Introduction of Pre-Paid Electricity in Zimbabwe: Insights from Chitungwiza

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Abstract
The study examined residents’ views on the introduction of pre-paid electricity metering in Chitungwiza. It set to investigate the level of acceptance for pre-paid electricity metering in Chitungwiza, acceptability of the prepayment system and factors affecting residents’ perceptions of prepaid electricity metering through the use of the total quality model. A mixed methodology design was adopted for the study and primary data were used. Questionnaires and field observations were used as data collection tools. A total sample of 390 heads of households was drawn from unit N, one of Chitungwiza’s residential units which were picked using random sampling (random numbers method using house numbers). The major finding of the study is that there is a general positive perception of pre-paid electricity metering in Chitungwiza. The major factor behind this high level of acceptability was found to be the convenience associated with the use of pre-paid metering such as buying electricity tokens online. The introduction of pre-paid electricity metering has greatly influenced consumer behaviour especially reduction of use of electricity. Based on these findings, it is recommended that the installation of pre-payment meters should continue and awareness campaigns need to be launched in order to provide information about how pre-payment meters’ work. Vending points should be increased and the network should be upgraded so that consumers buys token at any time that is convenient to them.

Key words: Chitungwiza, perceptions, pre-paid electricity, residents, total quality model

Introduction
In today’s culture, electricity is a vital part of functioning as a society. Simple tasks like waking up at a designated time or enjoying a piece of music are accomplished electronically. A short power outage will have detrimental effects on the factories, traffic, food storage and the functioning of electronic gadgets such as computers and cell phones. It is against this background that this study sought solicits for residents’ views on the introduction of pre-paid electricity metering in Chitungwiza. A change in the way electricity is provided in a community is something that cannot be taken for granted by the providers of electricity as it may change the perceptions of the residents on the service delivery.

Technological advancements have resulted in Power Sector Reforms in Africa and the world over. One option has been to switch from the traditional post-paid models of billing to the modern pre-paid model to improve efficiency. Other efforts have been targeted towards the adoption of various subsidy schemes, either directly or through tariff structures (Gomez, Bond, Countries, 2004). In recent years, Public Utility Corporations and Municipalities are changing to pre-paid models in order to cash on the benefits brought about by this model (Harvey, 2005). A well-managed Pre-paid model results in customer satisfaction and a positive perception of the Public Utility Corporations as well received services. Some researchers however see the introduction of the pre-paid meters as a capitalist management of the poor (Ruiters,
2009; Tewari, 2003; Bond, 2007). Sometimes customers are not consulted when the pre-paid meters are affected and this results in a bad perception of the service and customer dissatisfaction. Prepayment metering is the trade measurement of electricity or gas which is required to be purchased by the customer in advance of the consumption of the electricity or gas (Measurement Canada, 2006). In Zimbabwe, pre-paid metering is a new thing, it was only introduced in 2011 and there was anxiety by consumers. Chitungwiza is among the first recipients of pre-paid electricity in Zimbabwe, probably because it is one of the most populous urban settlements in the country. By population size, Chitungwiza is the third most populous municipality in Zimbabwe.

Conceptual framework

This study was based mainly on the concept of service quality as perceived by the consumers. The Total Perceived Quality Model is outlined briefly below.

