INFLUENCE OF ADOPTION OF TECHNOLOGY ON PERFORMANCE OF KENYA POWER AND LIGHTING COMPANY: A CASE OF KENYA POWER EMBU OFFICE

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ABSTRACT

The purpose of this study was to determine the influence of adoption of technology on performance of Kenya power in Kenya; a case of Kenya power Embu office. The study was guided by the following objectives; to determine the influence of adoption of smart meter technology on performance of Kenya power; to establish the influence of adoption of billing technology on performance of Kenya power; to determine the influence of adoption of electronic payment on performance of Kenya Power in Kenya; to examine the influence of adoption of Management information systems Technology on performance of Kenya Power. The study used Cross-sectional descriptive survey research design, this type of research design is a research tool used to capture information based on data gathered for a specific point in time. The study targeted a population of 86 employees working in Kenya Power Company Embu branch and 600 customers within the town who have high usage of power. Total sample size of 253 respondents. Data was collected using structured questionnaires and interviews. Quantitative data was analyzed using descriptive statistics. The data was coded, tabulated and analyzed using Statistical Package for Social Sciences based on study objectives. The outcome showed that adoption of Smart Meter Technology and performance of Kenya power positively and significantly enhanced performance. The analyzed data further indicated that Adoption of Billing technology and performance of Kenya power are positively and significantly related. It was further established that, adoption of Electronic payment and performance of Kenya power were positively and significantly related as they made it easier for customers to have a variety of payment modes. Similarly, results showed that MIS application and performance of Kenya power were positively and significantly related. The study concluded that the pre-pay billing system has helped eliminate customer congestion during payment of bills hence improving customer service, pre-pay billings system has resulted in a decrease in metering, billing and disconnection inconveniences hence improving customer service, the billing system is more beneficial to the consumer since they only consume what they pay. The study recommended KPL should review its technical and operational standards to facilitate adoption and implementation of Smart technologies in the entire grid management to include generation, transmission and distribution system.

Key Words: *adoption of technology, smart meter technology, billing technology, electronic payment and management information systems technology*

INTRODUCTION

Adoption of technology has brought a dramatic change in many organizations. It is important because it is the vehicle that allows most people to participate in a rapidly changing world where technology has become central to our lives. Individuals and organizations who won't or can't adopt will increasingly limit their ability to participate fully in the financial and convenience

benefits associated with technology. The decision on whether to put into place a new technology is dependent on what benefits will be gained by putting into place new technical, functional or esthetic solutions, so as to attain the company's competitive positioning; this decision also depends on the risk and costs involved. Businesses lack the resources may it be human, financial or structural to innovate or adapt new technologies, (Cummings, 2001).

Worldwide the development, integration and advancement of technology are changing our general public and economy. The appropriation of new innovation has altered the way associations speak with clients and providers and how they get data. For instance, in United States of America(USA) smart metering has come up strongly as an enabler of smart grids, electric utilities are sending savvy meters (Technically named Advanced Metering Infrastructure or AMI) to their residential customers as the fundamental building block of the Smart Grid. In a couple of zones of the US states, such as California and Texas, smart meters are almost fully deploye ,(Asewe2010). In June 2010, approximately 20million smart meters had been deployed in the U.S.A and it is likely that the number will rise to approximately 65million meters by the end of the year 2015.This would represent approximately 50 percent of all U.S. household. The smart meters may be deployed to almost all U.S. households, (Institution of Electrical Engineers, 2010).

