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A COMPARATIVE STUDY BETWEEN PRE AND POSTPAID SYSTEMS IN KARATU DISTRICT, TANZANIA

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Abstract: **The comparative study between pre and post-paid water payment system in Karatu district in Arusha region aimed to investigate the level of acceptability of pre-paid water payment system in comparison to the post-paid system, examine factors considered by water users before accepting the pre-paid system, investigate cost benefits of pre-paid system in comparison to the post-paid and determine management strategies that can promote acceptability of pre-paid water payment system. The study used the cross-sectional design. GPower statistical software was used to determine the required sample size of 124 respondents and out of whom 123 (99%) participated in the study. Semi-structured questionnaire administered through a non-probability snowballing techniques was used to collect primary data which were analyzed by using descriptive statistics through cross tabulation at 95 percent significance level (p = 0.05) and the results presented in Tables and Figures. The level of acceptability of the post-paid system in the district is 100% as compared to 88.6% acceptance level of the pre-paid system Availability of technicians to repair water meters, durability of meters, easy access to vending points, cost of installation, reliability of meters and reliability of billing report are vital factors considered by water users before accepting the pre-paid water payment system. The pre-paid system offers more cost benefits as compared to the post-paid system. Awareness education to water users on benefits of using pre-paid system, installation of durable meters, and establishment of emergence repair team and free installation of the pre-paid meters are management strategies that can promote acceptability of the pre-paid system. It is recommended that water authority in Karatu district should implement all suggested management strategies and put emphasis on educating water users on the benefits of the pre-paid water payment system. Studies on the impact of pre-paid water payment system on the revenue collection and profitability of the water authorities and another on the impact of pre-paid water payment system on water consumption rate among water users are suggested.**

Keywords: **Pre-paid Water Payment, Post-paid Water Payment, Management Strategies, Customers' Adoption.**

1. INTRODUCTION

To facilitate affordable and reduced utility cost, prepayment meters for water and electricity has been suggested as an innovative solution. Basically, this system requires that users of the utility pay in advance for the delivery of services or goods, prior to their consumption. By so doing, the consumers hold a credit and use the service up to the point when the credit is finished. Prepayment mode of payment for utilities was introduced for the first time in South Africa and later on found extensive use in the United Kingdom (UK), India, Turkey, and Ghana and eventually all over the world (Tewari & Shah, 2003). Traditional post-paid monthly utility consumption of customers is determined by taking readings from the traditional credit or post-paid meters and bills produced for customers to pay within a month period. However, this method has caused utility companies to struggle with collection of huge amounts of unpaid bills from customers. Hi-tech development has resulted into the prepayment metering system to deal with billing irregularities and consequently improve mobilization of revenue. (Quayson-Dadzie, 2012).

In South Africa pre-paid payment system have enabled reduction on costs associated with metering, billing, service disconnection and reconnection. Prepayment billing system has enabled minimization of working capital and also improved revenue collections. The system is also providing a flexible utility payment options to customers who have minimal and unpredictable streams of income without escalating transactional costs to the utility supply firm (Tewari & Shah, 2003).Survey on users' acceptance and satisfaction in South Africa has revealed that 99% of customers connected to the prepayment system are satisfied with system. Factors which have led to acceptance of the prepayment system include awareness and control on the amount of utility consumed and consumption of less amount of utility (Prepayment Metering Report, 2005). Incidentally, Pre-paid system benefits must be balanced with the thoughtful of possible increased costs owing to considerable increase in capital expenditure on water metering devices, periodic costs such as the vending cost, frequent repairs and monitoring and additional selling of water at subsidized tariffs rather than full tariffs (Heymans, Eales, & Franceys, 2014).