The total perceived quality model

The Total Perceived Quality Model was the first service quality model which was produced in the eighties (Gronross, 1983; Gronross, 1984). It was based on an individual’s perception of the quality of a particular service. The model is premised on the assumption that the customer compares his expectations and his experience of the service, that is; the technical quality (that obtained by the user) and the functional quality (how the service is provided), perceived through the filter of the company image. When the pre-paid model was introduced by the Zimbabwe Electricity Transmission and Distribution (ZETDC) in Zimbabwe the promise to consumers was that, among other benefits, the prepaid model would also help to reduce the problem of power cuts. How this was going to be achieved was not clear as the power cuts went on unabated. It therefore means the customers had been expecting to see the problem of power cuts reduced and convenience enhanced by the introduction of pre-paid metering system in their homes. The Total Perceived Quality Model is therefore relevant to the study. The survey helped to identify differences or gaps between the expectations of customers and their current experience on the use of prepaid meters. It should however be noted that the Total Perceived Quality Model has a major limitation in that it does not take into consideration the factors affecting an individual’s expectation pertaining a particular service (Monroe & Krishnan 1985). Again, it does not consider the role of a service provider or that of government in influencing and possibly changing consumer expectations when there is a change in the method of payment for the service. In implementing the total perceived quality management system, a company requires extensive training of employees and this can lead to disruption (Oliver, 1980). Employee training includes instruction in problem solving techniques and the tools to evaluate a process and identify weaknesses. A total quality management program eliminates defects and waste, which reduces production costs in a business and an increase in profit. Quality improvement teams can eliminate defects, reduce lead time and identify redundancies in the production process that can significantly add to the profit the company earns. Total perceived quality management entails change in mindset, attitude and methods for performing their job. This may lead to employee resistance, lower employee morale and productivity for the business (Berry et al 1988). The total quality management uses small incremental improvements to move the business forward. As a result, it can take years for a company to enjoy the benefits of the program. Once
workers understand their participation and involvement in total quality management it then becomes essential to its success, morale and productivity to improve (Churchill & Surprenant 1982). Workers become empowered through participation on quality improvement through working in teams.

Pre-paid electricity outside Africa

Pre-paid meters are relatively new in the world, many countries, developing and developed, have now adopted the system. This section reviews the studies that have been conducted by other researchers outside Africa on the use of pre-paid meters. USA is one of the developed countries in which pre-paid electricity was adopted a long time ago, with the first prepayment program coming into place in the early 1990s. Arizona’s Salt River Project (S.R.P) operates M-Power, the largest prepayment program in U.S.A. This programme has been operational since 1993 and by 2010, it had grown to about 100 000 customers with about 12% of the residents served by the Salt River Project. In the USA most customers are fond of the M-Power prepayment metering system with about 83% to 96% of the customers are satisfied (Neenan, 2010). One factor which has resulted in customer satisfaction with S.R. P’s M-Power prepayment system is that the customers are provided with real-time consumption information about their homes. The customers also cite ability to plan their consumption as the main advantage of the program.

Generally, the use of pre-paid electricity in America is increasing. According to Jamie Wimberley, (2014), surveys point to the same conclusion that Americans are satisfied with the prepayment system. In 2013, 39% of Americans surveyed who have used prepayment meters were “very satisfied” and 36% were “somewhat satisfied” to make purchases or contract for services using prepayment. Younger and more mobile Americans were especially satisfied. On the other hand, 61% of older Americans (55 years and older), were “very” or “somewhat” satisfied, preferring other prepayment options in relative terms.

In the Great Britain, more than 7million (13%) of energy consumers pay for their electricity by prepayment (Consumer Focus, 2013; UK Power Limited, 2012). The majority of these are low income earners. There is a potential increase in the uptake of prepayment metering in the Great Britain because the prepay tariffs are competitively priced and more convenient to top up. The users of prepayment meters value the system (ibid). A customer focus study conducted in 2012 found that 81% of the users of pre-paid meters were either very satisfied or quite satisfied with it. They liked the control offered by the prepayment system and the fact that the system helps them to budget and reduces their worry about receiving bills that could push them into debt. India has also adopted pre-paid electricity. The system is welcome by most of the Indians who have adopted it. For example, a study on pre-paid power billing was carried out by Santhosh in India. The study generally concluded that the pre-paid meter system proves to be a boom in the Power Sector. Hence the pre-paid metering device does not only discipline a user’s level of consumption but also helps the user to organize his relationship with urban services.

Carmen de Areco, a small municipality in Buenos Aires Province is the first municipality to widely adopt electricity pre-paid meters in Argentina. A Cost-Benefit Analysis on Prepaid Models in electricity carried out by Ariel and Luciana in Carmen de Areco seemed to suggest that adoption of prepaid meters improved the welfare to both those who adopted the system and those who did not. This contrasts with the results of the study carried on this municipality earlier in 2004 in which a total of 90 users were
surveyed and 47% of them had adopted pre-paid meters, while the rest indicated they had remained with the conventional system. This trend shows an increasing acceptability of pre-paid metering system.

