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Adoption Of The Prepaid Electricity Meter Billing System By Harare Residents: Was There Some Preference To Conventional Meters?

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Abstract: *The town centres and urban residents in Zimbabwe complained of being unfairly charged electricity bills, since estimating methods were used for billing. The electricity board could benefit from non-supply of electricity during load shedding and cut offs. The residents were happy when the prepaid meters were installed in their homes as they perceived it as a fair deal. There was, however, a decline of the rate of uptake for these new meters in 2013, 2014 and at the start of 2015. The study wanted to establish whether electricity customers were thinking about reverting to the conventional contract meters or remain with the conventional method. The study considered a random sample of 65 residents from Waterfalls and Hatfield medium density suburbs. The study compared the perceptual differences of residents on the prepaid meter billing system and the conventional meter billing system. The challenges of using the prepaid billing system were also analysed. The study recommended service innovations in the prepaid meter system that makes adoption by residents beneficial and easy.*

Key Words: *Innovation, Conventional meter, prepaid meter, adoption process, ZESA, billing system.*

I. Background to the Study

The improvements in technology and scientific development have altered the way services and good are provided the world over (Windahl, 2015). Many Zimbabweans are crying for various social services to be billed in a transparent and accountable way. Such services include television, radio, road fees, water rates and electricity. The customers feel cheated when they are asked to pay for services they are not consuming or paying using estimates. Service suppliers on the other hand also depended on this gap between customer complaints and legal requirements for them to pay. Customers were generally dissatisfied with the conventional system due to too much estimates used when billing, unfair power disconnections and expensive fees for connections. The customers also felt that the power utility had no urgency in repairing any faults since ZESA was just getting their revenues by using monthly averages for billing customers who did not even consume any unit of the power. Some customers also perceived that they were paying electricity for cross subsidising some big corporate and individual customers whose names were said to be known by ZESA alone. The rates payers suspected corruption and injustice in the billing and service delivery system (Muzoriwa, 2013). Some of those with large outstanding bills were having their conventional meters stay free from disconnections and safe from load shedding. Customers were in a tight situation and needed an immediate solution. When the prepaid meters were launched the residents jumped with joy and positive expectations that their cry was answered. No customer resisted the prepaid meter installations at all. ZESA also made the prepaid meter installations free and accessible to targeted residential areas. The power company was not worried about what will happen to customer satisfaction with the new system. In general, when carrying out a customer analysis of adopting a new product, switching costs need to be considered. The failure of the other product does not guarantee success of a new product or new system. After some six months of using the prepaid meters major setbacks became visible to the new adopters of the new billing system. Some cited high costs, others talked of the inconvenience in use, giving some doubt on whether they are happy with the prepaid system. The question at hand is that; Did customers wanted to go back to the conventional system or stay with the prepaid choice? What then were the challenges for using the prepaid system? [Are Harare Residents Still Yearning for Egypt While Going to Canaan?]

According to Adair (2007), innovation is a process that successfully brings new ideas, ways of doing things or physical equipment to a certain place. This definition is in agreement with West and Farr (1990) who see innovation as bringing some things that are new to a place. One such innovation, has been the introduction of the pre-paid electricity billing system. At first electricity customers were enthusiastic about this innovation. On the other hand, suppliers of meters were emphasising the attractive benefits of installing such prepaid meters in homes. But, customer complaints began to increase due to unavailability of electricity and other problems.

II. Review of Literature

The analyses of the differences in perception between the prepaid meter system and the conventional system is covered under key stages of new product development process, adoption stages, adopter categories, factors influencing adoption process rate and the post purchase behaviour.

1.2.1 The New product Development Process

From the supplier's point of view, the key stages for developing new products include idea generation, idea screening, concept testing and development, marketing strategy development, proto type development and testing, test marketing and commercialisation (Kotler, 2006). The ZESA billing section created a new product or system that had to pass these stages. The initial stages of the process are critical since they take into consideration the conceptual issues of the product. It might be good to reject the new product at its early stage than when many people and departments are involved at marketing strategy and other successive levels (Kotler and Armstrong, 2004). Once top management become committed and involved, it becomes difficult to drop the idea (Jobber, 2010). Although test marketing is put at the end of the new product development cycle, it seems to be co-ordinating all other levels. Problems which customers might face in adopting a new product might come when firms fast track or ignore the significance of the test marketing process. Test marketing refers to a stage at which the product and marketing programme are introduced into more realistic market settings (Kotler and Keller, 2013). The test marketing was mainly technical and could have ignored the marketing essence that enables strong connections to be made the customer and the new product. A test market enables dialogue to be made between the product and the customer.

