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The Effect of Customer Satisfaction on Water Utility Business Performance

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Abstract

This study investigates the effect of customer satisfaction on water utility performance. It considers customer satisfaction as a treatment variable and employs a non-parametric approach to test for differences in the conditional probability distributions of *Collection Ratio* and *Payment Time*, given pairs of *Customer Satisfaction* levels. Results show that the probability distribution of these performance indicators is significantly better for customers with high *Overall Service Delivery* satisfaction than for those with low satisfaction, leading to the conclusion that customer satisfaction has a significant effect on water utility performance and, therefore high satisfaction customers should be preferred by managers.

Key words:

Customer Satisfaction; Business Performance; Water Utility; Collection Ratio; Payment Time

1 INTRODUCTION

The relationship between customer satisfaction (CS) and business performance has been the subject of academic research and practical concern, where conclusions drawn from studies are expected to influence customer service improvement strategies (Anderson & Mansi, 2009; Gupta & Zeithaml, 2006; Mittal et al., 2005). For private sector businesses, as well as deregulated hitherto public monopolies such as telecom companies, attempts to understand this relationship is reasonable since CS is perceived to influence customer loyalty which in turn drives repeat sales and hence firm profitability (Anderson et al., 1994; Heskett et al., 1997; Silvestro & Cross, 2000).

But for the role of regulating agencies, the need to pursue customer service improvement policies in public monopolies such as water utilities, might be seen to be less important in improving firm financial performance, since the client base of these businesses is predominantly captive. Customer service improvement efforts, and their related performance reporting tasks, would therefore seem to be exercises undertaken in compliance with regulatory requirements (e.g Electric Perspectives, 2004; Utility Week, 2003), and not necessarily based on a clear evidence of the economic consequences of not doing so. Little wonder, therefore, that in the marketing literature much less attention has been given to the drinking water industry in examining the satisfaction-performance relationship.

For example, Gupta & Zeithaml (2006) integrated existing knowledge and research on the impact of customer metrics on firm financial performance. Although 138 references were cited, not a single mention is made of the drinking water industry. Even in water-related publications, only a handful of CS studies have been conducted, most of which do not even consider the link with performance (e.g Fattahi et al., 2011; Levallois et al., 1999; Olstein et al., 2000). Exceptionally, a study by Kayaga et al. (2004) tested the relationship between CS and bill payment behavior, using household survey data collected from customers served by the National Water and Sewerage Corporation in Uganda. The authors concluded that as expected, there was a negative relationship between customer satisfaction and *bill payment period*, although this relationship was insignificant. Thus, whether the perceived relationship between CS and firm performance holds in a water utility context has not been adequately addressed, although conclusions on a significant relationship will provide the evidence needed by utility managers to justify any investments made towards improving their customer service functions.

Therefore, the purpose of this study was to test if CS significantly affects business performance in the drinking water industry, using household level data obtained from surveying individual customers of the Ghana Water Company Ltd in Kumasi. In the marketing literature, performance is mostly measured by firm profitability, howbeit with exceptions, such as Homburg et al.'s (2005) study on the impact of CS on willingness to pay. Here, business performance was measured by two separate variables: *Collection Ratio* (CR) and *Payment Time* (PT). These performance indicators are related to the billing and collections function of water utilities, and are important because they determine the level and timing of cash holdings, and hence affect the utility's ability to meet its financial obligations. CR is the percentage of total receivables that is collected from customers and therefore provides an indication of the collection efficiency of the utility. Its use in the drinking water industry is exemplified in Kayaga et al.'s (2004) study, where the indicator was termed *Bill Collection Efficiency*. PT measures how long it takes customers to make a payment to the utility after a bill has been issued, and so measures the speed with which utilities collect their bills on account. For water utilities, higher CR and lower PT values indicate better performance. Contrary to the existing literature and to Kayaga et al.'s (2004) study, a non-parametric approach is used here, where CS is considered as a treatment variable with different satisfaction levels.

