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Influence of Mobile SMS Bill Query Application on Service Delivery by NAWASSCO AND NAIVAWASCO Water Utilities in Nakuru County

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Abstract
Water utilities play a critical role in providing safe and reliable water services to the public. However, ensuring efficient service delivery can be challenging, especially in areas with limited resources and inadequate infrastructure. In recent years, the use of mobile technology has emerged as a potential solution to address some of these challenges. This study examines the influence of a mobile SMS bill query application on the service delivery of two water utilities, NAWASSCO and NAIVAWASCO, in Nakuru County. This study aimed to determine the influence of mobile SMS bill query applications on service delivery by NAWASSCO and NAIVAWASCO water utilities in Nakuru County. Delone and McLean's IS success model, derived from the information systems (IS) theory, guided the study. A cross-sectional survey research design was adopted to achieve this, and data were collected using a structured questionnaire. Purposive sampling was used to select 33 and 24 staff in NAWASSCO and NAIVAWASCO water utilities, respectively. The Census method was employed since the target population was less than 100. Descriptive and inferential statistics were used to analyze the data. OLS regression analysis was used to test the hypotheses at a 0.05 significance level. The OLS regression analysis revealed that mobile SMS bill query applications significantly influenced water service delivery in water utility companies ($\beta = 0.212$, $p < 0.05$). Water utility companies in Nakuru County should continue investing in and promoting the mobile SMS bill query application.
Keywords: Mobile SMS Bill Query Application, NAWASSCO and NAIVAWASCO, Service Delivery and Water Utilities
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1. Introduction

Access to clean water is a fundamental human right for health, sanitation, and economic development (Corburn, 2022). Despite the efforts of governments and international organizations to improve water services, many regions of the world continue to face challenges in providing reliable and efficient water supply. In Kenya, for instance, water utilities have been grappling with issues such as low revenue collection, inadequate infrastructure, and poor customer service. However, according to Kihama and Wainaina (2019), recent advancements in mobile technology have provided an opportunity for utilities to enhance their services and improve customer satisfaction.

Information and communication technology (ICT) is at the forefront of efforts to boost service delivery performance and efficiency, particularly in the water sector (von Heland et al., 2015). The key players, including the regulator and service providers, rely on many ICT applications, which are still in development. At the national level, information and communication technology is primarily used to streamline data collection and analysis through the use of user-friendly/straightforward applications such as WARIS, a web-based tool for evaluating the performance of water service providers, and MAJIDATA, a database on inadequate water and sanitation service delivery in urban areas (both of which are currently under development). The majority of operations and business activities in the urban sub-sector are supported by mobile apps, including billing and invoicing procedures, which are supported by apps (Lemmens et al., 2017).

Even though information and communication technologies (ICTs) are used by a diverse range of stakeholders in the water sector, each system or application is distinct from the others, with little interoperability (Chemisto & Rivett, 2015). This is evident in the utility industry, which employs various information and communications technology (ICT) applications to support multiple workflow operations.

Kenya has sufficient ICT expertise, and the private sector, with its superior infrastructure and technical capabilities, is an essential partner in sustaining ICT use, highlighting the importance of forging partnerships to leverage various capacities (Kihara et al., 2016). Because development partners predominantly sponsor most water-related ICT applications, there is a shortage of post-development assistance.

Due to technical advancements and lower infrastructure costs, Kenya's water sector has advanced to more advanced ICT-facilitated data gathering and management practices (Kinuthia, 2019). Numerous applications are

currently being used to aid in performance measurement, increase consumer feedback, business/work processes, and governance, all facilitated by reliable information. Several examples include Maji Voice, WARIS (Water Regulation Information System), Jisomee Mita and Mobile field assistant, used to improve consumer feedback, company/work procedures, and other aspects of business and work life (Mukhtarov et al., 2018).

According to the Global System for Mobile Communications (2019), mobile billing and payment systems improve service delivery by allowing clients to make flexible multiple and small payments while also serving as an effective revenue collection tool for water utilities. Customers' impressions of ESKOM's prepaid billing system and its impact on satisfaction and trust were researched by Chinomona and Sandada (2014). According to the findings, the ESKOM prepaid billing system had a statistically significant beneficial impact on service delivery as evaluated by customer happiness and confidence. This study was carried out at a South African electricity-supplying public utility firm.