In Karatu district of the Arusha region the Catholic Relief Services (CRS) has implemented a Revolutionizing Remittance Recovery in Water (R3W) project aiming to deal with some of the main challenges concerning water delivery to communities and help to construct a sustainable system supported by a robust and reliable water infrastructure. The R3W project has put in place pre-paid water payment system in combination with an effective and accountable water management system. Karatu Urban Water and Sanitation Authority, Trunk Main Water Supply and Sanitation Authority have also started to introduce pre-paid water payment system with an aim to replace the existing post-paid water payment system (HDIF, 2018). The focus of this comparative study between pre-paid water payment systems in Karatu district of Arusha region is to examine the acceptance of the pre-paid water payment system among customers of the Karatu Water Authority in comparison to the traditional post-paid payment system. The study also intends to examine factors considered by customers before accepting the system, cost benefits of the pre-paid system and management strategies used by the water authority to promote acceptance of the pre-paid water payment system in the study area.

2. PURPOSE

The purpose of the study was to examine adoption of pre-paid water payment system and compare it with the post-paid water payment systems in Karatu district. Specifically the study sought to assess the Pre-paid Water Payment, Post-paid Water Payment, and Management Strategies on Customers' Adoption.

3. RESEARCH METHODOLOGY

The study adopted qualitative research design and has used the cross-sectional design. Qualitative research is valuable for studies at the individual level, and to uncover, exhaustively, the ways in which populace think or feel about a certain aspect (Denzin, Norman, & Lincoln, 2005. Population for the study is the water users in Karatu district. According to the 2016/17 Tanzania National population, Karatu District has a population of 263,976 (Tanzania National Bureau of Statistics, 2018). The study's sample size is 124 water users within Karatu district.

The study has mainly utilized primary data which have been collected by using semi-structured questionnaire. The questionnaire was distributed to water users in various wards of Karatu district and respondents were requested to respond to the questions to the best of their knowledge.

The collected data have been analyzed by using descriptive statistics by applying cross tabulation with Chi-Square tests at 95 percent significance level ($p = 0.05$).

4. RESULTS AND DISCUSSION

Level of Acceptability of Pre-paid and Post-paid Water Payment System

The findings in Table 1 indicates that the pre-paid water payment system is Slightly acceptable to about 38.2% (47) of the 123 water users in Karatu district who participated in the study. Another 32.5% (40) of the water users have indicated the level of acceptability of pre-paid water payment system as acceptable. The level of acceptability of the pre-paid water payment system is rated as very acceptable by about 17.9% (22) of the water users. About 6.7% (7) of the water users have indicated that the pre-paid water payment system is not acceptable. About 6.7% (7) of the water users who participated in the study are indifferent on the level of acceptability of pre-paid water payment system in Karatu district.

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Table 1: Level of Acceptability of Pre-Paid Water Payment System

Level of acceptability of pre-paid meters in your area * Gender Cross tabulation					
			Gender		Total
			Female	Male	
Level of acceptability of pre-paid meters in your area	Slightly acceptable	Count	25	22	47
		% of Total	20.3%	17.9%	38.2%
	Acceptable	Count	22	18	40
		% of Total	17.9%	14.6%	32.5%
	Indifferent	Count	3	4	7
		% of Total	2.4%	3.3%	5.7%
	Not acceptable	Count	4	3	7
		% of Total	3.3%	2.4%	5.7%
	Very acceptable	Count	7	15	22
		% of Total	5.7%	12.2%	17.9%
Total		Count	61	62	123
		% of Total	49.6%	50.4%	100.0%

The pre-paid system is generally is acceptable to 44% (54) females as compared to 45% (55) males. However, the outcome of the Chi Square tests shown in Table 4.2 indicates that there is no significant difference on the level of acceptability of the pre-paid water payment system between females and males in Karatu district, X^2 (123, 4) = 3.778, p > .05.

Table 2: Chi-Square Tests on the Level of Acceptability of Pre-paid System

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.778[a]	4	.437
Likelihood Ratio	3.848	4	.427
N of Valid Cases	123		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is 3.47.

Table 2 reveals that 51.2% (63) of the 123 water users in Karatu district who have participated in the study have ranked the level of acceptability of the post-paid water payment system as acceptable and 48.2% (60) ranked the level of acceptability of the post-paid water payment system as very acceptable.