2 THEORETICAL FRAMEWORK

Marketing theory explains why CS will affect water utility business performance. It posits that customers form confirmation or disconfirmation perceptions of products and services in relation to their pre-consumption/experience expectations. This leads to one of three possible outcomes: whereas confirmation will create moderate satisfaction, positive and negative disconfirmation will respectively result in high satisfaction and dissatisfaction (Oliver, 1980). The level of CS may then stimulate positive customer behavior, such as willingness to pay or to maintain regular payments for services (Homburg et al., 2005), or negative customer behaviors, such as defaulting in payment. Positive behavior may lead to desirable economic consequences for the firm, while negative behavior will do otherwise. Consequently, Heskett et al.'s service-profit chain partly suggests that customers who are satisfied are more likely to inform others about the business, remain loyal to it and engage in repeat sales, thereby contributing to firm profitability (Heskett et al., 1997).

Although the marketing literature is replete with studies that examine the satisfaction-performance relationship, evidence to date is contradictory. Whereas authors such as Jermias (2009) and Mittal et al. (2005) find a positive and significant relationship between CS and business performance, others have shown that the relationship, although positive, is either not significant or small, for example Yeung & Ennew (2000) and Yu (2007). Some studies have even been more dramatic in their departure from the envisaged relationship, showing counter-intuitive results. For instance, in a study of seventy four (74) firms, Guo & Jiraporn reported that contemporaneously, "*customer satisfaction performance is negatively related to both net income and total assets*" (Guo & Jiraporn, 2005). Similar cases of counter-intuitive results are reported in Gupta & Zeithaml (2006). Apart from attributing the non-intuitive results to data collection/measurement errors, some researchers have found that the perceived relationship is asymmetric and therefore diminishes beyond a threshold of customer satisfaction (Helgesen, 2006). It could also be that the relationship is not contemporaneous but lagged, as shown in studies such as Bernhardt et al., (2000) and Westlund et al., (2005).

Another possible explanation to the low power and counterintuitive results obtained in previous studies may relate to the nature of the performance variables and the analytical method used in testing the relationship. Parametric approaches to inferential statistics that depend on the classical assumptions of normality, independence and homoscedasticity lead to erroneous conclusions when the data violates these assumptions. Under such circumstances, a nonparametric approach such as the Mann-Whitney U test of equality of distributions may be more powerful and appropriate because, it does not make any distribution assumptions on the statistical moments of the data. Rather, for two independent samples *i* and *j* of a performance variable X, the method compares the relative locations of the conditional probability distributions of X, given *i* and *j*, i.e $F_i(x)$ and $F_j(x)$, and tests whether one distribution is shifted[1] to the right (or left) of the other (Bowerman & O'Connell, 2003; Fay & Proschan, 2010). If X is such that larger outcomes are preferred, as in CR, a significant shift of $F_j(x)$ to the right of $F_i(x)$ indicates that sample *j* has consistently larger values and hence should be preferred over sample *i*. On the other hand, when X is such that lower values are preferred, as in PT, a significant shift of $F_j(x)$ to the left of $F_i(x)$ indicates that sample *j* has consistently smaller values and hence should be preferred over sample *i*. Under certain conditions, this can be interpreted as empirically testing for first order stochastic dominance, used in ranking risky investment alternatives.

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[1] From Bowerman & O'Connell (2003), $F_j(x)$ is said to be shifted to the right (left) of $F_i(x)$ "if there is more than a 50% chance that a randomly selected observation from j will be greater than (less than) a randomly selected observation from i

From the above theoretical framework, one would expect satisfied customers to be more likely to pay a greater proportion of what they are billed, and to do so on time, resulting in higher CR and lower PT values. The implication here is straight forward: for any pair of CS levels *i* and *j*, where $i < j$, we would expect the probability distribution of CR for CS level *j* to be shifted to the right of that of level *i*. On the other hand, any significant effect of CS on PT will cause the probability distribution of satisfaction level *j* to be shifted to the left of that of level *i*. This leads to the following research hypotheses, where the null hypothesis in both cases posits identical probability distributions for samples *i* and *j* for all possible pairs of CS levels:

H1: for any two CS levels *i* and *j*, where *i* is lower than *j*, the probability distribution of CR for CS level *j* is shifted to the right of the probability distribution of CR for CS level *i*, for at least one pair of CS levels.