The impact of the computerised billing system on revenue collection has been emphasised in the water and sanitation industry (Amankwaa et al. 2021). According to Opiyo and Mwalili (2020), spot billing in water utilities enhances service delivery by eliminating human involvement and lowering the risk of fraud and billing errors. As part of a research project into the impact of billing systems on revenue collection in Rwanda, Su et al. (2012) found that implementing prepayment billing systems improved electricity service delivery in two ways. Firstly, it reduced the utility company's operating costs. Secondly, it increased and ensured timely revenue collection. Mobile phones have become ubiquitous in many developing countries, including Kenya, with high mobile penetration (Vimalkumar et al., 2021). This has created a platform for utilities to interact with their customers in new and innovative ways.

One such innovation is the mobile SMS bill query application, which enables customers to receive their water bills and inquire through mobile phones (Guma, 2019). Mobile technology can improve customer satisfaction and enhance revenue collection for water utilities (Zaki, 2019). According to a study by the World Bank (2016), mobile money transactions have become increasingly popular in Kenya, with over 30 million active mobile money accounts in the country.

Water services provision in Kenya is anchored in Water Act 2016, enacted by parliament to provide a framework for regulating, managing and developing water resources, water and sewerage services, and other connected purposes across the Republic. The Act recognizes the provision and management of water services as a shared function distributed between the National and County governments. WASREB's collaboration with water service providers enhances the delivery of services to water consumers. The mandate of WASREB is to regulate the water services sub-sector to improve the provision of quality service to consumers.

NAWASSCO and NAIVAWASCO are two water utilities in Nakuru County, Kenya, established in 2003 and the latter in 2005. NAWASSCO aims to provide high-quality, reliable, adequate, and long-term water and sanitation services to residents in Nakuru East and Nakuru West Sub-counties and neighboring areas, covering a 320-square-kilometer area with a population of over 500,000 people. Although NAWASSCO has achieved 83% water coverage, it must employ transformation techniques to meet the universal sector target of 100% coverage by 2030 and address the growing customer expectations. On the other hand, NAIVAWASCO is responsible for providing water, sewerage, and sanitation services to Naivasha Sub-County people, including the production and distribution of safe drinking water, wastewater network servicing, and revenue collection. Both utilities are fully owned and controlled by the County Government of Nakuru.

Access to a safe and reliable water supply is crucial for communities' sustainable development and well-being (Ghosal & Ruj, 2023). In many regions of the world, including Nakuru County in Kenya, water utilities face numerous challenges in providing efficient and effective water services to their customers. These challenges include inadequate infrastructure, limited financial resources, and ineffective communication channels between the utilities and customers. However, with the advent of mobile technology, a significant shift has occurred in how utilities interact with their customers. One such technological innovation is the mobile SMS bill query application, which enables customers to receive their water bills and make inquiries through their mobile phones. This application can improve customer satisfaction, enhance service delivery, and increase revenue collection for water utilities. Therefore, this study examines the influence of the mobile SMS bill query application on service delivery by two water utilities in Nakuru County, namely NAWASSCO and NAIVAWASCO.

1.2 Purpose of the Study

To determine the influence of mobile SMS bill query application on service delivery by NAWASSCO AND NAIVAWASCO water utilities in Nakuru County.

1.3 Hypotheses of the Study

The following hypotheses guided this study:

Ho_1 : Mobile SMS bill query application does not have a significant effect on service delivery by NAWASSCO AND NAIVAWASCO water utilities in Nakuru County

2. Theoretical Framework

A theory is a structured statement supported by evidence explaining certain phenomena. It describes a systematic explanation of the relationship between phenomena or the scope of a proposed study. Theories provide a general description of an occurrence and can be used to derive relevant models that support the systematic explanation, as pointed out by Sportra (2018). This study was based on two models; the Delone and McLean IS success model, derived from the information systems (IS) theory and the SERVQUAL model, which is used to measure service quality.

2.1 DeLone & McLean IS Success Model

DeLone and McLean created this model in 1992. They wanted to develop a comprehensive definition of information system success that considered all aspects of the evaluation process. Existing definitions of information system success and the metrics that go with them were analysed and categorised into six major categories. As a result, a multi-dimensional measuring model is developed, with dependency among the many success criteria (DeLone & McLean 1992). They include system, service, use quality, organisational impact, user happiness, and personal effect. The system's quality determines technical success, whereas the quality of the information determines semantic success. On the other hand, individual impacts, use, organisational impacts, and measurements of user satisfaction are used to gauge effectiveness and success.

