An Evaluation of Prepayment Metering in Electricity Consumption Behavior of Domestic Consumers in Zimbabwe (ZEDTDC): A Case Study of Harare Metropolitan

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The study was enthused by the need to evaluate the implication of prepayment metering system on electricity consumption behavior of domestic households in Zimbabwe focusing on Harare Metropolitan. The sample size was made up of 400 households from high, medium and low-density residential areas. Questionnaires and focus group discussions were used to collect data, which was analyzed using qualitative data analysis (QDA). Thus, the findings show that prepayment metering is significant to medium and high-density domestic customers because the residents in these areas feel that it helps them in budgeting on electricity expenditure and consumption unlike postpaid metering where they used to pay their bills based on estimates. In contrast, households from low-density areas prefer postpaid metering because their electricity expenditure is too high and buying cards in large quantities is knotty. In addition, there are also a few vending stations in low density areas, hence customers travel some distance to access them. That said, the study recommends that prepayment metering be embraced as it is convenient to the majority of customers and hence the need for a provision of emergence credit, should the customers run out of credit, especially at night and on holidays.

Key Words: Marketing, Customers, Consumer behavior, Segmentation, Electricity consumption, Prepayment metering, Post-paid metering

INTRODUCTION

The issue of electricity distribution is largely a very tantalizing issue that has habitually engrossed practically all governments world over (Van de Graaf & Colgan, 2016; Munyoro & Dzapasi, 2020). Thus, this has resulted in policy makers in various countries having sleepless nights (Munyoro & Shaningwa, 2019) because this issue of electricity distribution is directly associated with economic sustainability and development of a country (Department of Economic and Social Affairs, 2013; Munyoro & Dzapasi, 2020) as access to power supply is directly linked to the welfare of several households globally (Munyoro & Shaningwa, 2019). For example, the welfare of households in countries like Cameroon and Nigeria has been at stake, for the reason that most of the households in these countries have been facing huge bills despite that these countries are endowed with substantial energy resources in the form of gas and electricity (Tallapragada, 2009; Munyoro & Dzapasi, 2020). Similarly, the same challenge of huge bills has also been faced by Zimbabwe (www.dailynews.co.zw; www.newsday.co.zw; www.theindependent.co.zw) because there is feeling that this is being caused by lack of competition as electricity supply in Zimbabwe is solely in the hands of Zimbabwe Electricity Transmission and Distribution Company (ZETDC). In addition, ZETDC as a sole supplier of electricity has failed to cope with the surges in power demand (Bouttes et al, 2011; Munyoro et al, 2016; Munyoro & Shaningwa, 2019) which has been caused by rapid urbanization (Munyoro et al, 2016) and rural electrification (Munyoro et al, 2016) currently taking place throughout the country resulting in extraordinary electricity supply operation costs which are regrettably surpassing revenues and this has also been falsely attributed to high bills (Bouttes et al, 2011; Munyoro et al, 2016; Munyoro & Shaningwa, 2019; Munyoro & 2016)

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Dzapasi, 2020). Thus, prompting the Zimbabwean government to implement cost effective electricity distribution policies such as recommending ZETDC to be efficient, resilient and financially stable in order to ensure poverty reduction by reducing electricity bills through price reduction as what Indian government did in early 2000 (Ministry of Power, 2005; Sadelec, 2000; Kapika & Eberhand, 2013; Munyoro & Shaningwa, 2019). For example, over the past few decades, ZETDC has been crippled by failure to collect about $1.07 billion which it is owed by defaulters and chief lawbreakers being the local authorities, domestic consumers, parastatals, government departments, farmers and miners in that order (www.thestandard.co.zw) and at the same time, ZETDC owes over $1 billion to its creditors (www.theherald.co.zw) and these debts are accruing interests resulting in the debts escalating and this problem is not going away. In addition, the loss of experienced staff such as engineers, accountants and marketing in the last few decades is also contributing to the sub-standard performance of the electricity supply industry, in addition to poor collection of revenues (Zhou & Zvoushe, 2012; Munyoro & Dzapasi, 2020). Regrettably, this has also led to unsustainable performance of the electricity supplier as reflected in the low investment in infrastructure, poor service delivery, theft of electricity and vandalism of infrastructure (www.newsdaily.co.zw; Zhou & Zvoushe, 2012; Munyoro & Shaningwa, 2019), and chief among these snags, has been the stealing of electricity through by-passing as well as vandalism of electricity infrastructure (Brown et al., 2006; Munyoro & Dzapasi, 2020). Consequently, this electricity theft has resulted in a number of setbacks to the company’s operations as the company has lost a huge amount of money, whilst customers have been frustrated with the system of estimating meter readings due to lack of manpower such as artisans and meter readers leading to a number of contested bills, unfair power disconnections and expensive reconnection fees (Vutete, 2015; Munyoro & Dzapasi, 2020). Furthermore, according to ZETDC the prepared system was also associated with high costs of revenue collection and accumulation of debts as customers resisted settling the estimated bills. Consequently, the concern to improve service delivery motivated ZETDC to identify new technologies that aimed at encouraging access to electricity whilst making customers pay for the service in advance and prepayment metering was therefore considered as a viable solution to the problems of convectional billing inefficiencies (www.zetdc.co.zw; Munyoro & Dzapasi, 2020). Subsequently, in August 2012, ZETDC introduced prepayment metering for all domestic and commercial customers especially the domestic customers who were causing some difficulties in the collection of revenues. Thus, unlike with convectional metering, prepayment metering which required customers to pay before consumption was considered as it was assumed that this would result in the elimination of bad debts and contested bills (Newbery, 2001; Lipinge, 2016; www.theindependent.co.zw; www.zesa.co.zw). The interesting thing is that, after the introduction of the prepayment meters in 2012 by ZETDC (Joskow, 2003; Munyoro & Dzapasi, 2020) no study has been carried out to ascertain the significance of prepaid meters on the consumption behavior of electricity consumers in Zimbabwe after the introduction of prepayment metering (www.zetdc.co.zw; www.zesa.co.zw), thus giving doubts on whether the customers are benefiting from the new metering system. Accordingly, this study is therefore, expected to cover this gap because the effectiveness of prepaid metering depends on the socio-economic characteristics of each particular setting according to Casarin & Nicollier (2009) and Garthwaite (2014). For that reason, this study also aims to evaluate the behavior of domestic consumers towards electricity consumption in general and the use of prepayment and prepaid metering on electricity consumption in particular, in addition to establishing the significance of prepaid meters to domestic customers. Furthermore, the study intends to contribute academically to those who are interested in researching in the energy sector. Additionally, the study aims to investigate the consumption behavior and attitudes of domestic consumers towards prepaid electricity meters in developing economies as this study is at the moment rare (Qiu & Xing, 2015; Munyoro & Dzapasi, 2020). Also, the study is expected to benefit electricity distributors as this study is also aimed at improving the billing systems in the entire country and beyond the region (Bruitscher, 2011; ones et al, 2014; Munyoro & Dzapasi, 2020).