Larger part of the power utilities keeps on suffering from genuine difficulties of income and system administration in most Africa nations. This state of affairs coupled within adequate network facilities to match the client request and needs, resulting with consequential system overloads and under-voltages manifesting in higher control framework misfortunes, affect adversely on their primary concern and the consumer loyalty. With these difficulties picking up a considerable extent with time, utilities are progressively falling back on misfortune diminishment and income administration programs in their multi-feature minimum cost way to deal with beat these overwhelming difficulties. Subsequently, researches have been done and technology has been developed that would assist utilities out of these troubles. Some of these innovations include: System robotization, Prepayment Systems, Automatic Meter Reading (AMR) systems, Advanced Metering Infrastructure (AMI) and Billing Systems (Ndenderu, 2012). Non-specialized misfortunes meter disappointment, meter altering or extortion, un-metered or illicit associations or information altering in charging speaks to around 20-30% of income misfortunes for utilities across the continent, and in some cases, this achieves half. Also, control utilities' wasteful charging frameworks are one of the primary purposes for non-technical loses. They often rely on out dated and manual mode of billing and payment accumulation (post and in-person office installments) and face a culture of non-installment cultivated by social and political obstructions to detaching administrations (ADB report, 2013). Performance of association include the real yield or consequences of an organization as measured against its intended yields or goals and objectives. According to Stacey (2003) hierarchical execution envelops three particular ranges of firm results in particular money related execution i.e. benefits, return on resources, rate of return, item advertise execution that is deals, piece of the overall industry and

investor return, total shareholder return and economic value added (Mroczkowski & Hanaoka, 1997).

Electronic payment is a type of an e-commerce system where you pay electronically whether buying or selling goods that are in the internet. Due to the development of technology systems and processes range to transact electronically continues to increase while the cash and check transactions percentage continues to decrease, (Baddeley; 2004). For example, in the United States there was a decrease in the usage of checks from 85% of non-cash payments in 1979 to 59% in 2002 and the electronic payment system have grown up to 41%. The most active trade intermediary system within a very short time has been the internet. Electronic payment may revolutionize retailing by allowing the customers to purchase and sell goods at the comfort of their home and offices. A lot of customers are still wary of conducting extensive business and transactions electronically even though it is secure. The customer needs to fill the credit or debit card details such as card number, card expiry date, CVV (Card Value Verification Code) in the payment gateway during the payment. Some of this customer details are misused by the employees of the companies which they are transacting with. Phishing and identifying theft are the most common attacks on E-payment system, (Bildey, 2013).

In the world of Management Information System (MIS) most organizations provide numerous examples of successful information systems implementation providing benefits for both organizations and the employees working for them. These benefits include improved profitability; improved organizational performance as well as efficient and effective business processes (Kohli, 2003). There are numerous examples of management information systems implementation failures which lead to negative consequences for the organizations in terms of financial losses and other risk, (Nelson, 2007). An example of management information system technology implementation failures are Hewlett-Packard's (HP) failure in 2004 that had a financial impact of $ 160 million another example is Nike's failure in 2000 that cost $100 million in sales and resulted in a 20% drop in stock price (Koch 2004).

Generation, transmission, metering, customer queries and payments are some of the implementation that have been adopted in Kenya as smart technology in the energy sector. In electricity generation there is a system that controls and monitor power flow between Kenya Power (KP), Kenya Electricity Generation company (Kengen) and the Independent Power Producers (IPPs) it is known as the Supervisory Control and Data Acquisition (SCADA). The power output in terms of Megawatts, voltage levels, frequency and status are monitored by the KPs national control Centre. Decisions additional or reduction of generation are made remotely through the SCADA system which is part of smart technology. The technology is also used in monitoring and operation of all primary substation such as 220KV/66KV, 132/33KV substations and transmission lines (Fichtner, 2006).

In metering, Automatic Meter Reading (AMR) technology was implemented in 2008 for Large and Industrial customers. This took place after a study on the loss reduction of the power by the

International Consultant from Manitoba is was the suggested that since the Kenya Power had already changed the meter types to from convectional meter types to know take another step and convert them to large consumers meter from AMR (Mutua, 2007). This was set to improve billing systems by improving data accuracy and reliability. The technology was also aimed at combating losses in the Large Industrial and Commercial Customers by communicating exceptional occurrences in the supply through alarms through e-mails and SMS. Improvement in billing accuracy, elimination of estimated meter reading and reduction in labor costs was the major resultant of this undertaking.

In April 2016, almost 80% of large power consumers have been connected to outdoor meters as Kenya Power has adopted the use of technology to increase efficiency in their services. The installation of smart meters was a result of the outdoor metering which would ease the work of the Kenya Power officers when reading the meters and also during inspection this also would reduce the disturbing of the customers as the activities were taking place. The project targeted all existing large power consumers with about 5,600 outdoor meters to be installed near customer premises at cost of Sh.3.2 billion. The study will focus on adoption of technology already in use in Kenya Power and therefore to determine influence of adoption of technology on performance of Kenya power in Kenya; a case of Embu County based on the following variables smart meter technology, billing technology, electronic payment and Management information system technology.