The Power Division of the Ministry of Power, Energy and Mineral Resources, Republic of Bangladesh has, through its studies in 2011, managed to identify the benefits to customers and the Power Company resulting from pre-paid electricity. According to the Power Division, customers like pre-paid metering system because of its transparency and the fact that it allows them to control their consumption and budget. The system was also viewed as having no hassles with bill payment, disconnections and reconnections.

### Pre-paid electricity in Africa

While a large majority of utilities in Europe and the American continents are in the process of deploying pilots and full-scale rollouts of smart meters, Africa still lags behind in terms of improving its energy billing systems. Through the use of advanced metering technologies, African countries including Botswana, Ghana, Kenya, Mozambique Nigeria, South Africa Zambia and Zimbabwe amongst states on the continent began engaging in pilot projects and installation of smart meters (Mburu, 2014). Nevertheless, limited these financial resources have been channeled towards the full rollout of prepaid electricity meters. The minimal roll out has been exacerbated by lack of foreign currency and some technical which have stood as barriers to the successful connection of prepaid metering systems. Although the use of pre-paid electricity is relatively new to most African countries, many of the countries have now adopted the technology. South Africa was the first country to adopt the use of pre-paid electricity in the 1980s. In Botswana, a study by Mburu (2014) showed a general positive perception of the switch from post-paid to pre-paid models. In Mburu’s study, participants perceived the benefits of pre-paid electricity to overshadow the drawbacks of the system since it provided convenience and empowered them on decision-making. Customers noted that they were not consulted before the conversion negated the positive perception. This resulted in a mixed perception on pricing, network availability and under-utilization of some vending outlets. At the same time, the negative perception of safety, benefits to the poor and enrichment of the corporation would have been addressed by educating the customers before the conversion.

Quayson-Dadzie, John (2012) carried out a research on customer perception and acceptability on the use of pre-paid electricity metering system in Accra West Region of the Electricity Company of Ghana. One of his major findings was that customers considered a number of factors before accepting the pre-paid meter for use and these included user friendliness of the meter, durability of the pre-paid meter and access to the pre-paid meter vending points. Quayson-Dadzie, John’s study concluded that the majority of the respondents thought the use of pre-paid meters was not acceptable because of numerous problems associated with them. Most respondents were of the view that the old post-paid meters do not give customer a lot of problems as compared to the pre-paid meters. Out of the total sample population of 391 used by Quayson-Dadzie, John (2012), only 48 (12.3%) indicated that the introduction of pre-paid meters was acceptable.

In Kisumu, West Kenya a survey of Kenya Power carried out by Miyogo, Nyanamba and Nyagweso (2013) assessed the effects of pre-paid service transition in electricity bill payment on Kenya Power customers. The findings of the study indicated that the customers had embraced the pre-paid billing system since the majority registered unwillingness to return to their original post-paid billing system. The study
also established that the pre-paid billing system brought with it advantages such as reduced power disconnections and making customers more careful with their consumption of electricity. Besides that, the respondents seemed not to have noted any change in payment since they shifted to the pre-paid billing system. The study also revealed that the installation of pre-paid meters had greatly improved debt collection. Baptista (2013), in her study of the Everyday Practices in pre-paid electricity in Maputo, Mozambique concluded that the pre-paid metering devise improves the user’s discipline pertaining the consumption of electricity. The study also revealed that the pre-paid metering devise helps the user to organize her relationship with urban services.

Pre-paid electricity in Zimbabwe

According to the report on a survey by Harare News on 7 October 2014, there was a mixed reception of pre-paid meters in Harare. The survey, which covered various suburbs in Harare Province, including Chitungwiza and Harare itself indicated that some people supported the installation of pre-paid meters while others were against it. Those who were in support of the move cite advantages such as customer’s ability to manage and control and manage their own consumption as well as reducing misunderstandings between landlords and tenants over payment of bills. On the other hand, those against the move cited restrictions on consumption behaviour and lack of transparency as major problems faced by the users of pre-paid electricity meters.

