same. Some indicators of the positive significant relationship were the level of billing accuracy, enhancement of people's freedom to participate in development activities and improvement in welfare.

Secondly, prepaid electricity metering-systems reliability indicated a positive significant relationship with the revenue collection at KPLC. However, some indicators of the positive significant relationship were quick response to power outages and all these enhance better functional performance and greater ease of use compared to other competing products/services.Kenya Power and Lighting Company also relies on the process of replacing over headlines in the central business districts and environs with underground cables to

improve on the electricity reliability on the customers. Finally, Kenya Power and Lighting Company is improving on the renewable energy sources in order to provide reliable electricity to its customers.

Ultimately, prepaid electricity metering systems flexibility indicated a positive insignificant relationship with the revenue collection at Kenya Power and Lighting Company. However, some indicators of the positive insignificant relationship were that flexibility will accelerate Kenya Power and Lighting Company cash flow. It is also beneficial both to the customer and to the utility company because certain costs such as costs associated with bad debts can be avoided by paying in advance, thus resulting to an increase in levels of revenue as well as reduction in some operational costs for a given organization. In conclusion, Kenya Power and Lighting Company should ensure more access to electric power with flexible payment options to consumers who earn very little or with unreliable income by ensuring that, no additional costs are incurred on the transactions.

5.4 Recommendations

The following recommendations based on the study findings have been suggested to assist in improving the revenue collection of the different counties under Kenya Power and Lighting Company. The study established that the revenue collection at KPLC was affected by prepaid electricity-metering system collection costs. The management should consider improving durability and access to prepaid meter vending points in order to improve customer acceptability on the use of prepaid meters. The management should also adopt prepayment system that will involve customers more actively in their electricity supplies and enhance billing accuracy. Additionally, Kenya Power should convert more meters into prepaid, as this will help boost its revenue collection abilities as well as reducing costs connected to collection of revenue.

The study recommends thatKenya Power and Lighting Companymanagement should bear the responsibility of providing consumers with an uninterrupted supply of electricity at the appropriate voltage and frequency. KPLC should ensure that the prepaid electricity meters render on-timeservice, trustworthy and beproficient in advising the consumer. In addition, KPLC should use underground cables since they are less susceptible to faults caused by strong winds, heavy rains and fallen trees.

The study also recommends that in order to improve the revenue collection at Kenya Power and Lighting Company, the management must embrace Prepaid systems that constitute

a way to provide more flexible payment options to users with minimal or unreliable income streams without increasing transactional costs to the firm. The management should also put in place a Flexible prepaid billing system since is beneficial both to the customer and to the company because certain costs such as costs associated with bad debts can be avoided by paying in advance which would have a positive impact on revenue collection.

5.5 Limitations of the Study

The study addressed the topic 'the effects of prepaid meters on revenue collection at Kenya Power and Lighting Company'. The study was limited to examining the role of Kenya Power and Lighting Company as the only power distributing company in Kenya. The core respondents were the customer service staff who are always busy in the field or attending to customer's queries and at the same time some of the staff were being reluctant to answer the questions. To overcome this problem, the researcher endeavored to explain the importance of the research as increasing knowledge towards reducing the challenges related to the use of prepaid electricity meters. Due to financial constraints too, the study did not reach all stakeholders in Kenya Power and Lighting Company in Kenya; however, the researcher ensured use of a representative sample to ascertain a generalized perspective on the variables under examination.

5.6 Areas for Further Studies

The study was carried out to establish the effects on prepaid electricity-metering system collection costs, prepaid electricity metering-systems reliability and prepaid electricity metering systems flexibility. This compelled the researcher to analyze theKenya Power and Lighting Company- Kiambu County Sub Regions only, thus area for further studies should consider other counties for purpose of making a comparison of the findings with those of the current study.

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APPENDICES

APPENDIX I: Questionnaire

SECTION A: Demographic Information

This section of the questionnaire refers to background or biological information. Although I am aware of the sensitivity of the questions in this section, the information will allow me to compare group's respondents. Once again I assure you that your response will remain anonymous. Your co-operation is much appreciated.