STATEMENT OF THE PROBLEM

Adoption of new technology is the key to competitiveness and economic growth of organizations in the increasingly dynamic business world. A numerous number of factors affect business in various ways and hence influence their competitiveness and survival in the dynamic business world. These factors are not very certain for organizations in their pursuit for survival and success. Therefore, most organizations have come up with technological strategies which aim at ensuring continuous survival and competitive advantage sustained efforts are being made in the development, acquisition and integration of information technology by organizations. Technology has revolutionized communication and system operations. Several studies have been done locally and internationally in relation to new technology adopted by firms to achieve organizational performance. David & Ketchen (2004), investigated on the effect of technology on organizational performance study discovered that the manner in which the organization adopted and implemented new technology highly contributed to its performance. Today in Kenya, the energy sector has faced a number of challenges making it difficult for the sector to run its activities efficiently. Low investment in the power sector by private investors, limited capacity during peak demand, high cost of rural electrification, limited distribution capacity, grid-system losses and weaknesses, limited reach in rural areas, vandalism, over-reliance on hydro power which constitutes about 70-80% of the total electrical power, forcing the company to do power rationing in times of drought, and also switching to alternative power generation which is very expensive were some of the challenges that were being faced (ERC, 2013). In

Kenya power Company adoption of new technology has been touted to help the company to have better system management by protecting the revenue by reducing power theft, it has also guaranteed the quality supply by timely restoration of supply, load management and reducing the cost. The technology has the ability to control generation and transmission of power cable and control generation that can be used for operation and restoration of supply to collect the readings. Limited Studies have been done on adoption of new technology on performance of Kenya power based on the following variables; smart meter, billing, E-payment and MIS. This study therefore, is about establishing the influence of adoption of technology on performance of organization at the Kenya power office in Embu.

GENERAL OBJECTIVE

The purpose of this study was to establish the influence of adoption of technology on performance of Kenya power in Kenya

SPECIFIC OBJECTIVES

1. To determine the influence of adoption of smart meter technology on performance of Kenya power.
2. To establish the influence of adoption of billing technology on performance of Kenya power.
3. To determine the influence of adoption of electronic payment on performance of Kenya Power in Kenya.
4. To examine the influence of adoption of Management Information systems Technology on performance of Kenya Power.

THEORETICAL FRAMEWORK

Resource-based theory

The advocate of this hypothesis was Barney (1991). In this hypothesis, the upper hand and prevalent execution of an association is clarified by the peculiarity of its abilities (Johnson et al, 2008). Conventional wellsprings of upper hand for example, money related and common assets, innovation and economies of scale can be utilized to make esteem. Nonetheless, the asset-based argument is that these sources are progressively open and simple to copy (Pfeffer, 1994). Critics of this theory are of the opinion that the core position of this theory which sees resources as strategically valuable, rare, inimitable and organizationally embedded as sources of competitive advantage is not scientifically proven (Raps, 2005).

Barney's (1991) resource-based view reflects the fact that rival organizations may not perform at a level that could be recognized as impressive rivalry for the associations that have been settled in the market since they don't have the expected assets to perform at a level that makes a danger and rivalry. An association should abuse existing business openings utilizing the present assets while creating and building up another arrangement of assets to support its aggressiveness later

on showcase conditions; henceforth, an association ought to be occupied with asset administration. There is always high uncertainty in the environment and for organizations to survive and stay ahead of competition, new resources become highly necessary. (Crook et al, 2008). Adopting up to date technology has enabled Kenya Power in its strategic planning process thus giving the organization the needed opportunity to analyze the environment effectively and be able to prepare for any eventuality that may affect the plans therefore negatively affecting the performance of the organization.