H2: for any two CS levels *i* and *j*, where *i* is lower than *j*, the probability distribution of PT for CS level *j* is shifted to the left of the probability distribution of PT for CS level *i*, for at least one pair of CS levels.

3 METHOD

Data for the study was obtained by randomly sampling and surveying 330 urban residential customers of the Ghana Water Company Ltd in Kumasi, where a billing cycle of 1-month is used. Among others, the survey collected information on (1) customer ratings of overall service delivery satisfaction; (2) billing for water consumed in the billing cycle; (3) date of billing; (4) payments made against this billing; and (5) date of payment. Items (2)-(3) were obtained from bills issued to the customer by the utility, while items (4)-(5) were taken from payment receipts issued to the customer.

3.1 Measuring customer satisfaction

CS was measured on a 10-point likert scale by simply asking respondents to rate the extent to which they were satisfied with *overall service delivery* by the utility: 1 being *Low* and 10 being *High*. CS, as a treatment variable, was created by re-coding the data into five (5) CS levels: 1-2 as *Very Low* satisfaction, 3-4 as *Low* satisfaction, 5-6 as *Medium* satisfaction, 7-8 as *High* satisfaction and 9-10 as *Very High* satisfaction. Descriptive statistics presented in Table 1 indicate a general dissatisfaction with overall service delivery: *Very Low* satisfaction (34.5%); *Low* satisfaction (32.4%); *Medium* satisfaction (24.2%); *High* satisfaction (8.8%); and *Very High* satisfaction (0.0%).

3.2 Measuring utility business performance

CR was obtained by dividing customer payment (collections) by monthly receivables, were the latter is the sum of two items: billing for water consumed during the billing cycle and, any previous arrears. PT was obtained by subtracting the date of payment from the date of billing. Here, it is assumed that bills were distributed to customers on the same date they were generated, although this is generally not the case. The results and their associated conclusions are however not expected to be affected by violations of this assumption since any such violations among respondents will be by chance variation.

3.3 Data Analysis

Hypotheses H1 and H2 were tested using the Mann-Whitney U test option in the two independent samples non-parametric test procedure in SPSS® version 17. This procedure tests the null hypothesis that two probability distributions F_1 and F_2 are equal against one of two alternative hypotheses: $F_1 < F_2$ or $F_1 > F_2$[2]. For respective independent population sample sizes n_1 and n_2, the test ranks the $n_1 + n_2$ observations in ascending order and computes the sum and mean of the ranks for F_1 and F_2. The test then computes the test statistic U, which for large sample sizes ($n \geq 10$ for each sample) is approximated by the standard normal distribution Z (Bowerman & O'Connell, 2003), with zero mean and unit standard deviation. The null is rejected if the 1-tailed p-value of the test is less than the significance level α, in favor of $F_1 < F_2$ when the mean rank of F_1 is less than that of F_2, and in favor of $F_1 > F_2$, when the mean rank of F_1 is greater than that of F_2.

Generally, the test is justified when the samples under consideration violate the assumption of normality. Hence this assumption was tested at the significance level α, for both CR and PT, conditioned on the level of CS. Both the Kolmogorov-Smirnov and Shapiro-Wilks tests results are reported, where the null hypothesis of normality is reject if the p-value is less than the significance level α. Here, α is set at 0.05 for all tests. Descriptive statistics of the variables are also reported and graphical summaries of the conditional probability distributions of CR and PT for each pair of CS levels are presented. Each graphical summary has six panels, one for each pair of CS levels, as follows: (a) "Very Low" & "Low"; (b) "Very Low" & "Medium"; (c)" Very Low" & "High"; (d) "Low" and "Medium"; (e) "Low" & "High"; and (f) "Medium" & "High".

