EFFECT OF INTEGRATING MOBILE-BASED ICT SOLUTIONS IN SERVICE DELIVERY BY WATER UTILITY COMPANIES IN KENYA

Josiah Ogola Opiyo
Master of Science in ICT Management, Jomo Kenyatta University of Agriculture and Technology, Kenya

Dr. Mwalili Tobias
Jomo Kenyatta University of Agriculture and Technology, Kenya

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ABSTRACT

Continuous improvement and optimization of service delivery remains a key strategic goal of water utility companies when it comes to the competitive delivery of WASH services globally. The WASH sector is undergoing major structural reforms aimed at reshaping incompatible and outdated legacy systems and standardization of business processes to optimize and enhance the delivery of services. Mobile-based ICT solutions are being employed as significant and strategic enabler tools in this process as water utility companies aim to enhance transparency, effectiveness, and efficiency in service delivery. The purpose of the study was to establish the effect of integrating mobile-based ICT solutions in service delivery by water utility companies in Kenya. The specific objectives were: to determine the influence of the mobile meter reading system on service delivery; to examine the influence of the complaints management system on service delivery; to examine the influence of *'soma mita'* application on service delivery; and to determine the influence of bill query application on service delivery. The study was guided by the Delone & McLean IS success model and the SERVQUAL model. The study adopted a descriptive cross-sectional research design and data was collected from a sample of 300 employees of four water utility companies: KIWASCO, KACWASCO, MUWASCO and MAWASCO that were selected for the GSMA Mobile for Development of Utility Partnership Grant in 2015 and had implemented the mobile-based ICT solutions. Data was collected using self-administered questionnaires through the drop and pick method. The findings revealed that: mobile meter reading system had a significant effect on service delivery (p=0.326); complaints management system had a significant effect on service delivery (p=0.343); *'soma mita'* application had a significant effect on service delivery (p=0.263); bill query application had a significant effect on service delivery (p=0.216). Therefore, the study recommends that during the implementation of these mobile-based ICT systems the water utility companies need to develop partnerships with the various county governments to enhance support and ease of implementation through creating awareness and facilitating dissemination of information. These applications should also be promoted as a means for furthering staff development goals and increasing sufficient job satisfaction within the utility companies to promote buy-in and uptake. The water utility companies need to explore key technical and financial partnerships for technical and financial support.

Key Words: *mobile-based ICT solutions, service delivery, technology, water utility company*

INTRODUCTION

Continuous improvement and optimization of service delivery remains a key strategic goal when it comes to competitive delivery of WASH services globally. This is mainly attributed to the limited renewable supply of freshwater due to the ever-growing population, industrial production, deforestation and urbanization. The WASH sector is undergoing major structural reforms aimed at reshaping incompatible and outdated legacy systems and standardization of business processes to optimize and enhance the delivery of services. Timely, consistent and accurate information seems to be an obvious starting point as policymakers, service providers, regulators, and citizens rely on good information to make informed decisions. Mobile-based ICT solutions are playing a vital and pivotal role in the optimization of WASH sector service delivery, through improving general competitiveness and driving innovations. Due to their rapid growth, advancement, and uptake, these solutions are at the center stage of furthering the WASH sector goals and priorities that include increasing access to sanitation and water services to all citizens, improving service delivery by the water utility companies and improving governance by the national regulator (Abdullah, 2008).

Global experience indicates that economic growth has been boosted and poverty levels significantly reduced by incorporating mobile-based ICT solutions in service delivery. A report by GSMA, "Sub-Saharan Africa Mobile Economy, 2013" indicated in the Sub-Saharan Africa, mobile technology contributes to over six percent of the GDP, higher than any other comparable region globally, and is expected to rise to over eight percent by 2020. Mobile-based ICT solutions is an inclusive term that refers to a whole range of software applications that are designed to run on mobile devices, such as tablet computers or smartphones. They offer a number of new opportunities, which include but are not limited to facilitating real-time, low-cost data and information transfer and enhancing communication and engagement within communities. However, this involves substantial financial investment with the main objective of creating substantial business value by offering timely and reliable goods and services to all in a non-discriminatory manner (Pokharel, 2005).