Customer care is classified as a component of service quality by Sterne (1996) since it is a form of service. Online customer service, on the other hand, is integrated into the information and system quality assurance processes. The tasks an online client must do and the information provided during the transaction process distinguish the two. The system's net advantages are its long-term effects on the institution and its consumers (DeLone & McLean, 2004). Theoretical concerns are essential in this investigation. While the study aims to establish the efficacy of various ICT-based customer communication approaches in service delivery, the theory states that efficiency is measured in terms of individual impacts, use, company impacts, and user satisfaction. User-reported service quality was used to assess the success of ICT-based customer communication initiatives.

3. Methodology

The study used a cross-sectional survey research design to collect information on the influence of mobile SMS bill query applications on service delivery by NAWASSCO AND NAIVAWASCO water utilities in Nakuru County. The target population consists of 33 and 24 staff members in NAWASSCO and NAIVAWASCO, respectively. Purposive sampling and the census method were used to select the study participants. The data collection instrument will be a closed-ended questionnaire chosen for its high data standardization and ability to elicit generalized information from any population. Data analysis was done using descriptive and inferential statistics. OLS Regression analysis was used to test the study's hypotheses at a significant level of $\alpha = 0.05$.

4. Results and Discussion

4.1 Descriptive Statistics of Mobile SMS Bill Query Application

The study used descriptive statistical analysis to analyze data on mobile SMS bill query applications and water service delivery elements. The Likert scale was used with five points ranging from strongly agree to strongly disagree. The minimum strongly disagreed (1) and the maximum strongly agreed (5). The mean was calculated based on the respondent's choices between strongly agree and strongly disagree. Table 1 shows the descriptive statistics of mobile SMS bill query application elements.

Table 1: Descriptive Statistics Results of mobile SMS bill query application (N=52)

Elements of mobile SMS bill query application	Mean	Std. Deviation	Overall Mean
Consumer mobile SMS bill query enables consumers to get accurate provisional bills for the readings submitted without having to go to the office physically	3.56	1.662	3.483
Mobile bill query application has enabled consumers to query their Bills and check the status of their accounts without incurring any costs	3.42	1.576	
Mobile SMS bill query application has enhanced efficiency in revenue collection in our water utility company through accurate billing	3.44	1.474	
Mobile SMS bill query application offers a convenient way for clients to find out the utilities' pay bill numbers and how to remit payment through mobile money	3.52	1.475	

Grounded on the results in table 1 on the first element, "Consumer mobile SMS bill query enables consumers to get accurate provisional bills for the readings submitted without having to go to the office physically," the mean score was 3.56, indicating that the respondents, on average, agreed that the mobile SMS bill query application allows consumers to obtain accurate provisional bills without having to go to the office physically. The standard

deviation was 1.662, which suggests that there was considerable variability in the responses.

For the second element, "Mobile bill query application has enabled consumers to query their Bills and check the status of their accounts without incurring any costs," the mean score was 3.42, which implies that, on average, the respondents agreed that the application allowed consumers to check their bills and account status without incurring any costs. The standard deviation was 1.576, indicating that this element's responses were also relatively variable.

The third element, "Mobile SMS bill query application has enhanced efficiency in revenue collection in our water utility company through accurate billing," had a mean score of 3.44, indicating that, on average, the respondents agreed that the application enhanced efficiency in revenue collection through accurate billing. The standard deviation was 1.474, which suggests that the responses varied considerably.

Finally, for the fourth element, "Mobile SMS bill query application offers a convenient way for clients to find out the utilities' pay bill numbers and how to remit payment through mobile money," the mean score was 3.52, indicating that, on average, the respondents agreed that the application provided a convenient way to find out the pay bill numbers and how to remit payment through mobile money. The standard deviation was 1.475, indicating that this element's responses were moderately variable.

Overall, the mean score of all the elements was between 3.44 and 3.56, indicating that, on average, the respondents agreed that the mobile SMS bill query application was useful and provided convenience in obtaining accurate billing information and paying utility bills through mobile money. However, the standard deviations suggest variability in the responses, indicating that some respondents may not have agreed with the majority.