[2] See Fay & Proschan (2010) for a complete discussion on the various interpretations attributable to the Mann-Whitney U test.

4 RESULTS

Table 1 presents descriptive statistics of the data as well as tests of normality for CR and PT at each level of CS. Although mean CR generally increases from "*Very Low*" satisfaction to "*High*" satisfaction, ranking is reversed between "*Low*" and "*Medium*" satisfaction levels. On the other hand, mean PT decreases with increasing level of CS. For each performance variables, the variability of the data is virtually the same for each level of CS. However, both the Kolmogov-Smirnov and Shapiro-Wilk test results indicate that the null hypothesis of normality must be rejected for all satisfaction levels, apart from the "*High*" CS level for PT. Deviation of the data from normality therefore provides a justification for resorting to a non-parametric approach in examining the effect of CS on water utility performance.

Table 1: Descriptive statistics and normality tests results of performance variables conditioned on the level of customer satisfaction.

Variables		Sample Statistics				Tests of Normality					
Performance Variable	Satisfaction Level	N	Mean	Median	SD	Kolmogorov-Smirnov			Shapiro-Wilk		
						Statistic	df	Sig.	Statistic	df	Sig.
Collection Ratio	Very Low	114	45.53	37.04	30.53	.143	114	.000	.899	114	.000
	Low	107	55.13	43.83	34.70	.170	107	.000	.872	107	.000
	Medium	80	48.67	35.34	35.73	.169	80	.000	.877	80	.000
	High	29	63.09	59.17	34.67	.180	29	.017	.878	29	.003
Payment Time	Very Low	114	47.82	48.00	6.93	.139	114	.000	.950	114	.000
	Low	107	47.21	47.00	6.74	.141	107	.000	.957	107	.002
	Medium	80	46.90	46.00	7.38	.105	80	.029	.957	80	.009
	High	29	43.93	42.00	7.02	.160	29	.055	.942	29	.112

Source: Author's analysis

4.1 The effect of customer satisfaction on collection ratio (H1)

Hypothesis H1 predicted that if CS affects water utility business performance, the probability distribution of all possible values of CR for any two levels of CS i and j where $i < j$ will be unidentical, for at least one pair of CS levels, with the distribution of satisfaction level j shifted to the right of that of i. Graphical results of this hypothesis are shown in Figure 1, which depicts the relative positions of the conditional probability distributions of CR for all pairs of CS levels. This graphical summary shows that, apart from panel (d), the probability distribution of CR for higher CS levels are located to the right of lower satisfaction levels, with the gaps being more pronounced for panels (a), (c) and (f). Another interesting feature of Figure 1 is that for each CS level, there are CR values that exceed 100%, indicating instances of at least full bill recovery from both satisfied and dissatisfied customers.