Service delivery refers to a set of processes that provide the architecture on the way a service is rendered. This includes creating or production of the service, controlling the sessions and protocols. According to Burnes (2004), mobile-based ICT solutions should be integrated into service delivery to provide superior and unmatched services through effective and timely collaboration within departments. The general experience in several developed and developing nations have clearly indicated that integrating mobile-based ICT solutions as strategic enabler and implementer tools can significantly enhance service delivery. Their business value in delivery of service includes profitability improvement, productivity enhancement, improved work relations and efficient resource utilization of resources at both intermediary and organizational levels. Effective delivery of services to members of the public not only covers enhancement of productivity, but also ensures that services are easily accessible to all citizens in a non-discriminatory manner.

STATEMENT OF THE PROBLEM

As the government shifts more towards e-service provision, the Kenyan WASH sector is experiencing heightened mobile-based ICT solutions adoption and implementation. Consequently, the level of computerization and automation has significantly improved in the past few years, but the relatively low sustainability rate combined with the high frequency of failure in scaling applications beyond the pilot phase is a matter a great concern. All mobile-based ICT solutions are specifically driven by the ultimate desire to bring about significant strategic change to their areas of adoption and implementation. However, with cost-effectiveness, reliability and availability of the WASH sector services still hampered by weak institutions, poverty, weak monitoring and evaluation of the activities and poor infrastructure, it must be understood that adopting and incorporating mobile-based ICT solutions in the WASH sector is not a 'magic pill' as there is a weak financial reporting and unclear coordination between stakeholders leading to poor service delivery (Mouhamed & Mwangi, 2015). KIWASCO, KACWASCO, MUWASCO and MAWASCO being among the water utility companies that were selected for the GSMA Mobile for Development of Utility Partnership Grant in 2015 aimed at enhancing the quality of service delivery by integrating mobile-based ICT solutions in service delivery. However, as to whether the implemented solutions have improved service delivery by the water utility companies remains unknown. There is a considerable gap between what can be done using these solutions and what has actually been achieved. Therefore, there is a need to fill this knowledge gap. This research study aimed to investigate the effect of integrating mobile-based ICT solutions in service delivery by water utility companies.

OBJECTIVE OF THE STUDY

The general objective of this study was to determine the effect of integrating mobile-based ICT solutions in service delivery by water utility companies in Kenya.

SPECIFIC OBJECTIVES

1. To determine the influence of the mobile meter reading system on service delivery by water utility companies in Kenya.
2. To examine the influence of the complaints management system on service delivery by water utility companies in Kenya.
3. To examine the influence of *'soma mita'* application on service delivery by water utility companies in Kenya.
4. To determine the influence of bill query application on service delivery by water utility companies in Kenya.

THEORETICAL REVIEW

A theory is a well-structured proclamation or a number of proclamations that bear support of evidence for putting across some occurrences. A theory describes a methodical elucidation of the connection surrounding phenomena or confines of a proposed study. Theories stipulate a clarification that is general in approach to an incidence. Through theories relevant models can be derived to support the methodical elucidation (Ngumi, 2013). 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.

SERVQUAL Model

SERVQUAL is a measure of service quality. It refers to a multi-item scale used to assess the way customers perceive service quality in service and retail businesses (Parasuraman, Zeithaml, and Berry, 1988). The model has five factors that it measures including reliability, assurance, tangibles, empathy, and responsiveness. Reliability refers to the ability to dependably and accurately perform services. Assurance is the employee's ability to inspire trust and confidence. Responsiveness refers to the willingness to respond to the customer's needs. Empathy refers to the extent to which caring customized service is offered. Tangibles cover physical facilities, equipment, and staff appearance. SERVQUAL model represents service quality in terms of the discrepancy between what customers expect in service delivery and what they perceive of the offered service (Parasuraman et al., 1988).