The History of Harare Metropolitan

Harare is the City of Zimbabwe and got its name from the village near Harare Kopje which was under the Shona Chief whose name was Neharawa and whose nickname was “He who does not sleep” meaning ‘harare’ in Shona (Room, 2003; Munyoro & Gwisai, 2020). Thus, Harare became official in 1982 that is, after independence from Great Britain in 1980 (Britannica.com; Munyoro & Gwisai, 2020). Thus, the City was founded in 1890 as a fort by the Pioneer Column, a small volunteer military force of the British South Africa Company and was formed by Cecil Rhodes (roodeportrecord.co.za; Munyoro & Gwisai, 2020) and was later named Fort Salisbury after The 3rd Marquess of Salisbury, then United Kingdom Prime Minister – Lord Salisbury (Roman, 2013; roodeportrecord.co.za; Britannica.com) and it subsequently became known simply as Salisbury (Britannica.com). In fact, Company administrators demarcated the city and ran it until Southern Rhodesia achieved responsible government in 1923 (thepatriot.co.zw; Britannica.com), even though Salisbury was declared a municipality in 1897 and it became a city in 1935 (Horace, 2012; roodeportrecord.co.za; Britannica.com; Munyoro & Gwisai, 2020). Thereafter, Salisbury was then affirmed as the seat of the Southern Rhodesian by the Rhodesian government and later became the capital city of the Central Africa Federation, and that was between 1953 and 1963 (thepatriot.co.zw; Britannica.com).
Harare is now the most populous city in Zimbabwe (worldpopulationreview.com; zimstat.co.zw) and has an estimated population of 1 606 000 (worldpopulationreview.com; zimstat.co.zw). Furthermore, Harare is now a metropolitan province which incorporates the municipalities of Chitungwiza and Epworth (worldpopulationreview.com; zimstat.co.zw). In addition, Harare comprises of white people, who are originally from United Kingdom as well as Asians from India and Greeks and obviously the native black people (worldpopulationreview.com; Munyoro & Gwisai, 2020). In Harare, the official languages are mainly Shona, followed by English and Ndebele then Chewa, Chibarwe, Kalanga, Khoisan, Nambya, Ndau, Shanaan, Sotho, Tonga, Tswana, Venda and Xhosa (worldpopulationreview.com; zimstat.co.zw). In addition, Harare sits on a plateau at an elevation of 1 483 metres (4.865 feet) above sea level and its climate falls into subtropical highland category and the original landscape was described as "Parkland" (Britannica.com). In fact, it is worth noting that the Harare area at the time of founding of the city was in fact poorly drained and the earliest development was on sloping ground along the left bank of a stream and that is now the course of a trunk road now popularly known as Julius Nyerere Way (roodeportrecord.co.za; Britannica.com). Thus, the first area to be fully drained was near the head of the stream and was named Causeway (roodeportrecord.co.za; Britannica.com). This area is now the site of many of the most important government buildings including Parliament House (the then the Senate House) and the Office of the President after the position was abolished in 1988 (the then the Office of the Prime Minister) which are mainly found in Jameson Avenue (now Samora Machel Avenue) (roodeportrecord.co.za; Britannica.com; Munyoro & Gwisai, 2020). That said, Harare now boast of Northern and North Eastern suburbs which are home to the more affluent population of the city such as high ranked government officials and who most of them live in Borrowdale Brooke (Munyoro & Gwisai, 2020). Additionally, these norther suburbs are often referred to as ‘kuma dale dale’ because of the common suffix –dale found in some suburbs such as Avondale, Greendale and Borrowdale just to name a few (zimfieldguide.com; greatzimbabweguide.com; Munyoro & Gwisai, 2020).

LITERATURE REVIEW

The Evolution of Prepayment Metering

Prepayment metering was first introduced in the United Kingdom in the form of coin-in-slot operated gas meters in the early 1980s (Pillai, 2005; Owen & Ward, 2010) and the concept was then developed further and the first electricity prepayment meter was introduced in South Africa in the late 1980s under the government’s, "Electricity for All," program (Tewari & Shah, 2003; Kaseke, 2013). The objective of the program was to supply electricity to a large base of potential domestic customers and the majority of them were in rural areas regrettably, and the socioeconomic conditions in those areas made the use of postpaid metering inappropriate because these areas comprised of low-income earners, with the majority of them having no fixed postal addresses (Kessides, 2004). In addition, most of them were illiterate and could not understand the bills that arrived after consumption and so in order to address those problems, (ESKOM) the South Africa's state owned power utility, formed a partnership with the private sector to develop and introduce the first prepayment meter in 1988 (Lliev, 2005). By late 1990s, prepayment metering system was widely adopted in India, US and UK (Casarin & Nicollier, 2008). According to King (2012), in 2012 more than fifty countries worldwide are believed to have adopted the prepayment metering technology. In fact, a study by Navigant Research (2015) indicates that, the worldwide base of installed prepayment meters is expected to grow from 31.7 million in 2014 to 85.1 million by 2024.

Postpaid Billing Method

The Postpaid Billing Method is the aged-electromechanical induction watt-hour meters that is used for measuring energy consumption (Paul, 2004; King, 2012). In fact, such meters also record other parameters of the load and supply such as instantaneous and maximum rate of usage demands, voltages, power factor and reactive power used (Yan et al, 2002; Kondo, 2009). Additionally, such meters calculate and show the exact value of the electricity consumed rather than its amount and these electricity meters are manually read every month by representatives of ZETDC (The electricity distributor in Zimbabwe) to avoid the estimation of bills hence the name post-paid meters (Paul, 2004; Kamerschen, 2004; www.zesa.co.zw).