Please indicate the extent to which you agree to the following statements by ticking (√) the appropriate response.

1. What is your gender? Male ☐ Female ☐
2. How old are you?
   20 years & below ☐ 21-30 years ☐ 31-40 years ☐
   41-50 years ☐ 51 years & above ☐
3. What is your marital status?
   Married ☐ Single ☐ Separated ☐ Divorced ☐
4. How long have you worked with your current organization?
   Below 6 years ☐ 6 -10 years ☐ 11-15 years ☐
   16-20 years ☐ Above 20 years ☐
5. What is your level of education?
   Secondary ☐ Diploma ☐ Undergraduate ☐ Postgradua ☐
   Professional ☐
   Others (please state) ……..……...

SECTION B: Revenue Collection

6. Please indicate the extent to which you agree or disagree with the statement related to KPLC revenue collection by employee working in customer service. Where, Strongly Agree [5], Agree [4], Neutral [3], Disagree [2] & Strongly Disagree [1].

Statement	**1**	**2**	**3**	**4**	**5**
Revenue collection have improved due to avoidance of hiring					

staff and using contracted debts collectors					
Modern technology is likely to improve on financial status anddemands efficiency and effectiveness in the company					
Prepaid system has improved company's' strategy on sales, cash collection and its cash disbursement					
Prepaid system is a quality of management as well as quality of product and services.					

SECTION C: Prepaid Meters Collection Costs

7. Please indicate the extent to which the following statements impact on prepaid system on collection costs. Where, Strongly Agree [5], Agree [4], Neutral [3], Disagree [2] & Strongly Disagree [1].

Statement	**1**	**2**	**3**	**4**	**5**
Prepaid system canreduce operating cost as well as commercial losses associated with customer defaults					
Prepaid meters reduced meter reading costs, disconnection and reconnection costs					
Prepayment options available to customers with a standard credit meter other than paying bills in arrears.					
Prepaid systems reduced corruption within ranks thus are more accurate.					

SECTION D: Prepaid Meters Reliability

8. Please specify the degree to which the following statements on prepaid meter reliability affect revenue collection. Where, Strongly Agree [5], Agree [4], Neutral [3], Disagree [2] & Strongly Disagree [1].

Statement	**1**	**2**	**3**	**4**	**5**
We were involved in sensitizing the consumers on the advantages of using the prepaid meters					
I believed that customers are most often satisfied with the quick response from KPLC any time they encounter challenges					
There has been an improvement in access to electricity for the residents in both formal and informal settlements as prepaid meter is equitably distributed					
Prepaid meter aims at facilitating affordability and reduction in utility costs as well as being among the innovative solution.					

SECTION E: Prepaid Meter Flexibility

9. Please indicate the extent to which the following prepaid system statements on flexibility affect company revenue collection. Where, Strongly Agree [5], Agree [4], Neutral [3], Disagree [2] & Strongly Disagree [1].

Statement	**1**	**2**	**3**	**4**	**5**
The tokens are easily accessible whenever I need them					
Prepaid meters overcome limited infrastructural development required to dispatch and receive credit slip (bills)					
I now consume less power since I moved to prepaid billing					
Prepaid meter system was to help tackle difficulties arising from irregular income.					

Thank You

APPENDIX II: Schedule of Research Plan

Activities	**May 2018**	**May 2018**	**June 2018**	**July 2018**	**Aug 2019**	**Sept 2019**	**October 2019**
Coming up with a Researchable Topic							
Writing Chapter 1							
Writing Chapter 2 & 3							
Finalizing on the Research Proposal							
Proposal Compilation & Presentation							
Data Collection and analysis							
Presentation of final dissertation							