4.2 Descriptive Statistics of Water Service Delivery

Table 2 indicates the descriptive statistics of water service delivery results.

Table 2: Descriptive Statistics Results of water service delivery (N=52)

	Mean	Std. Deviation	Overall Mean
The utility can supply water to all the consumers in its designated service area	2.94	1.243	3.02
Water supply is available to the customers on a 24-hour basis	2.81	1.237	
The utility has an adequate storage facility to meet consumers' demand	3.06	1.305	
The company has a mechanism for identifying and reporting leakages, busts and breakdowns	3.19	1.344	
The company has an adequate allocation of funds to maintain and rehabilitate its water distribution infrastructure	3.12	1.215	
The water distribution system uses the latest technology for water leak detection and worn-out pipes	2.83	1.248	
The utility has well-trained staff to offer timely technical assistance to respond to water supply breakdowns	3.19	1.429	

Table 2 provides descriptive statistics for different elements of water service delivery based on a five-point Likert scale. The mean score of each component indicates the average response of the respondents. The first element examined was the utility's ability to supply water to all consumers, with a mean score of 2.94, suggesting the respondents were neutral (falls closer to the neutral option 3). The availability of water supply on a 24-hour basis had a mean score of 2.81, indicating respondents were neutral (falls closer to the neutral option 3). The utility's storage facility's adequacy had a mean score of 3.06, suggesting neutrality in perception by the respondents. The company's mechanism for identifying and reporting leakages, busts, and breakdowns had a mean score of 3.19, indicating that the respondents were neutral (falls closer to the neutral option 3). The company's allocation of funds to maintain and rehabilitate its water distribution infrastructure had a mean score of 3.12, suggesting general neutrality in perception by the respondents. Using the latest technology for water leak detection and worn-out pipes in the water distribution system had a mean score of 2.83, indicating respondents were neutral (falls closer to the neutral option 3). Finally, the availability of well-trained staff to offer timely technical assistance to respond to water supply breakdowns had a mean score of 3.19, suggesting that respondents were neutral (falls closer to the neutral option 3).

In summary, the descriptive statistics in Table 2 suggest that the respondents had mixed views on different elements of water service delivery. While some elements received scores closer to the agree option (4), others received scores closer to the neutral option (3) or even the disagree option (2). These results provide valuable insights into the respondents' perceptions of water service delivery and can inform improvements in the water distribution system.

4.3 Preliminary Tests for Linear Regression Assumptions

The continuous data for the independent and dependent variables fitted into the OLS regression model were

obtained through the mean score of the responses per variable. The OLS linear regression analysis was used as the primary analysis technique to test the study's hypotheses. OLS regression is based on correlation, allowing a set of variables to predict a particular outcome. Thu (2019) emphasized the importance of testing for underlying assumptions of OLS regression before performing linear regression analysis. These assumptions include linearity, autocorrelation, heteroscedasticity, homoscedasticity, normality of the scores, and multicollinearity between independent and dependent variables. This study tested normality, multicollinearity, heteroscedasticity, and linearity.

4.3.1 Test for Normality

Normality is the shape of the data. Therefore, the P-P Normal Plot was used to test the normality of continuous data for the independent and dependent variables, obtained through the mean score of the responses per variable. Figure 2 shows the P-P Normal Plot of the mobile SMS bill query application.