Prepayment Metering Method

According to Casarin & Nicollier (2009), prepayment method refers to the outlay made by a customer for using goods and services before consumption and in this case, customers pay their bills before consumption (Jack & Smith, 2017). Additionally, prepayment metering system consists of three differentiated components that operate at different levels (Tewari & Shah, 2003; Terry, 1988). Thus, the first component is the prepayment service meter (referred to as electricity dispenser (ED), then the second component is the Customer Interface Unit (CIU) whilst, the third component is a System Master Station (SMS) or master client. In fact, the ED consists of a current measuring unit called energy management unit (EMU); whilst, the Customer Interface Unit (CIU) is installed at the point where electricity is consumed (Jack & Smith, 2017; Tewari & Shah, 2003; Terry, 1988). Whilst, the CIU device is installed inside the customers’ building to allow the customer to interact with the energy management unit (Casarin & Nicollier, 2008) whereas, the second component of prepayment metering system is the vending component of prepayment metering system consisting of three differentiated components that operate at different levels. The first component is the prepayment service meter referred to as electricity dispenser (ED), then the second component is the Customer Interface Unit (CIU) whilst, the third component is a System Master Station (SMS) or master client.
station—often called the credit dispensing unit (CDU) and its role is to dispense electricity credits to the consumers (Bourdillon, 2012; Kessides, 2004). Whilst, the third component is a System Master Station (SMS) or master client, which links the various point of sales to the utility’s management system and its role is to provide common database for reporting in order to provide total management, administration, financial and engineering control (Pillai, 2005; Terry, 1988). In view of this, the vending station communicates with the service meter in the form of a token (Casarin & Nicollier, 2008; Bourdillon, 2012). It is also worth noting that prepayment metering system operates in a relatively simple way in which the customer purchases a credit at a vending station and as part of the transaction receives a voucher with a computer-generated identification code (Shwedi & Jackson, 1996; Kaseke, 2013). Accordingly, the identification code comes in the form of either magnetic device or a token (a string of twenty digits) and the digits are uniquely coded to work on a specific service meter and are therefore non-transferable (Tewari & Shah, 2003). In this case, the customer utilizes the magnetic device or the digits by entering them into the customer interface unit and if the code identifies that of the meter, the measuring unit will clear the consumption of the amount of electricity units purchased and displays in real time the running credit balance (Casarin & Nicollier, 2008; Bourdillon, 2012; Tewari & Shah, 2003). When the credit is exhausted the measuring unit will automatically cut off electricity supply in industry parlance, thus the customer opts to “self-disconnect.” (Malik et al, 2009). Thus, supply can be reconnected when a code corresponding to a new purchase is entered (Tewari & Shah, 2003; Casarin & Nicollier, 2008).

Types of Prepayment Meters

Modern prepayment meters tend to use magnetic cards, smart cards or keypads by inserting the credit into the service meter according to Casarin & Nicollier (2008). Accordingly, there are three different types of prepayment meters that corresponds to these different input mechanisms (Lliev, 2005) as stated below.

- Keypad Meter

As noted by Lliev (2005), keypad meters are found in two configurations that is the non-split keypad configuration and the split keypad configuration. In the non-split configuration, both energy management and customer interface units are combined in a single housing (Casarin & Nicollier, 2008), whilst the split keypad configuration has two components which are separate (Lliev, 2005). In this case, the two devices communicate using the power line carrier (PLC) system, whilst the keypad meters use the token technology input for communication between the vending station and the meter (Jones et al, 2014). Thus, the tokens support one-way communication from the electricity vendor to the prepayment meter and each keypad meter has a unique meter number that must be produced or quoted when purchasing a credit token thus allowing flexibility in debt recovery (Brutscher, 2011; Mekhilef, 2014).

- Magnetic Card Meter

According to Baker (2008), the magnetic prepayment meter loads the credit in the meter through single-use-dispose magnetic device stripe coded by the vending station and this magnetic stripe is inserted into the meter in order to achieve the measuring unit (Mekhilef, 2014). Unlike the keypad meters, magnetic card meters are more vulnerable to fraud, have maintenance costs and are inflexible in the recovery of debts (Casarin & Nicollier, 2008). Regrettably, utilities cannot set tariff and receive meter readings remotely through the transfer of information from the meter to the vending station and therefore, magnetic meters are commonly used in UK and other developed nations where cases of meter fraud are not common (Allen Consulting Group, 2009).

- Smart Meter

Smart meter, also referred to as advanced metering infrastructure (AMI) represents the latest technology of prepayment metering that uses smart card technology and smart meter is capable of identifying consumption patterns in better detail as compared to keypad and magnetic meters according to Frost & Sullivan (2010). In fact, smart meters enable the measurement of detailed, time-based information and frequent collection and transmittal of such information (Consumer Focus, 2012). Unlike keypad meters, smart meters communicate bi-directionally through the use of the smart card and it does not use the token technology but instead credit is purchased electronically (Casarin & Nicollier, 2008). Regrettably, the major disadvantage of smart meter is that, depending on the capability and capacity of the microprocessor, smart meters are expensive to buy and use as noted by Cardwerk (2008).

The Benefits of Prepaid Metering Systems

There are various motivations that made prepayment metering widely adopted by different countries and according to Tewari & Shah (2003), if implementation is done well, prepayment metering may bring financial fortunes to both utility and customer. On the other hand, Casarin & Nicollier (2005) and O’Sullivan (2012) argued against the use of prepayment meters stating that they are controversial in the sense that they may lead to energy deficiency especially amongst the low-income customers. Despite such arguments, use of prepaid meters continue to grow mainly due to the benefits the system offers to both the electricity distributors and customers (Lliev, 2005). In general, prepaid metering method has several benefits that can be enjoyed by all the stakeholders involved as stated below:
Benefits to the Company

So far, the studies tend to show that electricity providers consider prepayment metering as a way to eliminate bad debts, and to give a clearer predictability of their revenue inflows because electricity providers can obtain savings from using prepayment meters through remote reading and disconnection of services (Llief, 2005). According to Casarin & Nicollier (2009), automatic disconnections and reconnections will also result in a reduction of working capital and operating costs of the company. Additionally, prepayment metering also enables the utility to obtain accurate data that could help develop more efficient billing systems (Brutscher, 2011; Jones et al., 2014). The fact that payment is done prior to consumption, electricity providers tend to enjoy the time value of money and this benefit improves their relationship with customers who have a history of late payments as was the case with Zimbabwe. Furthermore, prepayment metering offers electricity providers the opportunity to reduce the effects of operational challenges presented by conventional metering (Pandey & Pandey, 2009; Casarin & Nicollier, 2009; Munyoro & Dzapasi, 2020). For example, it decreases the administrative and financing costs of electricity distribution something good for Zimbabwe especially at a time quasi government organisations such as ZETDC are struggling to make ends meet (Pandey & Pandey, 2009; Power division, 2011; Munyoro & Dzapasi, 2020; www.zetdc.co.zw).

Benefits to the Customer

Martin (2014) stated that, the benefits of prepayment metering can be divided into two categories and the first category is specific to individual and electricity providers, and these include the scrapping of disconnection and reconnection fees since they will be done automatically (Casarin & Nicollier, 2009; Munyoro & Dzapasi, 2020). Whilst the second category is considered as the main motivator of implementing the system and this has direct impact on the consumer’s consumption behavior (Casarin & Nicollier, 2009; Munyoro & Dzapasi, 2020). Under this category, the prepayment metering results in better understanding of consumption, thus affording the consumer an opportunity to manage and control usage (Miyogoetal, 2013).

However, since the study aims to evaluate prepayment metering in electricity consumption behavior of domestic consumers in Zimbabwe, it is vital to understand the consumers’ behavior towards newly introduced products as discussed below.

What is Consumer Behavior?