1.2.2 The Adoption Stages Of a New Product

The adoption of new products by consumers takes stages that are similar to the basic consumer decision making process (Chu and Li, 2011). They covered this by searching on the impact of market orientation in learning of new products. The basic adoption stages include awareness, interest, evaluation, trial and adoption. Adoption involve the use and continued use of the product or system by the customers (Johne, 1994). It is easy to influence users to quickly believe that other stages of the adoption process are covered except on the trial and adoption. The trial use might, however, be made more interesting by the marketers through use of sales promotion and public relations tools. These act like adoption pain killers. The Prepaid meters were launched to few residential areas accompanied by radio and newspaper positive comments. Some residents were used to give testimonials for encouraging others to accept the new system. The real use of meters could not be faked since consumer experiences had to tell the full story.

1.2.3 The Adopter Categories of Prepaid Meters

Whether the stages were all followed or not seems to be less important than the discussion on the features of people who adopt the new electricity billing system. The five categories of people who adopt the new products include innovators, early adopters, early majority, late majority and laggards (Jobber, 2010). Where a new product gives an advantage the innovators benefit much and in case the product is full of weaknesses the laggards will be safe. Though the free market expression was not accorded by ZESA to the Hatfield and Waterfalls residents, their reactions could have told who each adopter was. The factors that influence whether one is an innovator or laggard are perceived risks namely, functional risks, physical risks, financial risks, social risks, psychological risks and time risks(Kotler and Keller, 2013). In this study consumers were worried about reducing functional risks, time risks and financial risks associated with the conventional meters. Whether they succeeded in reducing these perceived costs was the main focus of this study. The problem of the new product is that most of these risks become clear after long period of its use.

1.2.4 Factors Influencing Adoption Of New Products

Speed of product adoption is also a critical concept to consider when analysing whether a new system was beneficial or not (Solomon, 1999). The relative advantage, compatibility, complexity, communicability and divisibility are the important product related factors for influencing success of new products (Jobber, 2010). The question is: Was the new electricity meter having some advantages over the conventional meter? Was the new system compatible to the customer's conditions? Was the new system less complex to use and apply? Was the new meter highly divisible and its features easy to communicate to customers and potential users. The major factor seemed to be the relative advantage of one system over another. In the study the variables used for comparing the two billing systems were accuracy, pilferage of power, user friendliness, convenience, price level and level of faults. It can be seen that the relative advantage covers the compatibility, complexity, communicability and divisibility dimensions.

1.2.5 The Post Purchase Behaviour and Adoption of a New Product

On the strict sense of consumer behaviour, the electricity customer is supposed to recognise the problem, search for information, evaluate the alternative features of products and companies, make a purchase decision and make reflections at the post purchase stage. Though the electricity is a product sold and bought for long term contracts, the reflections on post purchase dissatisfaction and satisfaction, and dissonance and consonance, need to be valued. There is a possibility that the customers are now under punishment for adopting the contract billing system (Solomon, 199). Though recently, the payment systems were improved, the residents earn their salaries late and infrequently and might need to use power and pay later. Dissatisfaction come when customers perceive a lower quality and value than expected (Kotler and Keller, 2013). The behaviour of an adopter changes depending of the stage of the buying cycle (Solomon, 1999). Schifman et al, (2001) emphasised the concept of consonance as critical for successful adoption of an innovation. Consonance is where the customer is psychologically stable after buying a satisfying or dissatisfying product. The dissonance is the anxiety that come as a result of buying a satisfying or dissatisfying product. The residents could be facing both dissatisfaction and cognitive dissonance with this new system (Peter and Olson, 2008). They might be having nostalgic memories of the old conventional electricity billing approach.

III. Research Methodology

The study took a positivist approach which applied a cross sectional survey. Positivists believe that the study of human behaviour can be conducted in the same way as in natural sciences. The experiences of electricity consumers were to be measured in quantitative figures and dimensions. In this study, a sample of 65 residents from Waterfalls and Hatfield was considered, with a response rate of 54%. The KMO sample adequacy was 0.50. A quota sample of 30 males and 35 females was met for this study. The sample consisted of 20% single parents, 27.7% single unmarried and 52.3% married people. The number of dependents were 63.1% for below 3, 33.8% for 3 to 6 and 3.1% for those in the 7 and above range. Those below $500 income were 56.7%, those in the $501 to $1000 were 33.8% and the $1001 and above were 9.2%. The data analysis was done using the SPSS and produced the mean values, correlations, t tests, raw percentages. The questionnaire reliability level was 0.49 Cronbach's Alpha. The tables were used for presenting data in the report.