Porter's Theory of competitive advantage

The study is guided by Porter's hypothesis of upper hand (1980), which distinguishes five focused powers in particular: Potential contestants, Buyers, Substitutes, Suppliers and Industry contenders that characterize the tenets of rivalry in an industry. He noticed that, the objective of aggressive technique for a specialty unit in an industry is to discover a position in the business where the organization can best protect itself against these focused strengths or can impact them to support its. Consequently, the pith of detailing aggressive procedure is to relate an organization to its condition. Information of these basic wellsprings of rivalry weight highlights the basic qualities and shortcomings of the organization, vitalizes its situating in its industry, clears up the zones where key changes yield the best result and highlights the zones where industry patterns guarantee to hold the best hugeness as either open doors or dangers. All the five powers together decide the power of industry rivalry and gainfulness, and the most grounded drive wind up noticeably vital from the purpose of system definition. Rivalry moves by one firm effectively affect its rivals and consequently may actuate striking back or endeavors to counter the move. Contention among existing contenders takes a type of moving for position utilizing strategies like cost rivalry, publicizing fights, item presentations and expanded client benefit.

Rivalry in an industry, along these lines, is established in its basic financial structure and goes past the conduct of current contenders yet he takes note of that a firm is not a detainee of industry structure and it can impact the five strengths through their own particular systems by fundamentally examining and recognizing key driving elements that characterize the business. For intensity and practical preferred standpoint, associations should attempt to make an incentive for clients which are just conceivable by reacting with speedier responses to the always showing signs of change business condition driven significantly by innovative changes. Doorman in any case, does exclude innovation and government as powers that may impact rivalry in an industry which can be comprehended in disconnection of the five powers. This hypothesis will direct Kenya Power as they receive shrewd innovation and enhance further to remain ahead as market pioneers and to enhance client mindfulness.

Competitive on the Edge- Theory

Einsenhardt and Brown's (1998) hypothesis of focused on the edge as referred to by (Whalley 2010) adjusts to this study since it recommends that techniques in light of adaptability,

experimentation and nonstop change and learning can be more critical than thorough investigation and arranging. It additionally contends that, organizations build up a 'semi-reasonable key bearing' which expects them to make and keep up adjust amongst request and mayhem. By contending at the 'edge of confusion', a firm makes an association that can change and create a persistent stream of upper hands that structure a 'semi-rational' course. Firms ought not simply well respond to change, but rather should likewise make a decent showing with regards to of reckoning and driving change. This hypothesis is useful for this examination as a result of the dynamic idea of the business condition occasioned by changes in innovative headways and globalization. In any case, the hypothesis has not considered in innovation and globalization but rather contends that, in fruitful organizations, change is time-paced, or activated by the progression of time as opposed to occasions.

RESEARCH METHODOLOGY

Research Design

The study used Cross-sectional descriptive survey research design. This type of research design is a research instrument used to capture information based on data gathered for a specific point in time. This design is appropriate since the researcher aims at collecting data on conditions that already existed or ongoing. This involves collecting opinions held by different respondents on influence of adoption of technology on performance of Kenya power in Kenya; a case of Kenya Power Embu office. This type of research design is to obtain pertinent and precise information concerning the current status of a phenomenon and wherever possible to draw a valid general conclusion from the facts discovered (Kombo, 2006).

Target Population

Target population is the total number of the subjects of interests to the researcher Osen, (2005). The study targeted a population of 86 employees working in Kenya Power Company Embu branch and 600 customers within the town who have high usage of power. According to Kenya Power Annual Report, (2012) Embu branch is estimated to be having a population of 86 employees and 600 customers who use high voltage power. Therefore, the study targeted a total of 686 respondents

Sample Size and Sampling Procedures

A sample is a smaller group or sub-group obtained from the accessible population, the sample is selected in such a way as to ensure that certain sub-groups in the population are represented in the sample proportion, (Mugenda, 2008).To determine the sample size the study employed Yamane (1967) formula for calculating sample sizes at 95% confidence level and e = 0.05.Where n is the sample size, N is the population size, and e is the level of precision. The sample size will be determined as follows;

$$\boldsymbol{n} = \frac{\mathrm{N}}{1+\mathrm{N(e)}^2} n = \frac{686}{1+686(0.05)(0.05)} = 253$$

$\frac{86}{686}$X (253)= 32 Employees $\frac{600}{686}$X (253)= 221 Customers

The total sample size for this study was 253 respondents.