It is worth noting that every business company aims to effectively reach out to its end customers by understanding the behavior of its consumers in different markets such as low, middle and high-density suburbs in that order (Kotler et al., 2010; Kardes et al., 2011; Munyoro & Nhevere, 2019). For that reason, consumer behavior is defined as those actions directly involved in obtaining, consuming and disposing of products and services, including the decision processes that precede and follow these actions (Engel et al., 1993). In addition, consumer behavior is seen as the study of individuals, groups, organizations and all activities associated with the purchase, use and disposal of goods and services, including the consumers’ emotional, mental and behavioral responses that precede or follow these activities (Kardes et al., 2011). In short, it examines how emotions, attitudes and preferences affect buying behavior (Engel et al., 1993; Kotler et al., 2010). Thus, characteristics of individual consumers such as demographics, personality lifestyles and behavioral variables such as usage rates, usage occasion, loyalty, brand advocacy, willingness to provide referrals, in an attempt to understand people’s wants and consumption are all investigated in formal studies of consumer behavior (Engel et al., 1993; Kotler et al., 2010; Kardes et al., 2011).

In addition, consumer behavior is also concerned with all aspects of purchasing behavior that is, from pre-purchase through to post-purchase activities such as consumption, evaluation and disposal activities (Engel et al., 1993; Kardes et al., 2011). Thus, consumers are important in business because they are the chief judge of the success or failure of every market (Kim et al., 2017). Hence, the need for marketers to know the features that characterize behavior of consumers because these features such as consumer perception, attitudes and consumer preference even though the differential border of these features are almost imperceptible (Engel et al., 1993; Kotler & Keller, 2006; Kardes et al., 2011). Thus, the holistic approach of observing all the features and aspects of consumer behavior should be taken into account when studying consumer behavior (Hauser & Urban, 1979; Engel et al., 1993; Kardes et al., 2011). Therefore, understanding consumer behavior helps researchers to ascertain the consumption behavior of consumers such as domestic electricity consumers in Zimbabwe, that is after the installation of prepayment meters from the old system in different parts of the country including Zimbabwe given that customers behave differently from one segment to another or from one market segmentation to another (Engel et al., 1993; Kardes et al., 2011; Munyoro & Nhevere, 2019).

What is market segmentation

Market segmentation is a customer-oriented philosophy and is a technique used by marketers to recognize effectively the differences among customers (Weinstein, 2002; Fullerton, 2016). Thus, it is a process of dividing potential customers into groups or segments based on different characteristics or traits such as similar interests, needs and locations as the case with prepayment metering in Zimbabwe (Dickson and Ginter, 1987; Tedlow and Jones, 1993; Fullerton, 2016). With reference to prepayment, ZETDC the Zimbabwean’s sole electricity
provider should know the type of customers they have, that is through the use of demographic, geographic, psychographic and behavioral research so that the users of prepayment metering in low density, middle density and high suburbs are profiled (McDonald & Dunbar, 2004). Accordingly, such information is very useful for subsequent marketing efforts such as offering the right product, to the right place, at the right time, and at the right price (Adcock et al., 2001; Fullerton, 2016). In short, this is important in that it helps an organisation to understand the behaviors of its customers and thus, will enable ZETDC to ascertain the usefulness of prepayment metering in the consumption of electricity by domestic consumers in Zimbabwe. Furthermore, this will help ZETDC to retain its customers, in addition to gaining a larger share of their business given the threats coming from other sources of energy such as solar and wind energies. Thus, ZETDC the current electricity provider needs to understand the customers from low, middle and high densities’ purchasing patterns in order to respond to their needs as their customers are not uniform due to the fact that they have different consumption behaviors, lifestyles, patterns of buying and use of services or products such as electricity in general and prepayment meters in particular (Kotler & Armstrong, 2003).

METHODOLOGY

The phenomenology philosophy was used in this study because it deals with the source, nature and development of knowledge (Wohllwill, 1970; Cherryholmes, 1992; Miller, 1998; Kraemer et al., 2000; Ghauri & Gronhaug, 2005; Munyoro & Dzapasi, 2020), in addition to its flexibility and feasibility that allows explanations for different context as a research philosophy (Morgan, 2007). Furthermore, the choice of the research philosophy was chosen based on the belief that reality is subjective (Miller, 2007) and therefore can be observed and described without interfering with the phenomena under study that is, the behavior of consumers towards prepayment meters (Saunders et al., 2009). Additionally, the choice of the research philosophy was also favorable in that the study was testing a proposition and was aimed at getting reliable results as the collected data was highly specific and to individual consumers (Walliman, 2005; Munyoro & Dzapasi, 2020). Thus, the researchers were independent to the study units, and followed a structured methodology and therefore their personal opinions did not influence the results (Gill & Johnson, 1997; Munyoro & Shaningwa, 2019). In addition, the study adopted a case study approach for the reason that this approach allows in-depth, multi-faceted explorations of complex issues in their real-life settings and the value of the case study approach is well recognized in the fields of business (Crowe et al., 2011). Furthermore, the researchers applied this research technique because it is a fast, inexpensive and an accurate means of obtaining information from a large population such as Zimbabwe (Marshall, 1996; Oisin, 2007; Lee and Lings, 2010). In order to successfully answer the research problem, qualitative approaches were employed in this study (Hakim, 2000; Munyoro & Dzapasi, 2020) because it attempts to maximize objectivity, reliability, and generalizability of findings (Jankowiez, 1995; Munyoro & Shaningwa, 2019). As supported by Cooper & Schindler (2011), focus groups on qualitative approach uncovered the deeper meaning and significance of human behavior and experience, including contradictory beliefs, behaviors and views of research respondents (Bendoly & Swink, 2007) and in this case the behavior of electricity consumers from different suburbs.