APPENDIX III: Schapiro Wilk Test

```
. swilk revenuecollection prepaidmetercollectioncost prepaidmetersreliability prepaidmeterflexibilty

                    Shapiro-Wilk W test for normal data

    Variable |     Obs       W           V         z       Prob>z
-------------+--------------------------------------------------
revenuecol~n |     126    0.84736     15.307     6.129     0.00000
prepaidmet~t |     126    0.95690      4.323     3.288     0.00050
prepaidm~ity |     126    0.93357      6.662     4.260     0.00001
prepaidm~lty |     126    0.80334     19.722     6.698     0.00000
```

APPENDIX IV: *VIF TEST*

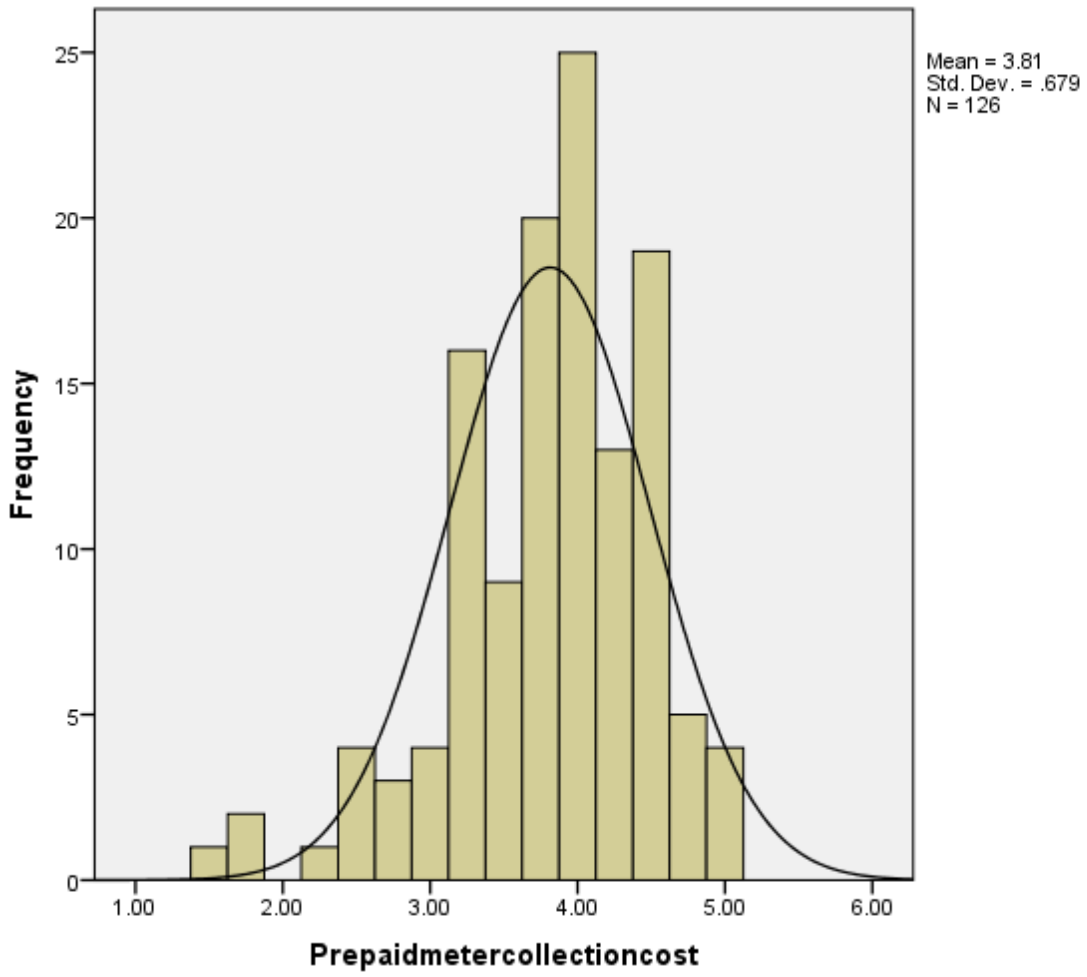
```
. vif
```

Variable	VIF	1/VIF
prepaidm~ity	1.53	0.651482
prepaidm~lty	1.50	0.668269
prepaidmet~t	1.15	0.870847
Mean VIF	1.39	