Sampling is a procedure, process or technique of choosing a sub-group from a population to participate in the study (Kothari 2004). It is the process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of characteristics found in the entire group, (Kombo, 2002). The study at the time of data collection adopted simple random sampling method. This type of sampling method was used since the sample size was not so large, and it is homogenous. This type of sampling is also known as probability sampling where each member/item in the population stands an equal chance of being selected. In addition, the sampling method has the advantage of giving relative advantage of time and money.

Data Collection Instruments

Data was collected using structured questionnaires and interview schedules. The structured questionnaires were given employees while interview schedule was given customers structured questionnaires refer to questions which are accompanied by a list of all possible alternatives from which the respondents select the answer that best describe their situation, (Mugenda & Mugenda, 2013). Structured questions are easier to analyze since they are in the immediate usable form, (Orodho and Kombo, 2002) Questionnaires were administered to the respondent to complete the questions themselves. The questionnaires were administered to the respondents physically and any challenges in answering the questions were addressed immediately.

Data Analysis Techniques

Data analysis is the process of editing, coding, classification and tabulation of the collected data with the purpose of summarizing data and organizing it in a manner that they answer the research questions as per the objectives of the study (Kothari, 2004). Quantitative data was analyzed using descriptive statistics and inferential statistics. The data was then coded, tabulated and analyzed using Statistical Package for Social Sciences based on study objectives.

RESEARCH RESULTS

Smart Meter Technology and Performance of Kenya Power

The study sought to find out how the smart meter technology has influenced the performance of KPLC. Based on the findings this implies that Smart meters have influenced to very great extent positively on the performance of Kenya Power. This goes in line with KPLC Report, (2016)

which affirmed the smart metering technology has boosted performance by allowing communication between Kenya Power and the meters thus enabling real-time monitoring of energy). Efficiency in operations has been boosted by the ability to read meters remotely, disconnect and reconnect remotely in the event of non-payment, reducing the need for sending technicians to site (Kostyk, 2012). Oduor (2016) also added that the introduction of smart metering technology solutions had improved customer satisfaction and revenue protection. Furthermore, generating automatic surveillance alerts, the smart metering has enabled the remote meter reading disconnections and reconnections time of use tariff functionality and supply to customers.

Billing Technology and Performance of Kenya Power

The study sought to find out the influence of adoption of billing technology on performance of KPLC. Based on the findings on the issues whether there was a greater engagement with customers due to technology 97% (29) employees strongly agreed; since the adoption of billing technology there was greater engagement with customers, 3% (1) agreed this implies that customers there paying their bills on time since the introduction of billing technology and this has really improved the performance of KPL. This goes in line with Kpl, 2016 report which showed that Availing a variety of payment types and options to customers enabled Kenya Power to offer their consumers the freedom to choose when, where and how to pay their bills. Offering convenience in payment and billing alerts improves customer relations. With smart devices, emails and posted mail, accurate bills have been delivered to consumers. According to Daily (2014), many customers have been served with inappropriately high bills or have disconnected wrongly. This goes in line with Potter, (2009) who affirmed that Engagements between consumers and the power supply companies have necessitated the power companies to shift modes of operations and take various measures to help households reduce their consumption and costs, by giving customers information about their usage and tips on how to save energy on their bills (Adverts by water and power companies on saving tips are commonplace, on television, social media and via websites.

Electronic Payment Systems and Performance of KPL

The study sought to determine the influence of adoption of electronic payment on the performance of Kenya power. This is a clear indication that electronic payment systems influence performance of KPL to a great extent. This finding is in agreement with Safaricom, (2009) who stated that Electronic payment systems enable a customer to pay for the goods and services online by using integrated hardware and software systems. The main objectives of these systems are to increase efficiency, improve security, and enhance customer convenience and ease of use; which are part of organizational strategic plans to increase performance. Majority of the employees 80% (24) affirmed the most efficient payment platforms was M-Pesa, 10% (3) affirmed most efficient payment platforms was over the counter and the rest 3% (1) and 7% (2) respectively affirmed credit card and direct debits were the most efficient payment platforms.