Table 3: Level of Acceptability of the Post-Paid Water Payment System

Level of acceptability of post-paid meters in your area * Gender Cross tabulation					
			Gender		Total
			Female	Male	
Level of acceptability of post-paid meters in your area	Acceptable	Count	34	29	63
		% of Total	27.6%	23.6%	51.2%
	Very acceptable	Count	27	33	60
		% of Total	22.0%	26.8%	48.8%
Total		Count	61	62	123
		% of Total	49.6%	50.4%	100.0%

The post-paid system is generally is acceptable to 49.6% (61) females as compared to 50.4% (62) males. However, the outcome of the Chi Square test shown in Table 4.4 indicates that there is no significant difference on the level of acceptability of the post-paid water payment system between females and males in Karatu district, X^2 (123, 4) = .989, p > .05.

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Table 4: Chi-Square Test on the Level of Acceptability of Post-paid System

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.989[a]	1	.320		
Continuity Correction[b]	.663	1	.416		
Likelihood Ratio	.990	1	.320		
Fisher's Exact Test				.369	.208
N of Valid Cases[b]	123				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 29.76.

b. Computed only for a 2x2 table

With regard to acceptability on the basis of categories of water users, Table 4 shows that the level of acceptability of pre-paid water payment system is slightly acceptable to 3.3% (4) of commercial water users and to 35% (43) of the domestic water users. The level of acceptability of the pre-paid system has been rated to be acceptable by 4.1% (5) of commercial water users and by 28.5% (35) of domestic users. The level of acceptability of the pre-paid water payment system is rated as very acceptable by about 4.1% (5) of commercial water users and by about 13.8% (17) among domestic water users. However, about 0.8% (1) of commercial users and 4.9% (6) of domestic users have rated the level of acceptability of the pre-paid water payment system as not acceptable.

Table 5: Level of Acceptability of Pre-Paid System on the Perspective of Categories of Water Users

Level of acceptability of pre-paid meters in your area * Categories of users Cross tabulation					
			Categories of users		Total
			Non-residential (Commercial)	Residential (Domestic)	
Level of acceptability of pre-paid meters in your area	Slightly acceptable	Count	4	43	47
		% of Total	3.3%	35.0%	38.2%
	Acceptable	Count	5	35	40
		% of Total	4.1%	28.5%	32.5%
	Indifferent	Count	1	6	7
		% of Total	.8%	4.9%	5.7%
	Not acceptable	Count	1	6	7
		% of Total	.8%	4.9%	5.7%
	Very acceptable	Count	5	17	22
		% of Total	4.1%	13.8%	17.9%
Total		Count	16	107	123
		% of Total	13.0%	87.0%	100.0%

Table 4.6 reveals that 6.5% (8) of commercial water users in Karatu district and 44.7% (55) of domestic water users in the district have ranked the level of acceptability of post-paid system as acceptable. The level of acceptability of post-paid water payment system is rated as very acceptable by a total of 6.5% (8) of the commercial water users and by about 42.3% (52) of domestic water users in Karatu.

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Table 6: Level of Acceptability of Post-Paid System on Perspective of Categories of Water Users

Level of acceptability of post-paid meters in your area * Categories of users Cross tabulation					
			Categories of users		Total
			Non-residential (Commercial)	Residential (Domestic)	
Level of acceptability of post-paid meters in your area	Acceptable	Count	8	55	63
		% of Total	6.5%	44.7%	51.2%
	Very acceptable	Count	8	52	60
		% of Total	6.5%	42.3%	48.8%
Total		Count	16	107	123
		% of Total	13.0%	87.0%	100.0%

The post-paid water payment system is in general acceptable to 100% (123) of the water users who has participated in the study in Karatu district as compared to the pre-paid water payment system which is generally acceptable to about 88.6% (109) of the participated water users. This result supports the findings of the study conducted in Ghana by Quayson-Dadzie, (2012) who concluded that pre-paid meters have not found extensive acceptability to users as compared to the post-paid system because of its numerous drawbacks. The outcome of the study also supports the conceptual framework for the study based on the Technology Acceptance Model (TAM) which conjectures that a technology is accepted by users basing on its perceived ease of use, perceived usefulness and quality of service expected from the use of the technology (Fishbein & Ajzen, 1975; Davis, Bogozzi, & Warshaw, 1989).