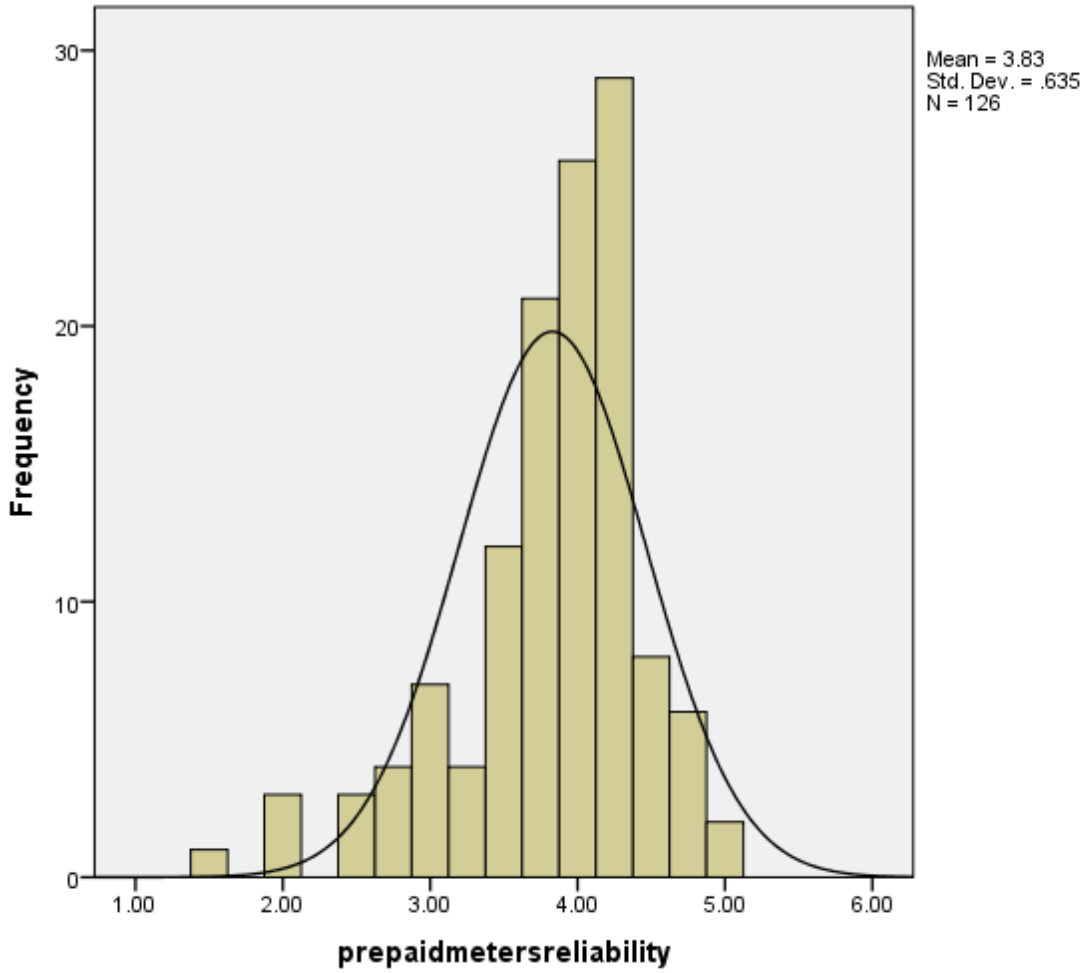
APPENDIXV : TEST FOR HETEROSCEDASTICITY

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of revenuecollection

         chi2(1)      =    11.18
         Prob > chi2  =   0.0008
```

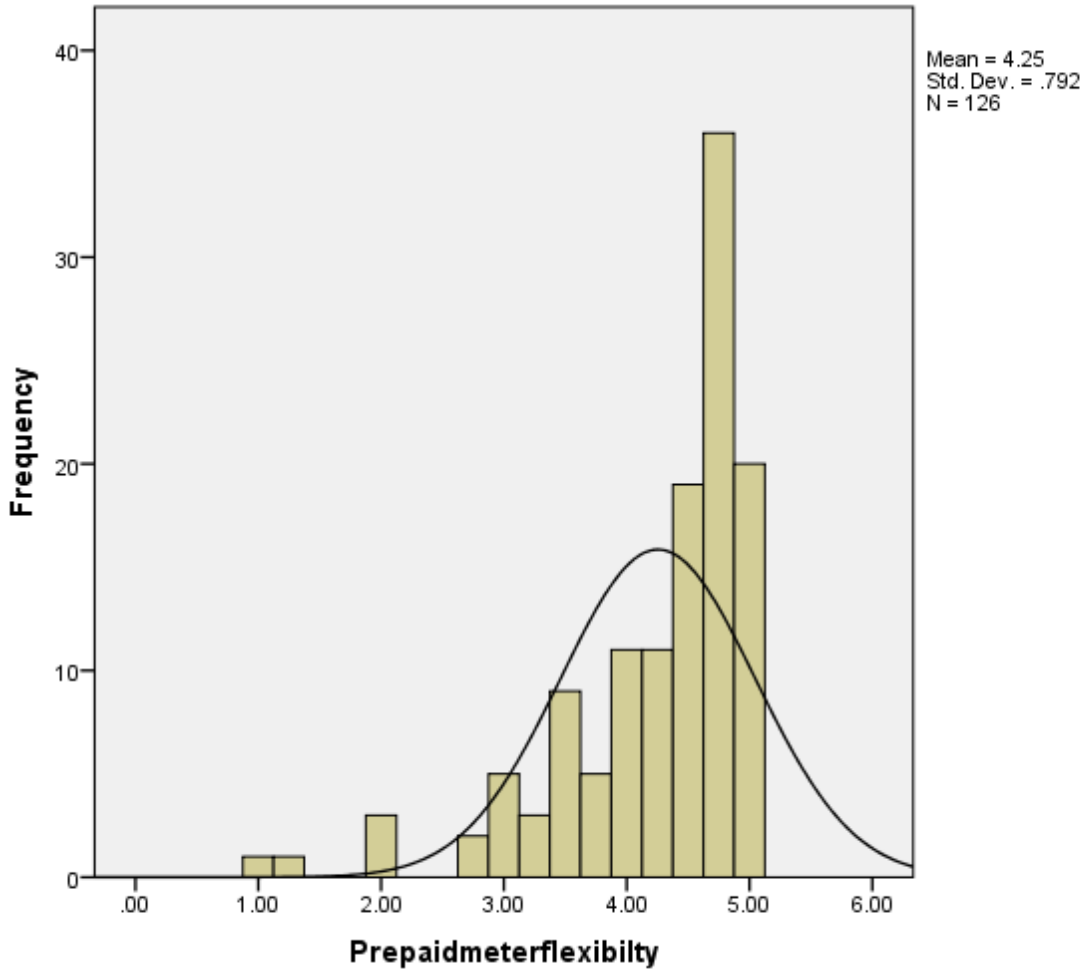
APPENDIX VI : HISTOGRAM – prepaid meter collection cost



APPENDIX VI : HISTOGRAM – prepaid meter reliability



APPENDIX VI : HISTOGRAM – PREPAID METER FLEXIBILITY



BUDGET

S/No.	Items	Cost (Kes)
1.	Transport Costs	20,000/=
2.	Typing Costs	5,000/=
3.	Printing, Photocopy & Binding Costs	25,000/=
4.	Internet Expenses& Library	5,000/=
	Sub Total	**55,000/=**
5.	Contingencies (10 % of Sub-Total)	5,500/=
	Grand Totals	**60, 500 /=**