Chitungwiza Town

Chitungwiza is a dormitory town in Zimbabwe located approximately 30 kilometres south of the capital Harare at co-ordinates 17.99389 degrees south and 31.04806 degrees east. It is located about 10 kilometres from Harare International Airport (now Robert Mugabe International Airport). Chitungwiza was formed in 1978 and consists of three townships; Seke, Zengeza and St Marys. St Marys is the oldest suburb and is divided into two sections; Manyame Park (New St Marys) and Old St Marys. Zengeza has sections 1 to 5 while Seke has fifteen residential units A, B, C, D, E, F, G, H, J, K, L, M, N, O and P. Landuse in Chitungwiza is predominantly residential, with a few industrial and commercial land uses. The town of Chitungwiza is the largest residential suburb in Zimbabwe and its population is growing rapidly. According to the official 2012 census report on Harare province, the population approximately 86705 households in Chitungwiza (ZIMSTAT, 2012). The average number of households per house is approximately 3.9 (ibid). The rapid increase in population also means an increase in demand for electricity.

In terms of livelihoods, Chitungwiza is predominantly occupied by low level strategies; hence there are predominantly low income earners. Most of the adults are unemployed and depend on informal activities such as vending, car wash, brick moulding and small tuck shops, among others. For those who are employed, most of them work in the capital Harare because there is a lack of industrial activities in Chitungwiza. Literacy rate in Chitungwiza is very high, well above the national average. The literacy rate was reported to be approximately 99% in the 2012 official census report. Fig 1 on page 8 below shows the location of Unit N in Chitungwiza.

Materials and methods

The research design adopted for this survey was the mixed methodology qualitative approach. This enabled the exploration of residents’ perceptions of prepaid electricity in its contemporary and real life context. Out of the 22 residential units in Chitungwiza,
UNIT N was chosen using random sampling. A sample of 390 households was used. This was chosen using random sampling by means of random numbers. Questionnaires and field observations were used as the data collection tools. Pre-testing of the questionnaire was done by giving the same questionnaire to a sample of 20 people randomly selected from Unit O, another low income residential suburb in Seke area. The questionnaires were administered on Saturdays when most people were expected to be at home. Consumer behaviour with regard to the use of the prepaid electricity meters was also observed during the survey. The study was based on the hypothesis that prepaid electricity metering was beneficial to the residents of Chitungwiza.

Results and discussion

Population profile of respondents

Out of the sample population of 390 used in this study, 234 were males and 156 were females. This means 60% of the participants were males and 40% were females, showing that in most cases, men are the heads of households. The participants’ levels of education were sought. The level of education was expected to have a significant influence on the residents’ perception on acceptability of prepaid electricity metering. Participants were grouped into four different categories according to their levels of education.
education. It was evident that over 90% of the participants have attained at least secondary education. The level of education could be one of the factors which might have influenced acceptability of the pre-paid metering system as educated people are likely to make informed decisions about such choices. Figure 4.2 below shows the levels of education among participants.

Employment status of participants

The majority of the participants (51.7%) were formally employed. The other 34.3% were involved in informal employment such as petty trading and brick moulding while the remaining 8.6% is unemployed. This again seems to have had a great influence on perception on pre-paid electricity as people’s perception on methods of payment for services depends on the nature of the job as well as the salary and certainty of getting money each month. The majority of the residents (60%) had acquired just some secondary education and this could be explain why the majority are not employed in the highly competitive formal sector.

Users and non-users of pre-paid electricity meters

This survey revealed that the majority of residents in Chitungwiza are now using pre-paid electricity metering. Out of the 390 participants, 256 were already using pre-paid electricity metering while 134 were not yet using the system. Some are not yet connected to the National Electricity Grid while some are still using the traditional post-paid electricity billing system due to non-availability of meters from ZETDC. About 66.4% of the non-users are willing to switch to pre-paid electricity metering while 33.6% are not willing. Those are not willing want to take advantage of using electricity without the option of purchasing first. Fig 2 below shows the proportion of users and non-users of pre-paid electricity in Unit N.