Similarly, this study employed stratified-systematic sampling procedure (Strauss & Corbin, 1988; Munyoro & Dzapasi, 2020), in which respondents were first grouped according to their residential areas that is low, medium and high densities. Thereafter, households included in the sample were selected by picking every 5th house in a street in high density, every 3rd house in the medium density and every 2nd house in the low density. Systematic approach was preferred after considering the distances to be covered by the researchers to access respondents during distribution of questionnaires in each respective residential area (Webster, 1985; Neuman, 2005; Few, 2004; Munyoro & Shaningwa, 2019). Generally, the distances are relatively long in low density areas where the stands are much bigger compared to small stands in high density areas (Kennedy, 2007). A sample size of 400 respondents was selected from all residential clusters. For a respondent to be considered in the sample it was considered that the respondent should be the owner of the house or a person directly involved in the purchase of the credit tokens or the main tenant. Thus, a sample size was made up of 200 households for high density, 120 for medium density and 80 for low density. Additionally, this study used a self-administered questionnaire and focus groups to collect qualitative data from consumers on their attitudes and experiences with prepaid electricity meters (Smith, 1981; Munyoro & Dzapasi, 2020). Furthermore, the questionnaire comprised of closed ended questions where the respondent ticked the area applicable to them, in addition, to structured questions which had two types- one to tick the necessary space and the other to tick where necessary on a likert scale ranging from strongly agree (SA) to strongly disagree (SD) (Saunders, 2012; Crossman, 2019; Munyoro & Shaningwa, 2019). Thus, the reason for choosing questionnaires was that it would collect a lot of information while retaining privacy of respondents as well as saving time (Munyoro, 2014). In order to ensure effectiveness, data collection instruments used in this study were subjected to some evaluation criteria and this was done to ensure that the data collecting instruments used are valid and reliable (Smith et al., 2008; Munyoro, 2014). Before the questionnaire was distributed, a pilot study was carried out on a selected few household and the purpose of the pilot survey was to ensure the validity of the questions and reliability of the questionnaire to collect relevant data (Saunders, 2012; Crossman,
In order to ensure high response, the researchers distributed questionnaires in the respective residential areas on their own and were completed by the head of household or person directly in charge of purchasing of electricity tokens for the household (Meyer et al, 1965; Munyoro & Dzapasi, 2020) and approximately five minutes were adequate to complete the whole questionnaire (Mintzberg & Waters, 1989; Munyoro & Shaningwa, 2019). When the questionnaire was given to a household, the researchers recorded the house number in a separate record book in order to keep track of the respondent (Adams & Schvaneveldt, 1991; Munyoro & Dzapasi, 2020). The issue of confidentiality is a key ethical consideration in the conduct of the study and as such, ethical considerations in this study were done because this study investigated human views and attitudes towards prepaid meters (Gibb, 1995; Tashakkori & Teddlie, 2003; Fox, 2009; Munyoro, 2014; Golder, 2017) and the confidentiality of the respondents was maintained by not disclosing their names or personal information in the study (Cooper and Schindler, 2008; Munyoro, 2014).

In this study, qualitative data was analyzed using Qualitative Data Analysis (QDA) (Munyoro, 2014), in which the data collected using questionnaires and focus groups was transformed into some form of explanation of the respondents’ views on the behavior of domestic consumers on the electricity consumption and towards the use of prepayment metering among other issues (Seidel, 1998; Crouch & Housden, 2000; Scott et al, 2003). As proposed by Scott et al (2003) and Munyoro (2014), the process of QDA involves coding and writing. In this case, the researchers looked into themes by identifying passages of text and applying labels to them that indicated some thematic ideas so as to enable them to quickly retrieve all the texts that were going to be associated with a particular thematic idea, and examine and compare them (Scott etal, 2003; Turner, 2010; Munyoro, 2014). Using Seidel’s (1998) model, the researchers divided the model into three parts, namely Noticing, Collecting and Thinking about interesting things (Plachkova & Boychev, 2012; Munyoro, 2014; Munyoro & Dzapasi, 2020) because these parts were interlinked and cyclical. As proposed by Seidel (1998), the researchers noticed interesting things in the data and assigned ‘codes’ to them, based on the theme of the study as shown in the findings section and these codes were in turn used to break the data into fragments (Crouch & Housden, 2000; Scott et al. 2003; Munyoro, 2014), hence the same codes were then used to act as sorting and collection devices. After that, the researchers started writing about the data and their findings and this involved writing a summary of the data and entailed some analytic ideas (Thorne, 2000; Turner, 2010; Munyoro, 2014; Munyoro & Dzapasi, 2020). Additionally, SPSS was used to create tables, whilst excel was used to generate visually appealing figures to illustrate the findings as indicated below.

### Data Presentation, Analysis and Interpretation

#### RESPONSE RATE

The overall response rate for the data collection exercise was 100%, making the data collection exercise popular, real and valuable (Cooper and Schindler, 2011).

- **Gender of Respondents**

The interestingly point worth discussing in this study is that the respondents were heavily skewed to female who were 268, whilst 132 were male and this translate to 67% female and 33% male as indicated in Table 1 below. Since the questionnaires were targeting household owners or individuals directly involved in purchasing of electricity tokens in Zimbabwe thus, the social structure of a household could possibly explain this gender outcome, where most women in Zimbabwe are house wives. Accordingly, this enabled the researchers to meet all of the respondents in their houses when they were collecting data. It is also worth noting that gender in this study is significant as it has a bearing on the electricity consumption behavior, as males and females have different attitudes towards electricity consumption.

#### Table 1: Gender of Respondents

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>132</td>
<td>33.0</td>
<td>33.0</td>
<td>33.0</td>
</tr>
<tr>
<td>female</td>
<td>268</td>
<td>67.0</td>
<td>67.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

#### Fig 1: Gender of Respondents

- **Age of Respondents**

The age group of the respondents was as follows: 9% are in the 21-30 years group, 17% are in 31-40 years group, 55% are in 41-50 years group, 11 % are in 51-60 years group, 6 % are in 61-70 years group and 2% are more than 71 years old group. The majority of the respondents were between 21-50 years as indicated in Table 2. The age group distribution was heavily skewed to a younger generation of 50 years and below as compared to those...
who were 50 and above. The distribution indicates that the majority of surveyed households are headed by a young generation, which forms the working class of the country.

Table 2: Age disposition of clients

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-30</td>
<td>36</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>31-40</td>
<td>68</td>
<td>17.0</td>
<td>17.0</td>
</tr>
<tr>
<td>41-50</td>
<td>220</td>
<td>55.0</td>
<td>87.0</td>
</tr>
<tr>
<td>51-60</td>
<td>44</td>
<td>11.0</td>
<td>98.0</td>
</tr>
<tr>
<td>61-70</td>
<td>24</td>
<td>6.0</td>
<td>15.0</td>
</tr>
<tr>
<td>71+</td>
<td>8</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 3: Distribution of respondents’ residential areas

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high density</td>
<td>172</td>
<td>43.0</td>
<td>43.0</td>
</tr>
<tr>
<td>medium density</td>
<td>136</td>
<td>34.0</td>
<td>34.0</td>
</tr>
<tr>
<td>low density</td>
<td>92</td>
<td>23.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 1: Distribution of respondents according to location

- **Billing system**

The study established that the type of billing system that is being used by the majority of respondents is the prepayment metering with 95% from all residential areas and only 5% are on postpaid metering which is being used by a few households in low density suburbs as shown in Fig. 2.

Table 4: Household electricity billing system being used

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>prepaid</td>
<td>392</td>
<td>98.0</td>
<td>98.0</td>
</tr>
<tr>
<td>postpaid</td>
<td>8</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 2: Household billing system used

- **The billing tariffs distribution**

For the purpose of the study, focus was on domestic customers and 98% of the respondents were on domestic billing tariff whilst 2% were on commercial billing tariff as indicated by Table 5.