SERVQUAL used perceptions as opposed to actual service received; hence, it is an attitudinal in nature (Parasuraman et al., 1988). Therefore, service quality is a good tool to measure customer satisfaction. According to Clemes (2008) the chances of achieving higher client satisfaction increase with an increase in service quality. Thus, to achieve a high level of client satisfaction, service providers ought to deliver high-quality services. This model is relevant in this study which investigates the effect of mobile-based ICT innovative applications on service delivery. It is important in explaining customer satisfaction with service delivered through the use of mobile-based ICT innovative solutions.

DeLone & McLean IS Success Model

This model was developed by DeLone and McLean in 1992. They sought to come up with a general and detailed definition of information system success that covers various perspectives of when evaluating information systems. Existing definition of information system success was reviewed as well as their corresponding measures and categorized into six main categories. Thus, creating a multi-dimensional measuring model with interdependencies between the different success categories (DeLone & McLean 1992). They include systems quality, service quality, use, organizational impact, user satisfaction and individual impact. The quality of the system measures technical success while quality of information measures semantic success.

On the other hand, effectiveness success is measured by individual impacts, use, organizational impacts, and user satisfaction measures.

According to Sterne (1996), since customer care is a type of service, it is categorized under the service-quality component. On the other hand, online customer service fits into both information and system quality. The two are separated by the different tasks that an online client needs to fulfill and the information task available in all phases of the transaction process. The net benefits form the ultimate impact of the system and affect both the institution and the users (DeLone & McLean, 2004). The theory is relevant in this study. While the study seeks to examine the effectiveness of various mobile-based ICTs applications on service delivery, the theory holds that effectiveness success is measured using individual impacts, use; organizational impacts, and user satisfaction. The effectiveness of the mobile-based ICT solutions was measured using service quality as attested by users.

EMPIRICAL REVIEW

Mobile Meter Reading System

A survey by Moraa et al., (2012) on the "mobile field assistant", an application with a mobile meter reading component implemented in Nairobi Water Company found that the application significantly reduced the cost of meter reading, improved governance through reliable data and greatly enhanced improved service delivery. The customization of this system was done in-house after a successful benchmarking exercise at Johannesburg Water Utility. During its implementation there was initial internal resistance to the system and as part of the utility's change management process a one-month training for staff was organized to rationalize the capabilities and salient features of the system.

Since its implementation, the utility had witnessed significant non-revenue water reduction from 40% to 38.5%, customer complaints related to meter reading and billing errors have also reduced significantly. Other utilities across the continent have since expressed interest in implementing the mobile meter reading system due to its associated benefits. The ability to support extended work process functions such as automatic routing system and the ability to present the meter readers with a route plan being a key feature (Moraa et al., 2012).

Complaints Management System

There are several empirical studies on the complains management system and its impact on service delivery. Isibor and Odia (2014) studied the complaint management system in the Nigerian service industry. The study sought to establish an overview of the complaints management system by consumers in the transport and restaurant service sub-sector. A structured questionnaire was used to gather data among 400 customers. The findings show that a complaint management system positively influences service delivery as measured by the customer's satisfaction.

A study from the Ministry of Health and Public Welfare (2012) in Anguilla revealed the impact of complaint management system on health sector service delivery. The report shows that the system has helped in effective analysis of complaints leading to redesigning of various services, improving procedures and policies; increasing efficiency and effectiveness as they were able to clearly read customer information needs. Additionally, the complaints management system is considered a total quality management element and a source of good quality feedback. In fact, it aims at significantly improving the service quality by identifying customers' problems or shortcomings of processess, eliminating them, avoiding their possible reoccurrence, and restoring customer satisfaction (Chinomona & Sandada, 2014).