As a result of civic education provided by ZETDC, the majority of the people were willing to switch on to prepaid metering system as alluded to earlier on.
Residents sowed mixed perceptions on the acceptability of pre-paid electricity metering system. The perceptions were classified into four categories namely: very acceptable; acceptable; not acceptable and indifferent. A total of 68% of the participants perceived pre-paid metering as either acceptable or very acceptable. The other 25, 5% perceive it as unacceptable while the remaining 5, 6% were indifferent. Figure 5 below shows residents’ perceptions on the acceptability of pre-paid electricity metering system. Those who argue that it was acceptable thought that it was easy to plan electricity household usage whilst those who thought the model as not being acceptable wanted to use electricity first before paying for it.

Acceptability of pre-paid electricity metering system

Figure 3 Users and non-users of pre-paid electricity
Source: Field Survey, August, 2015

Figure 4 Willingness to switch to pre-paid metering system.
Source: Field survey, August, 2015
Residents’ perceptions on whether ZETDC is doing enough to promote awareness on the pre-paid electricity metering system.

Participants had mixed views on whether ZETDC was doing enough to promote awareness on pre-paid electricity metering system. Sixty percent (60%) were of the view that ZETDC was doing enough while the remaining 40% were of the view that ZETDC is not doing enough. This shows that the majority of the participants appreciate ZETDC’s effort to promote awareness by means of brochures. However, ZETDC emphasised that pre-paid electricity metering was the way to go and residents should brace for it as there was no going back on the part of the parastatals.

Factors affecting residents’ perceptions on pre-paid electricity metering system.

The majority of the participants considered the convenience associated with the use of pre-paid electricity metering system to be the major factor affecting their perceptions of the system. Convenience was measured in terms of easy of buying electricity tokens and ability to manage electricity expenditure. Others considered economic factors such as the ability to save when using the pre-paid electricity metering system. The views of the residents were captured on table 1 as shown below.

Table 1 Factors affecting resident’s perceptions of pre-paid electricity.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number of participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>129</td>
<td>33</td>
</tr>
<tr>
<td>Convenience</td>
<td>261</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>390</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field Survey, August, 2015
General observations

Field observations made during the survey suggested that the introduction of pre-paid metering system for electricity has greatly influenced consumer behaviour and decision in the use of electricity. The following observations were made.

- Some people (39%) reverted using other sources of energy (paraffin, gas and firewood) even when there is no power outage. This is meant to save electricity so as to reduce spending on electricity. The use of these traditional sources included when residents were preparing meals that require more electricity e.g. the preparation of offal’s and beans.
- There is now increasing strictness on energy saving measures such as putting off lights when they are not required. Cases of conflicts between maids and landlords was observed.
- Pre-boiling and packing beans in bulk to reduce energy consumption was evident in all households visited. This was revealed by 14% of the households in Unit N.

Residents of Chitungwiza did not see the introduction of pre-paid meters as the key to providing access to grid electricity especially for the poor who cannot afford to pay their bills. The residents argued that since ZETDC is a parastatal, revenue collected by this entity is not always used for financing electricity issues but was being used for other issues. This scenario is mainly caused by massive corruption and looting at state parastatals as well as the employment of people without the requisite qualifications and experience. There is need by ZETDC to detail whether pre-paid meters in low-income households lead to decreased consumption or forced consumption. Without proper figures and/or information it was difficult to get such information. In Chitungwiza ZETDC was not able to provide detailed information so as compare reality on the ground. It was no clear on what was going to happen to those households with a history of poor-payment or huge debt on credit meters hence it was not clear on whether they had larger reductions in consumption. It was also not clear on whether households with limited liquidity would reduce more on consumption. There are emerging issues: financial, economic and technological e.g. Poverty and energy poverty- percentage of population living below upper-bound poverty level, consumptive growth i.e. buying more electricity so that the parastatal is in a position to expand other electricity grid hence the taking on board of new connections and including the need to minimise pilferage and theft, a view shared by Ariel et al., (2009).