Table 5: Electricity tariff by user

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>domestic</td>
<td>392</td>
<td>98.0</td>
<td>98.0</td>
</tr>
<tr>
<td>commercial</td>
<td>8</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig 3: Electricity tariff by user

FINDINGS

- Prepayment Metering is Significant

Table 6: Respondents feelings with prepayment metering system

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Highly satisfied</th>
<th>Satisfied</th>
<th>Neutral</th>
<th>Dissatisfied</th>
<th>Highly dissatisfied</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>48 (38.7%)</td>
<td>136 (77.3%)</td>
<td>8 (25%)</td>
<td>8 (16.7%)</td>
<td>0</td>
<td>200 (100%)</td>
</tr>
<tr>
<td>Medium density</td>
<td>68 (54.8%)</td>
<td>28 (15.9%)</td>
<td>12 (37.5%)</td>
<td>12 (25%)</td>
<td>0</td>
<td>120 (100%)</td>
</tr>
<tr>
<td>Low density</td>
<td>8 (6.4%)</td>
<td>12 (6.8%)</td>
<td>12 (37.5%)</td>
<td>28 (58.3%)</td>
<td>20 (100%)</td>
<td>80 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>124 (31%)</td>
<td>176 (44%)</td>
<td>32 (8%)</td>
<td>48 (12%)</td>
<td>20 (100%)</td>
<td>400 (100%)</td>
</tr>
</tbody>
</table>

Fig 4: Respondents feelings about the current billing system

The study shows that prepayment metering is significant and a major development to households’ socio-economic life in Zimbabwean suburbs, especially the high-density suburbs. In short, there is a general agreement that prepaid meters are vital as they have led to improved budgeting on electricity expenditure in Zimbabwe. For example, there is consensus in households in the medium and high-density suburbs that prepaid meters have enabled them to pay their historical debts at much affordable rates than was the case before and this is a virtuous development in the history of electricity consumption in Zimbabwe. In fact, households have been able to budget electricity consumption as they are now able to buy electricity first before using it unlike before. Thus, enabling the ZETDC to meet its expenses without restraining its budget and this is consistent with the findings from Argentina by Casarin & Nicoller (2009), in Zambia by Malama et al. (2014) and in Malaysia by Alam & Shahriar (2012), whose results show that prepayment metering is significant, especially in improving electricity availability as it allows the electricity providers such as ZETDC to have more predictable revenue collection and can plan its operations in advance (Munyoro & Dzapasi, 2020). Furthermore, prepayment metering has resulted in the reduction of households’ electricity expenditure, thus increasing the customers’ spending on their incomes as they can now pay less than they used to do on postpaid meter (Miyogo et al., 2013; Ariel & Luciana, 2008). In short, prepayment metering system as shown in Fig 4 was well received with households especially in high density suburbs as they consider it as a better and convenient way of purchasing and consuming electricity in Zimbabwe (Cooper et al., 2011).

- Postpaid Metering is Significant

Table 7: Respondents feelings about previous billing system

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Highly satisfied</th>
<th>Satisfied</th>
<th>Neutral</th>
<th>Dissatisfied</th>
<th>Highly dissatisfied</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>8 (22.2%)</td>
<td>4 (11.1%)</td>
<td>32 (47.1%)</td>
<td>108 (62.8%)</td>
<td>48 (54.5%)</td>
<td>200 (100%)</td>
</tr>
<tr>
<td>Medium density</td>
<td>8 (22.2%)</td>
<td>4 (11.1%)</td>
<td>20 (29.4%)</td>
<td>52 (30.2%)</td>
<td>36 (40.9%)</td>
<td>120 (100%)</td>
</tr>
<tr>
<td>Low density</td>
<td>20 (55.6%)</td>
<td>28 (77.8%)</td>
<td>16 (23.5%)</td>
<td>12 (7%)</td>
<td>4 (4.5%)</td>
<td>80 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>36 (9%)</td>
<td>36 (9%)</td>
<td>68 (17%)</td>
<td>172 (43%)</td>
<td>88 (22%)</td>
<td>400 (100%)</td>
</tr>
</tbody>
</table>

Fig 5: Respondents feelings about previous billing system
Although the majority of the households hailed the introduction of the prepayment, regrettably low-density households on the other hand see prepayment metering as an inconvenience compared to households from medium and high-density suburbs. This result as shown in Fig 5, tallies with other findings from elsewhere, that show that low density households prefer postpaid metering than prepayment metering. For example, high income earners in South Africa prefer postpaid meters than low-income earners (Kumwenda, 2006). This is not surprising because high-income earners have more disposable income and can afford high bills thus, they generally prefer postpaid to prepayment metering (Deloitte, 2011). Accordingly, this finding can also be explained by the fact that their electricity expenditure is too high hence, the need to use postpaid metering which has less inconveniences such as buying tokens at night as well as avoiding disconnections at odd times such as night times, weekends and holidays. Additionally, low density households do not see the logic of buying electricity worth twenty dollars upfront when they can afford more than five thousand dollars’ worth of electricity per month (O’Sullivan et al, 2012). The situation is even being made worse by the non-availability of vending machines in these areas compared to high density suburbs as there are few vending stations in low density areas forcing them to travel some distance to access them (Olsen, 1983; Poortinga et al, 2003).

- **Consciousness of power usage**

**Table 8: Consciousness of power usage**

<table>
<thead>
<tr>
<th>Residential Area</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>88</td>
<td>66.7%</td>
<td>92</td>
<td>46.9%</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Medium density</td>
<td>36</td>
<td>27.3%</td>
<td>60</td>
<td>30.6%</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Low density</td>
<td>8</td>
<td>6.1%</td>
<td>44</td>
<td>22.4%</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>132</td>
<td>33%</td>
<td>196</td>
<td>49%</td>
<td>32</td>
<td>8</td>
</tr>
</tbody>
</table>

The study as indicated in Table 8 shows that respondents from low density suburbs indicated that they are now spending more money on electricity than they did on post-paid metering forcing them to reduce their monthly electricity usage. Whilst, respondents from high and middle density suburbs are of opinion that electricity is now cheaper after the introduction of prepayment metering. In fact, different reasons were given by the respondents in relation to the study and this includes the ability to control electricity consumption and budget for amount to be spent on electricity tokens. Whilst, others indicated that prepaid meters are more convenient because the consumption of electricity is now predictable and you are now able to tell the amount to be spend on electricity tokens. In addition, others reported that prepayment is helping them to reduce electricity expenditure compared to postpaid metering where customers were surprised by bills, they could not afford to pay. Most respondents, especially from low income bracket indicated that they are now able to purchase and use what they can afford. Whilst others commented that prepaid metering was ideal, reliable and more convenient to them.