Factor Considered by Customers before Accepting Pre-paid System

Results presented in Table 4.7 reveals that 19.5% (24) of the 123 water users in Karatu district who participated in the study considers availability of technicians to repair the pre-paid meters as an essential factor before accepting to use the pre-paid water payment systems. About 8.1% (10) of the water users consider durability of pre-paid meters as an essential factor prior to acceptance of the system. Easy Access to pre-paid vending points is considered by 7.3% (9) of the 123 water users in Karatu district as an important factor to consider before accepting the pre-paid water payment system. About 19.5% (24) of the water users consider cost of installation of pre-paid meters as an important factor before acceptance of the system. About 32.5% (40) of the water users are considering reliability of pre-paid meters as an important factor. About 13% (16) of the water users in Karatu district consider reliability of billing report as another important factor to be considered prior to acceptance the pre-paid water payment system.

Table 7: Factors Considered by Water Users before Accepting the Pre-paid system

Factor considered by Customers Before accepting the Prepaid met * Gender Cross tabulation					
			Gender		Total
			Female	Male	
Factor_considererd_by_Customers_Before_accepting_the_Prepaid_met	Availability of technicians to repair faults of prepaid meters	Count	15	9	24
		% of Total	12.2%	7.3%	19.5%
	Durability of prepaid meters	Count	7	3	10
		% of Total	5.7%	2.4%	8.1%
	Accessing to prepaid vending points	Count	2	7	9
		% of Total	1.6%	5.7%	7.3%
	Cost of installation of prepaid meters	Count	6	18	24
		% of Total	4.9%	14.6%	19.5%
	Reliability of Prepaid meters	Count	23	17	40
		% of Total	18.7%	13.8%	32.5%
	Unreliable financial report of vendors	Count	8	8	16
		% of Total	6.5%	6.5%	13.0%
Total		Count	61	62	123
		% of Total	49.6%	50.4%	100.0%

In general, main factors considered by water users in Karatu district in Arusha region before accepting the pre-paid water payment system are cost associated with the use of the new system, reliability, user friendliness and ease of use of the system. This finding support the outcomes reported by Quayson-Dadzie, (2012) who conducted a study in Ghana and found that many customers consider reliability, user friendliness or ease of use of the pre-paid meter, durability, cost of installations and availability of maintenance team to repair the pre-paid meter as main factors for consideration before accepting pre-paid payment system. Again this outcome is in line with the conceptual framework for the study which has its basis on the Technology Acceptance Model (Fishbein & Ajzen, 1975; Davis, Bogozzi, & Warshaw, 1989). In the conceptual framework it is conceptualized that acceptance of pre-paid water payment system would depend on how users perceive usefulness, ease of use and quality of service realized from the payment system.

Cost Benefits of Pre-paid Water Payment System in Comparison to the Post-paid System

Outcome of the study in Table 4.8 shows out of the 123 of the water users who participated in the study in Karatu district in Arusha region, 73.2% (90) believe that the pre-paid water payment system offers more cost benefit in comparison to 26.8% (33) of water users in the district who considers the pre-pad system to offer more cost benefit. This finding supports the outcomes reported by Tewari & Shah, (2003) who conducted a study in South Africa and found that consumers who use the prepayment systems are able to control utility consumption and thus have a better budget management. They also found pre-paid system have the advantage of decreasing the costs associated with metering, billing, service disconnection and reconnection

Table 8: Water Payment System Which Offers More Cost Benefit

Crosstab					
			Gender		Total
			Female	Male	
Payment system which is more cost effective	Post-paid	Count	22	11	33
		% of Total	17.9%	8.9%	26.8%
	Pre-paid	Count	39	51	90
		% of Total	31.7%	41.5%	73.2%
Total		Count	61	62	123
		% of Total	49.6%	50.4%	100.0%