'Soma Mita' Application

In a study on the impact of municipal billing systems on revenue collection, Rao (2012) studied the influence of various mobile-based ICTs innovation for reading meters in the WASH sector in various countries. In Thailand, for instance, the influence of handheld meter reading devices on revenue collection was examined. The device allowed instant access to water bills which enables customers to check the cost of water consumed at any given moment. The study found that the adoption of the handheld meter reading devices has led to enhanced efficiency in revenue collection which improves service delivery.

Mwaura (2012) studied the adoption of an electricity prepayment billing system and how it impacts the reduction of non-technical energy losses. The study found that the adoption of the electricity prepayment billing system reduced operational costs, increased and timely revenue collection and improved service delivery to electricity users as it allowed users to purchase tokens at their convenience. This study was conducted in the electricity company in Rwanda.

On the impact of municipal billing systems on revenue collection, Rao (2012) examined the influence of spot billing scheme for billing water connections using handheld data logger machines in India by the Hyderabad metro water supply and sewerage board. This technology allowed meter reading and generation of on-the-spot bills. The study found that the innovation improved performance of the board and increased service delivery to the consumers. The board was able to increase its revenue collection and even managed to collect arrears.

Bill Query Application

In a study on the role of mobile for improved water services in urban Pakistan GSMA, (2016) found that the mobile billing and payment systems improve service delivery in that it allows flexible multiple and small payments from clients as well as providing an effective tool for water utilities to improve revenue collection. Chinomona and Sandada (2014) studied customers' perceptions of ESKOM's pre-paid billing system and the effects on their satisfaction and trust. The study was done on a sample of 151 respondents. The findings revealed that ESKOM prepaid billing system positively and significantly influenced service delivery based on customers' satisfaction and trust. This study was conducted in an electricity public utility company in South Africa.

In the WASH sector, the focus has been on the influence of the e-billing system on revenue collection. According to Misra and King (2012), spot-billing influences service delivery as it eliminates human handling which prevents fraud and billing errors. In a study on the impact of billing systems on revenue collection in Rwanda, Rao (2012) found that implementation of a prepayment billing systems in Rwanda improved electricity service delivery in that it reduced the cost of operation for the utility company; increased and timely revenue.

Service Delivery

Service delivery in the modern-day business environment is backed by ICT innovations globally as strategic enablers. The reasoning behind this is the need for efficiency during service delivery. Failure of companies to evaluate how integrating mobile-based ICT solutions impact their service delivery is a big hindrance in achieving their full potential as an organization. A study by Muthui (2016) on the factors influencing service delivery at the county government showed that lack of accountability, poor public participation and lack of transparency by leaders led to poor service delivery. The study recommended that there be modern ways of tracking financial resources assigned to various projects in the county, it also recommended a feedback mechanism that would allow the county residences to air out their opinions to the county government. This research was relevant to this study in that customers should be involved as active stakeholders in service delivery.

RESEARCH METHODOLOGY

Research Design

Creswell (2012) described a research design as procedures and methodology used for conducting scientific research. A descriptive research design was used in this study as it allowed an indepth analysis of the subject matter and allowed for capitalization on dependability and decreased prejudice, thus portraying a real image of components under study. Descriptive research was used to describe the effect of integrating mobile-based ICT solutions in service delivery by water utility companies in Kenya.

Target Population

A population refers to the total collection of elements a researcher wishes to make inferences (Cooper & Schindler, 2006). The target population comprised of the 1200 employees of the four water utilities selected for the GSMA Mobile for Development of Utility Partnership Grant in Kenya. The population was categorized into top management, middle-level management and operational staff.