- **Electricity Consumption Behavior**

**Table 9: Respondents views on electricity expenditure**

<table>
<thead>
<tr>
<th>Residential Area</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>56</td>
<td>41.2%</td>
<td>124</td>
<td>72.1%</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Medium density</td>
<td>68</td>
<td>50%</td>
<td>32</td>
<td>18.6%</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Low density</td>
<td>12</td>
<td>8.8%</td>
<td>16</td>
<td>9.3%</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>34%</td>
<td>172</td>
<td>43%</td>
<td>36</td>
<td>40</td>
</tr>
</tbody>
</table>

**Fig 6: Consciousness of power usage**

**Fig 7: Responses on electricity expenditure**

Another key issue in this study as indicated in Fig 7 was to understand the behavior of electricity consumption by households after the introduction of prepayment metering and the sentiments are that the use of prepaid meters has made customers to be more aware of their consumption and expenditure, consequently forcing them to adopt electricity saving behaviors as a way of reducing
consumption rate and manage costs especially at a time electricity is a scarce commodity world over (Miyogo et al., 2013; Qui & Xing, 2015; Azila-Gbettor et al., 2015; Munyoro & Shaningwa, 2019; Munyoro & Dzapasi, 2020). In addition, the results from Kenya, Ghana and US shows that households tend to reduce their electricity consumption through switching off some appliances after the introduction of prepayment meters. Although this behavior was reported in all the residential categories but it is more prevalent in the high-density suburbs where the majority of low-income earners stay (Azila-Gbettor et al., 2015, Miyogo et al., 2013). A good example is USA where households in Phoenix metropolitan area are reported to have reduced their consumption by 12% (Qui & Xing, 2015) and this is also supported by studies from Olgem (2007) and Deloitte (2011). Thus, this development is good news for ZETDC who over the years have been facing electricity supply deficiencies (www.zetdc.co.zw; Munyoro and Shaningwa, 2019; Munyoro & Dzapasi, 2020).

- **Positive Attitude Towards Prepayment Metering**

Table 10: Prepaid meters are preferable to postpaid meters

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Strongly agree</th>
<th>agree</th>
<th>neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>0</td>
<td>4</td>
<td>8.3%</td>
<td>16</td>
<td>5.5%</td>
<td>200</td>
</tr>
<tr>
<td>Medium density</td>
<td>8</td>
<td>28.6%</td>
<td>12</td>
<td>25%</td>
<td>20</td>
<td>120</td>
</tr>
<tr>
<td>Low density</td>
<td>20</td>
<td>71.4%</td>
<td>32</td>
<td>25%</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>7%</td>
<td>48</td>
<td>12%</td>
<td>48</td>
<td>400</td>
</tr>
</tbody>
</table>

Fig 8: Prepaid meters are preferable to postpaid meters

The results from this study show that households from high density areas have a positive attitude towards prepayment meters and they are generally satisfied with its use as noted by Carter & Claywell (2014) in their Ugandan study. In short, as indicated in Table 10, the majority of the respondents from high density suburb have a positive perception towards prepaid meters over post-paid meters because it gives them control over their consumption rate thus, allowing them to better understand the amount of electricity they consume each month and this is good for budgeting (Casarin & Nicollier, 2009). These findings were also supported by Azila-Gbettoretal (2015) and Ajenikoko & Adelusi (2015)’s findings, which stated that prepaid meters empower the low-income customers to understand the cost of the electricity and enable them to budget their usage in accordance with their financial situation. Similarly, households especially from medium and high density areas view prepayment meters as a convenient way to pay for electricity because it gives them an opportunity to buy electricity that they can afford at any time and this is viewed as an advantage especially during economic downturns as it is characterized by very low disposable incomes as well as cash shortages and price upsurge of other commodities (Moyo et al., 2013; Chari, 2019; Munyoro & Dzapasi, 2020). Furthermore, it is also worth noting that households in medium and high-density suburbs have a positive attitude towards prepayment meters because they are more convenient due to the availability of vending stations and kiosks throughout the country and are accessible even at night. Accordingly, customers no longer travel long distances to pay electricity bills in ZETDC banking halls as was the case before as noted by Quayson-Dadzie (2012) who emphasized that customers consider accessibility of vending stations as a factor in their satisfaction with prepayment metering. Thus, the more the vending machines are closer to them the more they can claim satisfaction while the opposite is true.

- **Negative Attitude Towards Prepayment Metering**

Table 11: Postpaid meters are preferable to prepaid meters

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Strongly agree</th>
<th>agree</th>
<th>neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>0</td>
<td>4</td>
<td>8.3%</td>
<td>16</td>
<td>5.5%</td>
<td>200</td>
</tr>
<tr>
<td>Medium density</td>
<td>8</td>
<td>28.6%</td>
<td>12</td>
<td>25%</td>
<td>20</td>
<td>120</td>
</tr>
<tr>
<td>Low density</td>
<td>20</td>
<td>71.4%</td>
<td>32</td>
<td>25%</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>7%</td>
<td>48</td>
<td>12%</td>
<td>48</td>
<td>400</td>
</tr>
</tbody>
</table>

Fig 9: Postpaid meters are preferable to prepaid meters
Fig 9 show that households from the low-density suburbs, on the other hand perceive prepayment meters as an inconvenience compared to households from medium and high-density suburbs. For example, Kumwenda (2006), report that high income earners in South Africa tend to dislike prepaid meters than low-income earners. This finding is interesting because high income earners consume a lot of electricity and can afford high bills hence their negativity towards prepayment metering which they feel regretfully limits their consumption (Deloitte, 2011). Thus, the reason for this aversion of the prepayment metering can be explained by the fact that, since their electricity expenditure is too high then there is no need for the use of prepayment metering which has more inconveniences, such as buying tokens at night and disconnections. Additionally, low density households do not see the logic of buying electricity worth twenty dollars upfront when they can afford more than five thousand dollars’ worth of electricity per month (O’Sullivan et al, 2012). The situation is even made worse by the non-availability of vending machines in these low-density areas compared to high density suburbs forcing them to travel some distance to access them (Olsen, 1983; Poortinga et al, 2003).