Management Strategies to Promote Adoption of Pre-paid Water System

The study has also investigated management strategies that can enable water authorities to promote usage of pre-paid water payment system. The finding of the study presented in Table 4.9 shows that about 19.5% (24) of the respondents believe that education on benefits of using pre-paid meters in comparison to the post-paid meter is essential in the promotion of the pre-paid water payment system. This finding supports the outcome reported by Quayson-Dadzie, (2012) who in their study in Ghana had found that intensification of public education on the use of the pre-paid meters increases awareness and acceptability of the system and enable many people to consider changing their meters from the traditional post-paid meters to pre-paid meters.

Installation of durable pre-paid water meters is viewed by 22.8% (28) of the 123 respondents as a management strategy that can be useful in promoting the pre-paid water system. The outcome of the study also shows that about 8.9% (11) of the respondents have indicated establishment of emergence response teams to sort out any problem or fault of the pre-paid meters as another management strategy that can be useful in promoting acceptance and usage of pre-paid water payment system among water users. Free installation of the pre-paid water meters is also an effective management strategy that can promote acceptance and usage of pre-paid water payment system as indicated by about 22.8% (28) of the 123 respondents. Increase the number of vending points is another management strategy that can be used to promote acceptance and usage of pre-paid system as suggested by about 26% (32) of the respondents.

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Table 9: Management Strategies to Promote Pre-Paid Water Payment System

Strategies recommended for management_ to be able to promote the * Gender Cross tabulation					
			Gender		Total
			Female	Male	
Strategies_recommended_for_management__to_be_able_to_promote_the	Education on Benefits of Prepaid Meters	Count	7	17	24
		% of Total	5.7%	13.8%	19.5%
	Installation of durable Prepaid Meters	Count	16	12	28
		% of Total	13.0%	9.8%	22.8%
	Establishment of Emergencies Response team	Count	6	5	11
		% of Total	4.9%	4.1%	8.9%
	Free installation	Count	12	16	28
		% of Total	9.8%	13.0%	22.8%
	Increase vending point	Count	20	12	32
		% of Total	16.3%	9.8%	26.0%
Total		Count	61	62	123
		% of Total	49.6%	50.4%	100.0**%**

5. CONCLUSIONS AND RECOMENDATIONS

Level of acceptability of the post-paid water payment system is generally higher at 100% as compared to about 88.6% acceptance level of the pre-paid water payment system in Karatu district in Arusha region. The post-paid water payment is more acceptable to domestic water users at 87% than the pre-paid system which its level of acceptability is 77.3%. Availability of technicians to repair the pre-paid meters, durability of pre-paid meters, easy access to pre-paid vending points, cost of installation of pre-paid meters, reliability of pre-paid meters and reliability of billing report are vital factors which are considered by water users before accepting the pre-paid water payment system. The pre-paid water payment system offers more cost benefits as compared to the post-paid system to water users in the Karatu district.

Various management strategies such as providing awareness education on benefits of using pre-paid meters in comparison to the post-paid meters, installation of durable pre-paid water meters, establishment of emergencies response team to sort out any problem or fault of the pre-paid water meters, free installation of the pre-paid water meters and increase the number of vending points can effectively enable water authorities to promote pre-paid water payment system and consequently increase its acceptability and usage among water users in Karatu district and elsewhere.

Basing on the outcome of the study and the conceptual framework the following recommendations are put forward:

i. Water authority in Karatu district in Arusha region should put more efforts on educating water users on the benefits of using the pre-paid water payment system in comparison to the traditional post-paid system.

ii. Water authority in Karatu district should implement various strategies such as free installation of the pre-paid water meters, installation of durable pre-paid water meters, establishment of effective emergencies response team to sort out any problem or fault of the pre-paid water meters and increase the number of vending points to encourage acceptance of the pre-paid system.

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