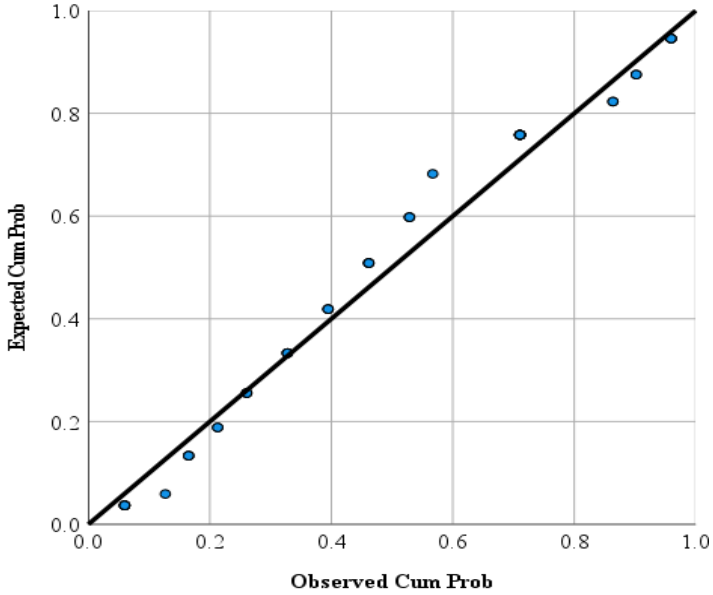

Figure 2. P-P Normal plot of the mobile SMS bill query application

Figure 2 shows that the points in the P-P Normal Plot lie on a straight diagonal line from bottom left to top right, suggesting that the mobile SMS bill query application had a normal distribution with no significant deviations. According to Feng and Sadeghpour (2020), data distribution in a straight diagonal line from bottom left to top right shows the normal distribution.

Figure 3 shows the P-P Normal Plot of water service delivery.

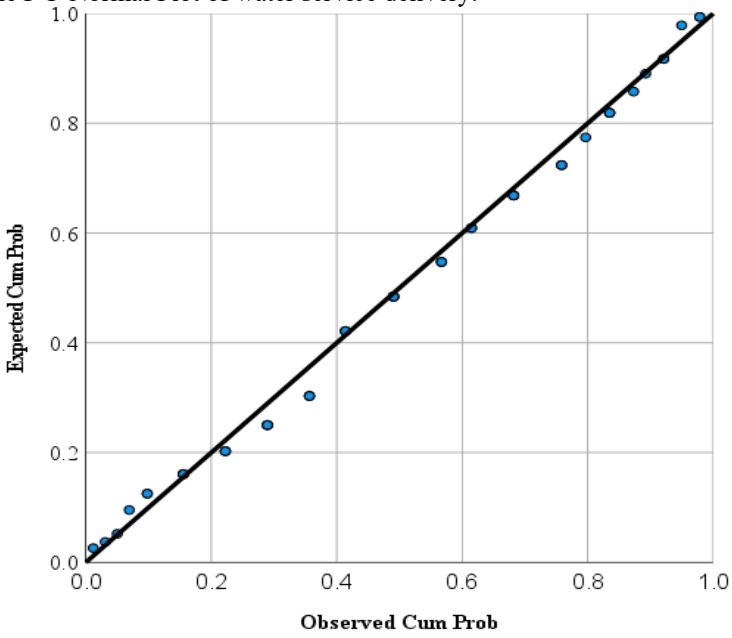

Figure 3. P-P Normal plot of water service delivery

The P-P Normal Plot lies on a straight diagonal line from bottom left to top right, suggesting that the water

service delivery data had a normal distribution with no substantial deviations.

4.3.2 Multicollinearity Test

Multicollinearity is a state of very high inter-correlations or inter-associations among the independent variables (Mobile SMS bill query application). The continuous data for the independent variable, obtained through the mean score of the responses, was subjected to the multicollinearity test. The variance inflation factor (VIF) for the Mobile SMS bill query application was found to be 1.680, which implies that there was no multicollinearity as indicated by the Variance Inflation Factor (VIF<10).

4.3.3 Heteroscedasticity Test

The White test detects heteroscedasticity for all hypothesised explanatory variables (Table 3). White's test is a statistical test used to detect the presence of heteroskedasticity in a regression model. It tests the null hypothesis of homoskedasticity against the alternative hypothesis of general heteroskedasticity (Uyanto, 2022).

Table 3: Test for Heteroscedasticity Results

Source	**chi²**	**df**	**p**
Heteroscedasticity	30.45	14	1.4200
Skewness	3.74	4	0.4428
Kurtosis	0.40	1	0.5257
Total	34.59	19	2.3885
$chi^2(185) = 30.45$			
Prob > $chi^2 = 1.4200$			

The results in table 3 Indicate that the test statistic is chi-squared with 14 degrees of freedom and has a value of 30.45. However, the p-value is 1.4200, more significant than the significance level of 0.05. Therefore, there is insufficient evidence to reject the null hypothesis of homoskedasticity in favour of unrestricted heteroskedasticity. The total chi-squared test statistic is 34.59, with 19 degrees of freedom and a p-value of 2.3885. This means that the overall model has some non-normality, but the significance level is not high enough to reject the null hypothesis of homoskedasticity. Thus, based on White's test and Cameron and Trivedi's decomposition of the IM-test, there is no evidence of significant heteroskedasticity in the model, and the null hypothesis of homoskedasticity cannot be rejected.