Sample Size and Sampling Technique

According to Marczyk, et al (2005), a sample is a subset of the population the researcher intends to study. According to Ader, Mellenbergh and Hand (2008) using sample is advantageous due to its relatively low cost, speed, accuracy, and quality of the data. The study used simple random and stratified sampling techniques to get the desired sample. Stratified sampling was used to categorize the employees into various levels of management; top level management, middle-level management and operational staff. Then the study employed simple random sampling to establish a representative sample size per category (Kothari, 2008). To get a representative sample size from the population the Slovin's formula was used as follows:

n = N/(1+Ne^2)

Where: n = sample size; N = Total target population; e= error tolerance; The study confidence level was 95% which was a margin error of 0.05 and the target population was 1200 employees.

n = 1200/(1+1200*0.052) = 300

Data Collection Instruments

According to Gall and Borg (2007) data collection refers to the process of where raw and unprocessed information is gathered for processing into meaningful information, through a scientific data analysis process. The main research instrument used in the study was a structured questionnaire. Kombo and Tromp (2006) defined a questionnaire as a research instrument that is used to capture data over a large sample, they are easier to administer and economical compared to other data collection methods.

Data Collection Procedure

According to Peersman (2014), a data collection procedure refers to the method used in approaching respondents with a view of collecting data, after having consulted and decided what to collect. This is essential as it ensures that data collected is well-defined and precise and that the succeeding resolutions centered on points of view exemplified in the outcomes are effective. Self-administered structured questionnaires were distributed to the respondents using a drop and pick method. In cases where the respondents were either busy or reluctant then the questionnaire was left with them to fill and collected later at an agreed time.

Data Analysis and Presentation

The questionnaires were collected once they had been fully filled and the researcher assessed them for consistency and completeness. The questionnaires were then assigned codes to enable the researcher to minimize errors during data entry and analysis. Analysis was done using the Statistical Package for Social Scientists (SPSS) after which data breakdown obtained from the tool was be tabulated, put in cross tabulation as well as charts. Quantitative data generated from

this study was analyzed using descriptive statistics, which included measures of variability (standard deviation), measures of central tendency (the mean), and measures of relative frequencies. Graphs and tables offer fundamental visual representation concerning desirable interests utilizing descriptive statistics (Glewwe & Levin, 2016). The study also used a Likert scale ranging from 1 to 5 to analyze items that were in the nominal scale. The data was presented in figures and tables whereas the interpretation of the data comprised of comparing and contrasting the study findings with the literature reviewed. Inferential statistics that is regression and correlation were applied to analyze the link between the dependent variables and the independent variables. In deciding the connection amid variables, a regression examination was done using the equation as shown below.

$$Y = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4 + \varepsilon$$

Where: Y = is the depend variable (Service Delivery); β_0 = Constant of the model; β_1, $\beta_{2,3}$ and β_4 = Regression coefficients; X1 = Mobile meter reading system; X2 = Complaints management system; X3 = *'Soma mita'* application; X4 = Bill query application; ε = Error term

RESEARCH RESULTS

Table 1: Correlation Analysis

			Service Delivery	Mobile Meter Reading	Complaints Management System	*'Soma Mita'* Application	Bill Query Application
Service Delivery	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	247					
Mobile Meter Reading Systems	Pearson Correlation	.488**		1			
	Sig. (2-tailed)	.000					
	N	247		247			
Complaint Management system	Pearson Correlation	.397**		.091	1		
	Sig. (2-tailed)	.000		.178			
	N	247		247	247		
***'Soma Mita'* Application**	Pearson Correlation	.697**		.284**	.230**	1	
	Sig. (2-tailed)	.000		.000	.001		
	N	247		247	247	247	
Bill Query Application	Pearson Correlation	.588**		.079**	.276**	.293**	1
	Sig. (2-tailed)	.003		.243	.001	.000	
	N	247		247	247	247	247

**. Correlation is significant at the 0.01 level (2-tailed)

The purpose of the study was to examine the effect of integrating mobile-based ICT solutions in service delivery in water utility companies in Kenya. To accomplish this primary objective, the study targeted 1200 employees of the four water utilities selected for the GSMA Mobile for Development of Utility Partnership Grant in Kenya. The study sampled 300 respondents from which 247 filled in and returned the questionnaires. This represents an 82.25% response rate. According to Kothari (2004), a response rate of 50% is sufficient for a descriptive study. Therefore, the response rate obtained was satisfactory to make conclusions for the study. The study used Pearson's product-moment correlation analysis to assess the correlation between variables. Additionally, a multiple regression was done to determine the predictive power between variables.