IV. Results and Discussion

1.4.1 Descriptive Discussion Of Raw Means and Percentages

Table I: Perceptions on Conventional Meters by Residents

	MEAN VALUE	SA	A	NS	DA	SDA
Accuracy	2.82	16.9	24.9	29.2	18.5	10.8
Low pilferage of power	2.86	1.5	27.7	58.5	7.7	4.6
Being user friendly	2.29	18.5	47.7	20.0	13.8	0
Has convenience	2.58	20	27.7	26.2	26.2	0
Being cheaper	2.69	16.9	36.9	20.0	12.3	13.8
Fewer faults associated with the meter	1.95	49.2	29.2	6.2	7.7	7.7

Table II: Perceptions on Prepaid Meter by Residents

	MEAN VALUE	SA	A	NS	DA	SDA
Accuracy	1.77	46.2	38.5	7.7	7.7	0
Low pilferage of power	2.54	23.1	20.0	43.1	7.7	6.2
Being user friendly	2.40	24.6	30.8	24.6	20.0	0
Has convenience	2.42	23.1	32.3	26.2	16.9	1.5
Being cheaper	2.77	21.5	21.5	23.1	26.2	7.7
Fewer faults associated with the meter	2.83	20.0	16.9	35.4	15.4	12.3

	Conventional Mean	Prepaid Mean	Differences	Comment
Accuracy	2.82	1.77	0.05	Marginally Improved
Low pilferage of power	2.86	2.54	0.32	Largely improved
Being user friendly	2.29	2.40	-0.11	Marginally Decreased
Has convenience	2.58	2.42	0.16	Improved
Being cheaper	2.69	2.77	-0.08	Marginally Decreased
Fewer faults associated with the meter	1.95	2.83	-0.88	Largely Decreased
Overall Mean	2.532	2.455	+0.077	Marginally Improved

NOTE: A positive value shows preference of prepaid meters.

The study refers to details given in Table I, Table II and Table III. In Table I and Table II the results indicate the raw percentages and the mean values for evaluating the attractiveness of conventional meter system and prepaid meter system respectively. The most preferred factors in conventional billing system is fewer faults, followed by being user friendly, high convenience, being cheaper, accuracy and low pilferage. The overall agreement on that conventional meters having fewer faults is (49.2 + 29.2) 78.4%. This was the greater strength of the old system with a mean value of 1.95. The most preferred factors in prepaid billing system(Table II) is accuracy, followed by being user friendly, high convenience, low pilferage, being cheaper, and fewer faults. Such characteristics might be a good area for concentrating market-driven strategies for improving adoption of prepaid meters (Day, 1999). The overall agreement on that prepaid meters being accurate was (46.2 + 38.5) 84.7%. This was the greater strength of the new system with a mean value of 1.77. These findings are in agreement with Windahl, (2015) who cited that management of interdependencies between the supplier and the customer of technologies is critical for successful adoption. The supplier firm of a technology's market orientation behaviour could also improve the success of the prepaid billing technology (Vega-Vazquez et al, 2012).

The comparisons given in Table III show how some electricity consumers are still appreciating the old billing system. The areas where residents are perceiving prepaid meters as more important is on accuracy in billing, low pilferage and convenience, with differences of 0.05, 0.32 and 0.16 respectively. The areas where the residents felt conventional meters are having relative advantage were found to be being user friendly, has convenience and have fewer faults. The differences were -0.11, -0.08 and -0.88 respectively. Though there seems to be a balance between the conventional system and the prepaid system, the overall mean difference is in favour of prepaid meters (Diff=0.077). This study indicates that customers had no outright advantages for going to the new system.

1.4.2 Hypotheses Testing of The Meter Preferences

The hypotheses that were tested include the following statements:

Hypotheses	**H_0**	**Critical Value**	**Test Value**	**Conclusion**
Pearson, r	H_1: strong positive correlation	P-value= 0.05	p-value= 0.162 r-value= -0.49	Not statistically significant. Negative relationship
Spearman, rho	H_1: strong positive correlation	P- value= 0.05	p-value=0.272 r-value= -0.314	Not statistically significant. Negative relationship
Conventional Meters(One Sample Test)	H_2: $\mu \leq 3.00$	P-value =0.05	p-value=0.022 t= - 3.271	Accept H_0
Prepaid Meters (One Sample Test)	H_3: $\mu \leq 3.00$	P-value =0.05	p-value= 0.077 t = -0.1466	Accept H_0

H_1: There is a strong positive correlation between prepaid billing system and conventional billing system.
H_2: The residents are not happy with the conventional billing system
H_3: The residents are not happy with the prepaid billing system

The results indicate that the r value is -0.49, and p-value of 0.160 for Pearson and r-value of -0.314, and p- value of 0.272 for Spearman. We reject the null hypotheses and conclude that there is a negative relationship between prepayment and contract system of customer billing. For the one sample test of conventional billing, the hypothesis was rejected since the p-value of 0.022 indicate the customers agreed on the beneficial features of this system. The prepaid meters were also favoured and we rejected the hypothesis that customers were not happy with the new system.