4.3.4 Test for Linearity

A linearity test was done to establish if the assumption of linearity between the independent and dependent variables was violated. The linearity test determines the relationship between the independent variables and whether the dependent variable is linear (Alita et al., 2021). The linearity test is a requirement in correlation and regression analysis. There should be a linear relationship between the independent and dependent variables. The linearity test was done with the aid of a significant value of Deviation from Linearity values in the ANOVA Table. If the value *p* of sig. Deviation from linearity is > 0.05, then the relationship between independent variables is linearly dependent and if the value of sig. The deviation from linearity is <0.05, so the relationship between independent variables is not linear. Table 4 shows the ANOVA test of linearity results.

Table 4: ANOVA Table Results of Test Linearity between the Variables of the Study

Dependent by the independent variable			**F**	**Sig.**
Water service delivery by Mobile SMS bill query application	Between Groups	Deviation from Linearity	0.622	0.810

Based on the ANOVA results in table 4, the significance value of deviation from linearity ($F = 0.622$, $p > 0.05$). Hence, a linear relationship exists between Mobile SMS bill query applications and water service delivery.

4.4 Econometric Analysis

The OLS regression model was used to determine the influence of mobile SMS bill query applications on service delivery by NAWASSCO AND NAIVAWASCO. The results for the OLS regression model are presented in Table 5.

Table 5: OLS Model Results for Influence of Mobile SMS Bill Query Application on the Water Service Delivery

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error in the Estimate
1	.260[a]	.067	.049	.87899

a. Predictors: (Constant), Mobile SMS bill query application
b. Dependent Variable: Service Delivery

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.792	1	2.792	3.614	.003
	Residual	38.631	50	.773		
	Total	41.423	51			

a. Dependent Variable: Service Delivery
b. Predictors: (Constant), Mobile SMS bill query application

Coefficients

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.120	.353		6.003	<.001
	Mobile SMS bill query application	.212	.111	.260	1.901	.003

a. Dependent Variable: Service Delivery

Mobile SMS, bill query application, accounted for 6.7% of the variance in water service delivery (R-squared = 0.067). This shows that approximately 93.3% of the variance in the water service delivery was explained by factors not included in the OLS regression model of the study.

The F statistic ($F = 6.19$, $p < 0.05$) from ANOVA results indicates the fitness of the regression model, which implies that socio-demographics was a significant predictor of water service delivery in water utility companies in Nakuru County.

The individual unstandardized coefficients showed that mobile SMS bill query application was significant at a 0.05 significance level ($\beta = 0.212$, $p < 0.05$). This implies that the Mobile SMS bill query application significantly influences the water service delivery in water utility companies in Nakuru County. Thus, Hypotheses one, which stated that 'Mobile SMS bill query application has no statistically significant influence on the water service delivery in water utility companies in Nakuru County, was rejected and the alternative premise was accepted. These findings conform with the findings of Guma et al. (2019), who did a study on "Hybrid constellations of water access in the digital age: the case of Jisomee Mita in Soweto-Kayole, Nairobi. Water Alternatives" established that the use of digital tools like Mobile SMS bill query application enhances service delivery in the water sector.

From the results in Table 4.19, the following model is predicted:

$$Y = 2.120 + 0.212X_1 + \varepsilon$$

Where:

y = Water service delivery

X_1 = Mobile SMS bill query application

Thus, if all the study variables were constant, the water service delivery in water utility companies in Nakuru County would be at 2.120 units. A unit change in the SMS bill query application holding other factors constant would result in a 0.212 unit increase in the water service delivery in water utility companies in Nakuru County.

5. Conclusion

The study concludes that the Mobile SMS bill query application contributed significantly to the water service delivery in water utility companies in Nakuru County.

5.1 Recommendations

The Water utility companies in Nakuru County should continue to invest in and promote using the mobile SMS bill query application. The application should be made available to all customers, and efforts should be made to ensure that customers know its availability and how to use it.

Further research could be done to Explore the effectiveness of the mobile SMS bill query application in other water utilities in other counties. This can help to determine whether the application is equally effective in different contexts and to identify any potential factors that may affect its performance.

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