Table 1 shows that all the independent variables had a statistically significant ($p < .01$) correlation with the dependent variable (Service Delivery). It also revealed that there was a positive correlation between the mobile meter reading system and service delivery as shown by r = 0.488**, statistically significant P = 0.000. A positive correlation was established between the complaints management system and service delivery as evidenced by r = 0.397**, statistically significant P = 0.000. There was also a positive correlation between the *'soma mita'* application and service delivery as shown by r = 0.697**, statistically significant P = 0.000. There was a positive correlation between the bill query application and service delivery as shown by r = 0.588**, statistically significant P = 0.000. This implies that the mobile meter reading system, complaints management system, *'soma mita'* application and bill query application all positively influence service delivery.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Regression	.783[a]	0.613	0.606	2.59220

The researcher used model summary to analyze the variation in service delivery due to the integration of the mobile meter reading system, the complaints management system, *'soma mita'* application and bill query application in service delivery. The results indicated that R squared was 0.613 implying that there was 61.3% variation in service delivery, due to the integration the mobile meter reading system, the complaints management system, *'soma mita'* application and bill query application in service delivery. The remaining 38.7% implies that there are other factors that lead to quality service delivery which were not included in the model.

Table 3: ANOVA

Model	Sum of squares	df	Mean Square	F	Sig
Regression	82.960	4	20.740	2.891	.025[b]
Residual	1731.268	242	7.154		
Total	1814.228	246			

The analysis of variance (ANOVA) was used to determine whether the data used in the study was significant. From the ANOVA statistics, the processed data (population parameters) had a significance level of 0.025. This shows that the data is ideal for making conclusions on the population's parameter as the value of significance (P-value) is less than 5%. The F calculated which is 2.891 was greater than the F critical value. This shows that the overall model was significant.

Table 4: Coefficient of Determination

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.948	.981		1.128	.112
Mobile Meter Reading	.326	.162	.235	2.593	.004
Complaints Mgt Systems	.343	.171	.369	1.749	.007
'Soma mita' application	.263	.043	.036	.933	.019
Bill query application	.216	.154	.086	.250	.003

Based on the established regression equation, when all factors (mobile meter reading system, complaints management system, *'soma mita'* application and bill query application) are held constant at zero, this would be the outcome.

$$\mathbf{Y = 1.948 + 0.326\ X_1 + 0.343X_2 + 0.263\ X_3 + 0.216X_4 + \varepsilon}$$

The first objective of the study was to determine the influence of the mobile meter reading system on service delivery by water utility companies in Kenya. The regression results revealed that there is a significant positive correlation between the mobile meter reading system and service delivery at **β = 0.326; t = 2.593** and **p = 0.004.** Therefore, a unit increase in use of the mobile meter reading system would improve service delivery by **0.326.** The findings support previous studies. Moraa *et al.,* (2012) found that the "mobile field assistant", an application with a mobile meter reading component implemented in Nairobi Water Company significantly reduced the cost of meter reading, improved governance through reliable data and greatly enhanced improved service delivery.

The second objective of the study was to examine the influence of the complaints management system on service delivery by water utility companies in Kenya. The regression results revealed that there is a significant positive correlation between the complaints management system and service delivery at **β = 0.343; t = 1.749** and **p = 0.007.** Therefore, a unit increase in use of the complaints management system would improve service delivery by **0.343.** The study findings show the importance of incorporating a complaints management system in service delivery, which is in support of the findings by the Ministry of Health and Public Welfare (2012) in Anguilla that revealed the impact of complaint management system on health sector service delivery. The report shows that the system has helped in effective analysis of complaints leading to redesigning of various services, improving procedures and policies; increasing efficiency and effectiveness as they were able to clearly read customer information needs.