1.4. 3 Analysis Of Variance Between The Prepaid And The Conventional Meters

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig
Between People		.342	5	.068		
Within People	Between Items	.018	1	.018	.089	.778
	Residual	.994	5	.199		
	Total	1.012	6	.169		
Total		1.353	11	.123		

Grand Mean = 2.4933

The differences between conventional meters and prepaid meters in the minds of residents was given an ANOVA test at the significance level of 0.05. The results show that an F- value of .089 and p-value of 0.778 confirms that there is a big difference between the two products. Both the 'between people' and 'within people' variance were below the F value of 0.089.

1.4.4 Analysis Of Challenges Faced in Use of Prepaid Meters by Residents

Table III: Challenges Faced in Use of Prepaid Meters by Residents

	MEAN VALUE	SA	A	NS	DA	SDA
Conflict among tenants on who uses much electricity	1.86	38.5	46.2	9.2	3.1	3.1
They can be finished up during the night and fail to top up	1.82	40.0	47.7	6.2	3.1	3.1
Need to control children and visitors on use of lights and heating	1.82	40.0	49.2	1.5	7.7	7.7
Problem in adopting the new loading and digitalised system	2.17	29.2	47.7	7.7	7.7	7.7

The study also considered issues that came up as a result of using the prepaid billing system. The residents confirmed that tenants who share meters still have the need to further determine who consume more power. The billing system had problems at its inception of inconveniencing the users when power was finished during the night. The other social cost was on the need to control visitors and children on use of lights and heating. There was some technological fear on the application of new loading and digitalised system. This shows some post purchase dissonance and dissatisfaction. These problems in use of prepaid meters made customers to think of reverting to the conventional system. Though Windahl (2015) study was on business-to-business situations, it enabled understanding of how adoption of an innovation could disrupt the customer's way of life.

V. Conclusions

The study concludes that electricity consumers marginally prefer the prepaid meter system. There is also some attachment to the conventional meters since they have fewer faults and being user friendly. The study indicates that residents are generally happy with both systems of electricity billing. There is also some negative relationship between prepaid meters and conventional meters in terms of performance. This indicated that a hybrid meter might need to be designed for the residents.

VI. Recommendations

The study recommends consumers to teach their children on how to use the new system in places these are to be installed. The power utility is also encouraged to find out ways of improving the service delivery by considering the needs of electricity consumers. ZESA is also recommended to improve the effectiveness of the conventional meter since other residents are finding the system useful. A hybrid meter is also recommended for the electricity users in Harare.

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Appendices
Correlations

		ConMeter	PrePdMeter
ConMeter	Pearson Correlation	1	-.490
	Sig. (1-tailed)		.162
	Sum of Squares and Cross-products	.615	-.326
	Covariance	.123	-.065
	N	6	6
PrePdMeter	Pearson Correlation	-.490	1
	Sig. (1-tailed)	.162	
	Sum of Squares and Cross-products	-.326	.721
	Covariance	-.065	.144
	N	6	6

Correlations

			ConMeter	PrePdMeter
Spearman's rho	ConMeter	Correlation Coefficient	1.000	-.314
		Sig. (1-tailed)	.	.272
		N	6	6
	PrePdMeter	Correlation Coefficient	-.314	1.000
		Sig. (1-tailed)	.272	.
		N	6	6

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	ConMeter	2.5317	6	.35074	.14319
	PrePdMeter	2.4550	6	.37962	.15498

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	ConMeter & PrePdMeter	6	-.490	.324

Paired Samples Test
One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ConMeter	6	2.5317	.35074	.14319

One-Sample Test

	Test Value = 3.00					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ConMeter	-3.271	5	.022	-.46833	-.8364	-.1003

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
PrePdMeter	6	2.4550	.37962	.15498

One-Sample Test

	Test Value = 3.00					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
PrePdMeter	-3.517	5	.017	-.54500	-.9434	-.1466

Correlation Matrix(a)

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.490	74.503	74.503	1.490	74.503	74.503
2	.510	25.497	100.000			

Extraction Method: Principal Component Analysis.

Inter-Item Correlation Matrix

	ConMeter	PrePdMeter
ConMeter	1.000	-.490
PrePdMeter	-.490	1.000