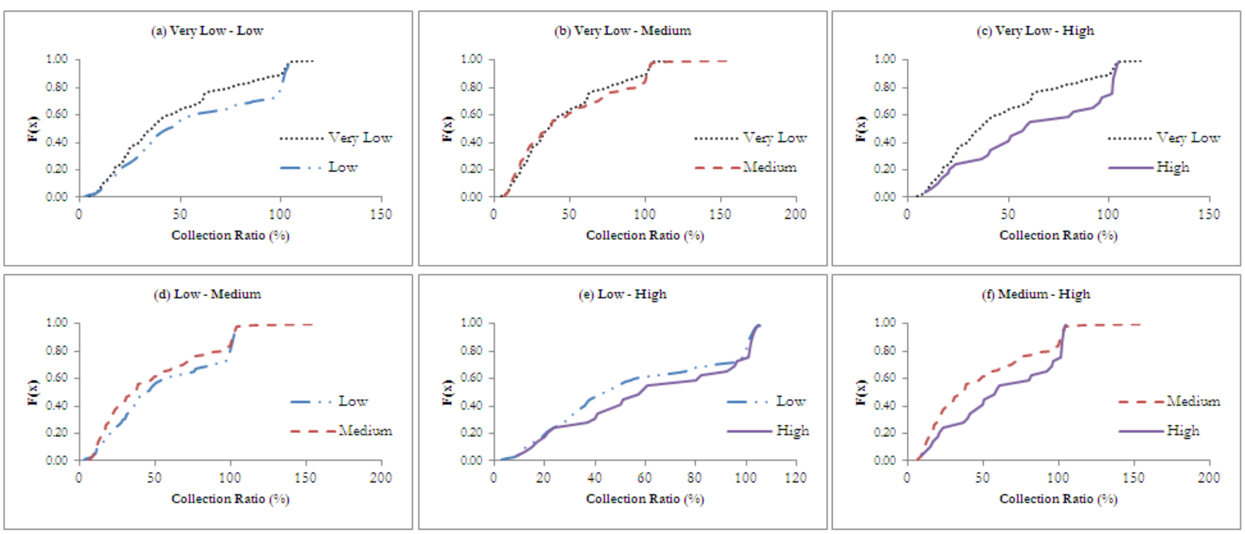

FIGURE 1 Conditional empirical distributions of *Collection Ratio* for pairs of customer satisfaction levels: (a) Very Low-Low; (b) Very Low-Medium; (c) Very Low-High; (d) Low-Medium; (e) Low-High; (f) Medium-High.

SOURCE: Author's construction

In consonance with the graphical summaries, the empirical results shown in Table 2 indicate that generally, higher satisfaction levels tend to have "stochastically" larger distributions as compared to lower satisfaction levels, although some of these differences are insignificant. From the results, the probability distribution of CR for "High" satisfaction customers is significantly shifted to the right of those of "Very Low" satisfaction customers (U = 1184, p-value =.011) and that of "Medium" satisfaction customers (U = 861, p-value =.020), but not to that of "Low" satisfaction customers (U = 1325, p-value = .112). In the latter case, the evidence in favor of the null is weak. The distribution for "Medium" satisfaction is slightly larger but not significantly different from that of 'Very Low" satisfaction (U =4539, p-value = .477). Surprisingly, this distribution is stochastically smaller, howbeit insignificantly, than that of "Low" satisfaction (U=3720, p-value = 0.06). Here too, the evidence in favor of the null is rather weak. Finally, the probability distribution of "Low" satisfaction customers is significantly larger as compared to that of "Very Low" satisfaction customers (U = 5193, p-value = .027).

Table 2: Nonparametric test results on parwise comparisons of the probability distribution of collection ratio for levels of customer satisfaction.

Level of Customer Satisfaction		Mean Rank		Mann-Whitney U test for Equality of Distributions			
i	j	i	j	U	W	Z	Sig. (1-tailed)
V. Low	Low	103.05	119.47	5193	11748	-1.908	.027[a]
V. Low	Medium	97.31	97.77	4539	11094	-.056	.477
V. Low	High	67.88	88.19	1184	7739	-2.357	.011[a]

Low	Medium	99.23	87.00	3720	6960	-1.529	.060
Low	High	66.38	76.31	1325	7103	-1.203	.112
Medium	High	51.26	65.31	861	4101	-2.050	.020[a]

Notes: [a]Significant at the 0.05 significance level

Source: Authors analysis

4.2 The effect of customer satisfaction on payment time (H2)

Unlike H1, hypothesis H2 predicted that if CS affects water utility business performance, the probability distribution of all possible values of PT, for any two levels of CS *i* and *j* where $i < j$, will be unidentical, for at least one pair of PT levels, with the distribution of satisfaction level *j* shifted to the left of that of *i*. Graphical results for pairs of CS levels are shown in Figure 2, which depicts the relative positions of the associated conditional probability distributions of PT. Again, apart from panel (d) where there is no clear shift in the probability distributions, the graphical results confirm that for each pair of CS levels, the probability distribution of PT for higher satisfaction levels are located to the left of those for lower satisfaction customers. This shift is less pronounced in panels (a) and (b) than for (e), (c) and (f).