This implies majority M-pesa is the most efficient payment platforms used by customers for paying bills. This goes in line with Okuttah, (2009) who stated that Mobile banking is the most popular E-Payment platform in Kenya. Half of all mobile money transactions in the world take place in Kenya, where annual transfers have reached $10 billion. Kenya Power has adopted Mobile Money payment systems and capitalized on the rapid adoption was spurred by the invention of M-Pesa). It was further established that, adoption of Electronic payment and performance of Kenya power were positively and significantly related (r=0.534, p=0.000).

MIS application and performance of Kenya Power

The study sought to examine the influence of MIS technology on performance of Kenya power. Based on the analysis this implies that Adoption of information systems boosts the speed in energy industry where the pace of change has greatly accelerated this goes in line with Adeoti-Adekeye, (1997) who asserted that Management Information Systems are used to facilitate the provision of services; and that the speed of the adoption is expected to grow further as the technology expands. When employees were asked to list the information system in KPLC, the listed Enterprise Resource Planning (ERP), Knowledge Management Systems (KMS) and Customer Relations Management (CRM) to upgrade the proficiency and adequacy of the Decision-Making process. It was confirmed that MIS application influenced. Adebayo (2007) clarified that the presence of MIS is expected to enhance and upgrade basic leadership on the issues influencing human and material assets. Taking everything into account, the significance of MIS is giving leaders certainties, which thusly support and improve the whole basic leadership handle; to help the governing body and administration levels to make an exact and on time key choices.

CORRELATION ANALYSIS

The results in Table 1 show the Pearson coefficient of determination using Pearson correlation to get the relationship between dependent variable and independent variables as well as coefficient of determination of relationship among the independent variables. The outcome showed that adoption of Smart Meter Technology and performance of Kenya power correlated positively and significantly (r=0.548, p=0.000). Table 1 further indicated that Adoption Billing technology and performance of Kenya power are positively and significantly related (r=0.521, p=0.000). It was further established that, adoption of Electronic payment and performance of Kenya power were positively and significantly related (r=0.534, p=0.000). Similarly, results showed that MIS application and performance of Kenya power were positively and significantly related (r=0.541, p=0.000). This implies that, Smart Meter Technology, Billing Technology, Electronic payment and MIS application influence performance of Kenya Power positively.

Table 1: Correlation Analysis

		Performance of Kenya Power	Smart Meter Technology	Billing Technology	Electronic payment	MIS application
Performance of Kenya Power	Pearson Correlation	1				
	Sig. (2-tailed)	0.000				
Smart Meter Technology	Pearson Correlation	0.548	1			
	Sig. (2-tailed)	0.000	0.000			
Billing Technology	Pearson Correlation	0.521	0.475	1		
	Sig. (2-tailed)	0.000	0.000	0.000		
Electronic payment	Pearson Correlation	0.534	0.363	0.226	1	
	Sig. (2-tailed)	0.000	0.002	0.071	.	
MIS application	Pearson Correlation	0.541	0.333	0.337	0.324	1
	Sig. (2-tailed)	0.000	0.005	0.015	0.003	-

CONCLUSIONS

Having set out to influence of adoption of technology on performance of Kenya power, the researcher made the following conclusion in line with the objectives of the study. It was clear from most of the respondents that the four-independent variable Smart Meter Technology, Billing technology, Electronic payment technology and MIS application technology had a positive effect in the Performance of Kenya Power. The study also concluded that there is a significant relationship between the objectives of the study and performance of Kenya power.

RECOMMENDATIONS

Smart meter technology having a key role in the Performance of the Kenya power its full adoption and implementation is a necessity for improvement of the Performance of the Energy Sector. Based on this critical importance of smart technology, the researcher therefore proposed the following recommendations; The KPLC should review its technical and operational standards to facilitate adoption and implementation of Smart technologies in the entire grid management to include generation, transmission and distribution system; The KPLC should invest in the most efficient and effective metering solution since metering is the interface between the customer and the utility and plays a critical role in the determination of sales volumes, losses through under billing and operational cost and lastly KPLC should include Mobile Technology in its processes because the mobile has become part and parcel of people lives. Mobile technology services should be expanded to include service requests like application of power supply, accounts closure and account opening to enable customer to get these services without having to visit the utilities banking hall. KPLC should come up with a policy document which will outline how technology will be utilized to influence its performance.

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