Although the use of prepaid metering was welcome in Chitungwiza there were however weaknesses associated with the and these included difficulties associated with options for online/innovative payments methods, mainly due to internet challenges and note everyone has a smart phone so as to be able to buy ZESA tokens online. Challenges in the use of pre-paid include a lack of funding and regulatory frameworks to support the deployment of prepaid electricity meters. In Zimbabwe there were incidents prepaid meter tampering incidents. ZETDC utility had to enforce heavy penalties and disconnect customers found illegally connecting their prepaid meters. This came from a number of complaints of increases in electricity payments, opposed to the set amount paid by customers prior to the installation of prepaid meters. Faulty prepaid meters exacerbated the problem as well. In December 2016, Zimbabwe’s Daily News reported installed meters inaccurately billing customers due to technical issues. Zimbabwe Electricity Supply Authority (ZESA) had to recall some 6,000 prepaid units and cancelled its contract with Chinese supplier. New and improved custom made meter specifications were to sourced. These meters had to be in order to commission and buy meters’ resistant to
Zimbabwe’s climate. Another issue is that of initial transaction costs which are very prohibitive especially for poor households.

**Conclusion**

The general conclusion from this survey is that there is a positive perception of pre-paid electricity metering in Chitungwiza. With the majority of people now using pre-paid electricity metering, the model has gained acceptance in Chitungwiza as the residents are quite aware of the advantages and disadvantages of prepaid as compared to post-paid electricity metering. High level of willingness by non-users of pre-paid electricity meters to switch to the pre-paid metering system highlights this positive perception. Other factors with the greatest influence on consumer perception on acceptability of pre-paid metering for electricity are convenience. The convenience related factors include access to vending points and the reduced risk of disconnections if one is subscriber. Economic factors also play a pivotal role in influencing consumer perception in this regard, but not as much as convenience related to factors highlighted above. The economic considerations highlighted by the participants include controlling spending, subscribing what one has and the need to reduce debts. There are however other social, economic and political factors that are associated with electricity generation and distribution that are beyond ZETDC such as the shortage of foreign currency reserves in Zimbabwe to import more electricity and also increase the chances of more generation. With reference to the perceived total quality consumers were generally happy with the service they are getting from ZETDC but they want to less power cuts and more education with reference to prepaid meter and other ways of saving electricity.

**Recommendations**

The study revealed a general positive perception of pre-paid electricity metering but the acceptance level was not 100%. This means there is still a lot that needs to be done in order to raise awareness on the advantages of prepaid metering as well as the need to reduce the disadvantages of the prepayment system. Based on the findings of the survey, the following recommendations are put forward:

- In light of the high level of acceptability for pre-paid electricity metering system among residents, ZETDC should proceed with the installation of pre-paid electricity meters since most of the non-users of pre-paid meters are willing to switch to pre-paid metering. This will go a long way in saving electricity and thus promoting a culture of responsibility.

- ZETDC should embark on awareness campaigns to make sure that customers are well informed about how the system operates. These awareness campaigns should cover the whole of Chitungwiza so that residents capture advantages of the model.

- ZETDC should take advantage of the energy saving opportunity provided by pre-paid metering and improved efficiency in revenue collection to upgrade power stations so as to normalise electricity supply and reduce load shedding and power cuts especially during the rainy season and in winter.

- More vending points for pre-paid electricity tokens should be availed by ZETDC. However, suffice to say that ZETDC has covered a lot of ground in terms of increasing vending sites and acquisition of tokens electronically thus reducing the burden of travelling to acquire these. Electronic vending (e-vending) should also be adopted to enhance easy access to the pre-paid electricity.
There is need for more details of cash-flow in poor households for effective use of pre-paid metering and for innovative payment methods; information on tariffs/consumption and budgeting is required to increase the acceptability of the pre-paid meter system.

References