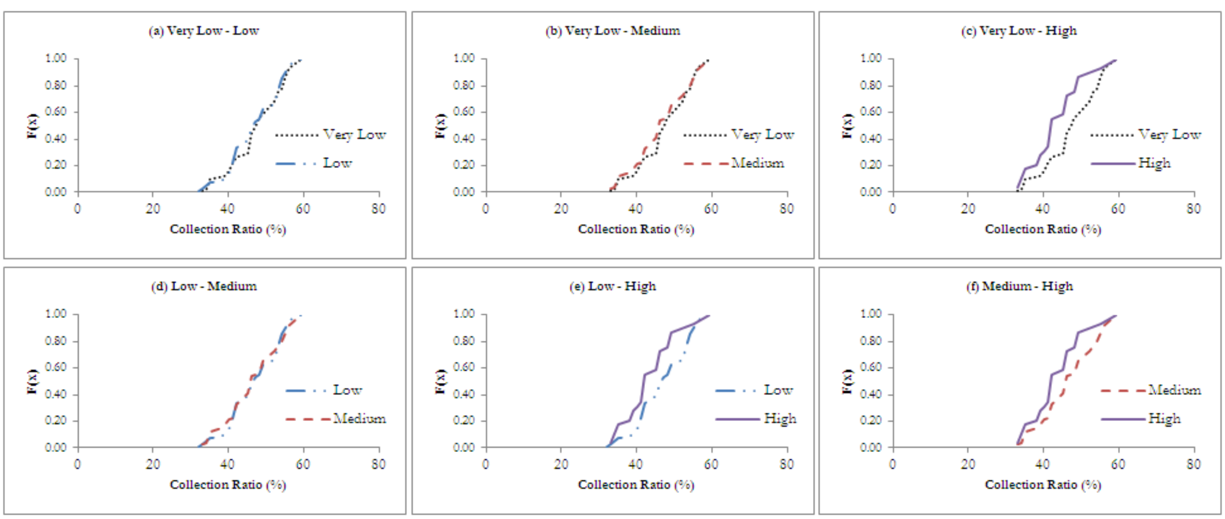

Figure 2: Conditional empirical distributions of *Payment Time* for pairs of customer satisfaction levels: (a) Very Low-Low; (b) Very Low-Medium; (c) Very Low-High; (d) Low-Medium; (e) Low-High; (f) Medium-High

NOTE: Authors construction

Empirical results shown in Table 3 agree with the graphical summaries shown in Figure 2, indicating that generally, higher satisfaction levels tend to result in "stochastically" smaller distributions as compared to lower satisfaction levels, although some of these differences are not significant. From the results, the probability distribution of PT for "High" satisfaction customers is significantly shifted to the left of those for "Very Low" satisfaction (U = 1134, p-value =.004), "Low" satisfaction (U = 1140, p-value = .016) and "Medium" satisfaction (U = 887, p-value =.030) customers. As expected, the distribution for both "Medium" and "Low" satisfaction customers are each shifted to the left of that of "Very Low" satisfaction customers, although these differences are insignificant: (U = 4204, p-value = .181) and (U = 5781, p-value = .258), respectively. Unlike CR, an expected but insignificant result emerges for the conditional distribution of PT for the "Medium" and "Low" satisfaction levels (U = 4191, p-value = .404).

Table 3: Nonparametric test results on parwise comparisons of the probability distribution of payment time for levels of customer satisfaction.