- Prepayment metering is expensive

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Strongly agree</th>
<th>agree</th>
<th>neutral</th>
<th>disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>56</td>
<td>124</td>
<td>12</td>
<td>8</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>41.2%</td>
<td>72.1%</td>
<td>33.3%</td>
<td>20%</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Medium density</td>
<td>68</td>
<td>32</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>18.6%</td>
<td>33.3%</td>
<td>10%</td>
<td>25%</td>
<td>100%</td>
</tr>
<tr>
<td>Low density</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>28</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>8.8%</td>
<td>9.3%</td>
<td>33.3%</td>
<td>70%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>172</td>
<td>36</td>
<td>40</td>
<td>16</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>34%</td>
<td>43%</td>
<td>9%</td>
<td>10%</td>
<td>4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Fig 10: Responses on electricity expenditure

| Table 12: Respondents views on electricity expenditure |

Table 13: Accessibility of electricity vouchers

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Strongly agree</th>
<th>agree</th>
<th>neutral</th>
<th>disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>80</td>
<td>100</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>82.5%</td>
<td>52.1%</td>
<td>45.5%</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Medium density</td>
<td>52</td>
<td>52</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>27.1%</td>
<td>27.3%</td>
<td>75%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>Low density</td>
<td>16</td>
<td>40</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>12.5%</td>
<td>20.8%</td>
<td>27.3%</td>
<td>45%</td>
<td>40%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>128</td>
<td>192</td>
<td>44</td>
<td>16</td>
<td>20</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>32%</td>
<td>48%</td>
<td>11%</td>
<td>4%</td>
<td>5%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Fig 11: Accessibility of electricity vouchers

As a way to improve client service and indicated in Table 13, prepaid metering aims to have consumers reach for services with the minutest effort by accessing electricity vouchers within the shortest possible distance. Responses show that electricity vouchers are easily accessible, especially in high density suburbs where the use of electricity vouchers is very high compared to low density suburbs. In fact, respondents show that in the high-density areas there is a high concentration of electricity vendors than low densities -where clients travel for some distance to purchase power because of limited electricity vendors in their residential areas.
Time taken to attend to prepayment meter faults

Table 14: Faults being quickly attended to

<table>
<thead>
<tr>
<th>Residential area</th>
<th>Strongly agree</th>
<th>agree</th>
<th>neutral</th>
<th>disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>28.6%</td>
<td>12</td>
<td>27.3%</td>
<td>42.9%</td>
<td>56.1%</td>
<td>200</td>
</tr>
<tr>
<td>Medium density</td>
<td>12</td>
<td>12</td>
<td>27.3%</td>
<td>14.3%</td>
<td>34.1%</td>
<td>120</td>
</tr>
<tr>
<td>Low density</td>
<td>8</td>
<td>20</td>
<td>45.5%</td>
<td>42.9%</td>
<td>9.8%</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>12%</td>
<td>44</td>
<td>11%</td>
<td>14%</td>
<td>41%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Fig 13: Price of electricity is now affordable to low income earners

With electricity fast becoming a basic need in every household, its affordability becomes of paramount importance as shown in Table 15. Thus, the study indicates that respondents strongly agreed that the price of electricity was now affordable to low income earners unlike the postpaid metering era. This was also confirmed by ZETDC, the electricity provider that electricity is now reasonably priced and the affordability of electricity is now due to the setting of price per kilowatt from stepping costing to a fixed price per unit. In short, stepping costing results into higher price per kilowatt as the consumption increases, that is after the first 300 units whilst, prepaid power retails charge a constant price per unit regardless of the number of units consumed. Accordingly, this is assumed to be one of the contributing factors that explain the decrease in consumption expenses compared to the postpaid era hence, the significance and popularity of prepayment metering in high density suburbs.

Positive relationship between electricity provider and consumers

The study also shows that since the inception of the prepayment meters, there has been an improvement in the relationship between ZETDC and its customers. Thus, this is attributed to low consumption expenses as a result of the elimination of estimated bills, in addition to engaging in energy-wise use so as to keep consumption within affordability levels, hence the significance of prepayment metering to low income earners. As noted by Carter & Claywell (2014) in their study in Uganda, the main reason for the improvement in the relationship between the electricity provider and users is that prepayment meters eliminate debt accumulation and helps households to pay for their historical debts at a very affordable rate without being disconnected.

RECOMMENDATIONS

Based on the analysis and findings of the study, it can be concluded that customers from high and medium households have a positive attitude towards prepayment metering.
meters, whilst low density households have a negative attitude towards the use of prepayment metering system. The following recommendations have therefore been made to guide ZETDC in improving its prepayment metering system:

- **The need for segmentation**

Before introducing a new policy, ZETDC should vet or segment its customers according to their disposable income as it is assumed that disposable income determines consumer spending patterns on certain goods or services because in Zimbabwe residential segregation is still rife and it is historical going back to time of colonial days (Gummerson, 2013). According to Weinstein (2002), market segmentation is customer-oriented philosophy and is a technique of recognizing effectively the differences among customers and provides benefits such as helping to gain a competitive advantage in the market by analyzing various customer groups and targeting specific products to meet their demands, timing of marketing efforts, efficient use of resources, better service to customers, helping in fixing prices as well as assisting with formulating effective distribution strategies (McDonald & Dunbar, 2004; Kotler & Armstrong, 2003). In this case, households should be divided into three major categories thus high density, medium density and low density and it is clear from the findings that generally customers in these areas have diverse electricity demands and incomes, hence the need for ZETDC to consider such issues as a matter of urgency (Deloitte, 2011; Orkoh, 2014; Rogeretal, 2005).

- **The use of smart meters technology**

There is need for the electricity provider to introduce smart meters technology which will help them to eliminate unscrupulous consumers on their use of meters. In this case, any attempt to commit frauds is monitored online, thus making it difficult to tamper with meters and in the process reducing theft by clients (Saarietal, 2003). In fact, smart meters have already been adopted in developed countries such as UK, Canada and Britain (De Almeida & Wine, 1993; Koponenetal, 996). In fact, smart meters literally are monitored online and this is intended to curtail meter tempering thereby reducing power likeages and revenue shrinkages (Munyoro & Dzapasi, 2020).

- **ZETDC should educate all its customers**

ZETDC should also explain to their clients any new change in the service operations by educating them through massive marketing campaigns so that they become aware of the benefits of new product or service to avoid resistance from their customers (Munyoro et al, 2016). Thus, this should involve anything such as prepayment metering and other changes and improvements that might impact on the electricity usage level so as to remove speculation which might be seen to be infringing customers’ rights (Zhou & Zvoushe, 2012).

- **Need to prioritize prepayment meter faults**

Prepayment meter faults should be prioritized in order to avoid discommoding customers (Kenya Power, 2011; Kinyoda, 2013). Thus, in order to address the current prepaid meter shortages, ZETDC should consider partnering with private sector and universities if they cannot meet the demand as well as manufacturing local prepaid meters that suits its operating environment than importing from other countries who have different operating environment (Tewari & Shah, 2003).

- **Vital for ZETDC to lobby the government**

The service provider, ZETDC should lobby the government to limit the importation of incandescent bulbs, geysers and other gadgets that are heavy power consumers until the generation of electricity stabilizes in the country. For example, Malaysia has been successful with this strategy resulting in the minimization of electricity consumption (Ganandran, 2014). That said, ZETDC is currently faced with challenges of maintaining demand and supply equilibrium of electricity and removing the use of high voltage gadgets can at least abate the high demand of electricity which is currently in short supply (Yadoo & Cruickshank, 2012; Munyoro & Shaningwa, 2019; Munyoro & Dzapasi, 2020).

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