Level of Customer Satisfaction		Mean Rank		Mann-Whitney U test for Equality of Distributions			
i	j	i	j	U	W	Z	Sig. (1-tailed)
V. Low	Low	113.79	108.02	5781	11559	-.672	.258
V. Low	Medium	100.62	93.05	4204	7444	-.928	.181
V. Low	High	76.55	54.10	1134	1569	-2.615	.004[a]
Low	Medium	94.84	92.88	4191	7431	-.245	.404
Low	High	72.35	54.29	1140	1575	-2.196	.016[a]

Medium	High	58.41	45.59	887	1322	-1.879	.030[a]

Notes: [a]Significant at the 0.05 significance level

SOURCE: Authors analysis

5 DISCUSSION

This study was designed to test the effect of customer satisfaction (CS) on water utility business performance. The results show that CS has a significant effect on both Collection Ratio (CR) and Payment Time (PT), thus providing evidence in support of the satisfaction-performance relationship. Comparing the median values of these indicators shows that improving customer satisfaction from "Very Low" to "High" satisfaction increases median CR and reduces median PT by approximately 60% and 13% respectively.

In relation to Kayaga et al.'s (2004) study, the results here do not only confirm the negative effect of CS and PT, but also shows that this effect is significant. The significant result found here is at variance with the conclusion drawn in Kayaga et al.'s (2004), just as it is different from those studies that reported counter-intuitive results. It is interesting to note that apart from the comparison between "Very Low" and "Low" satisfaction levels for CR, all pairwise comparisons not involving the "High" satisfaction level, were insignificant. This seems to reflect the notion of an existing CS threshold beyond which the effect of CS becomes apparent (Homburg et al., 2005). The surprising result of the distribution of CR for "Medium" satisfaction customers being located to the left of that of "Lower" satisfaction customers and the occurrence of some high CR values (≥ 100%) for satisfaction levels lower than "High" may have resulted from either threats of possible lawsuits against customers for non-payment, threats of service termination, and/or (3) forced collections, all being management action that can provide the stimulus required for motivating delinquent customers to meet their debt obligation.

By way of contribution to the existing literature on the relationship between CS and business performance, this study is unique in four main ways: (1) it has extended the body of knowledge to include the drinking water industry; (2) its use of data from Ghana has added to the limited number of developing country studies; (3) by adopting a non-parametric analytical approach, with customer satisfaction as a treatment variable, it has found evidence in support of the theorized satisfaction-performance relationship, indicating that this approach, in contrast with the predominantly parametric approaches currently used in the literature, might resolve the present inconsistent conclusions on the effect of CS on business performance; and (4) the use of CR and PT as performance indicators, as well as the results of a significant effect of CS on these indicators, is a unique contribution not yet alluded to in the literature.

Despite these contributions to the existing literature, the study is limited in its reliance on data from a single system and, a limited number of measures of water utility performance, to generalize the effect of CS on water utility business performance. This creates opportunities for future research in two areas: a need (1) to replicate the study using data from other water utilities; and (2) to explore the satisfaction-performance link using other performance indicators.

6 CONCLUSIONS AND MANGERIAL IMPLICATIONS

Using billing and collections data from the drinking water industry in Ghana, this study has shown that customer satisfaction has a significant effect on water utility performance, where performance was measured by *Collection Ratio* and *Payment Time*, and that this effect can be tested using a non-parametric approach. It can be concluded that the probability distribution of the performance variables is "stochastically better" for customers with high overall service delivery satisfaction than for those with low satisfaction. The implication here is that performance risk for high satisfaction customers is lower than that for low satisfaction customers, indicating that managers should prefer high over low satisfaction customers. This preference ranking underscores the need to invest in customer service improvement initiatives, instead of doing so just in compliance with regulatory requirements. Since each water system is different, and since currently there is no standard on a threshold of customer satisfaction rating beyond which economic gains become significant, each water utility would have to determine what ratings, for example on a scale of 1-10, constitutes high satisfaction, strive to improve the level of customer satisfaction when this is below the threshold, and endeavor to maintain ratings above this threshold.

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