The third objective of the study was to examine the influence of the *'soma mita'* application on service delivery by water utility companies in Kenya. The regression results revealed that there is a significant positive correlation between the *'soma mita'* application and service delivery at **β = 0.263; t = 0.933** and **p = 0.019.** Therefore, a unit increase in use of the *'soma mita'* application would improve service delivery by **0.263.** The results are in support of a previous study by Mwaura (2012) that found that the adoption of the electricity prepayment billing system reduced operational costs, increased and timely revenue collection and improved service delivery to electricity users as it allowed users to purchase tokens at their convenience.

The fourth objective of the study was to determine the influence of bill query application on service delivery by water utility companies in Kenya. The regression results revealed that there is a significant positive correlation between the bill query application and service delivery at **β = 0.216; t = 0.250** and **p = 0.003.** Therefore, a unit increase in use of the bill query application would improve service delivery by **0.216.** These findings support a previous study by GSMA (2016) on the role of mobile for improved water services in urban Pakistan that the mobile billing and payment systems improve service delivery in that it allows flexible multiple and small payments from clients as well as providing an effective tool for water utilities to improve revenue collection.

CONCLUSIONS

Based on the findings of the study the research concluded that the mobile meter reading system, complaints management system, *'soma mita'* application and bill query application influence service delivery by water utility companies in Kenya. All the four variables have a positive impact on service delivery by water utility companies in Kenya. The study revealed that the mobile meter reading system facilitates efficient capturing of meter reading data: meter reading, time read, photo of reading and GPS co-ordinates. The mobile meter reading system has also improved governance at the water utility companies through an online platform that allows supervisors to monitor meter reading data captured from the field.

The study also revealed that the complaints management system has enabled effective and efficient communication between the water utilities and their clients. It has made sure that clients can easily report complaints and request for services from the utility in real time without incurring any cost. The complaints management system has also enabled the utilities to address complaints and service requests instantly, enhancing transparency in attending to these requests.

The study found that the *'soma mita'* application gave the customers a chance to be part of the water utility company's business process by allowing them to manage their own meter by submitting their readings when required without incurring any cost, thus ensuring all meters are read within a particular billing cycle. The application also ensures that customers get accurate provisional bills for the readings submitted without having to physically go to the office.

The study also revealed that the bill query application has always enabled clients to query their bills and know the status of their accounts without incurring any costs. It has also enhanced efficiency in revenue collection in the water utility companies as it offers a convenient way for clients to find out their bill amounts, the utilities' pay bill numbers and how to remit payment through mobile money.

RECOMMENDATIONS

The study recommends that the design of the mobile meter reading system should be easily customizable in terms of meter reading statuses so as to reflect the local environment and conditions in which it will be used, for a more enhanced efficiency. The study also recommends that during the implementation of this system the water utility companies need to develop partnerships with their various county governments to enhance support and ease implementation through creation of awareness and facilitating dissemination of information.

With regard to the complaints management system, it is recommended that the water utility companies should ensure responsiveness to the various system generated reports so as to build trust among clients, value among various stakeholders and encourage uptake of the system. The water utility companies should also ensure anonymity and privacy of data while enabling reliable feedback loops allowing for continual refinement of the system.

The water utility companies should ensure efficient incorporation and easily accessible *'soma mita'* application learning tools; images and audio-visual clips to combat low literacy levels. The application should also be promoted as a means for furthering staff development goals and increasing sufficient job satisfaction within the utility companies to promote buy-in and uptake.

The water utility companies need to leverage on technical partners to assist in relieving some of the burden experienced when acquiring and maintaining the application. The water utility companies need to explore key technical and financial partnerships for technical and financial support.

The study finally recommends that the management should be more transparent and accountable in the way they handle the employees and be more approachable so that they are able to listen to employee's opinions and incorporate these opinions when need be thereby having their 'buy-in' when they want to implement changes within the department; more consultations on the challenges faced by the registration officers by the registrars during their day to day activities in a bid to ensure they serve their customers better.

REFERENCES

Ader, H.J., Mellenbergh, J.G. & Hand, D. (2008). *Advising on Research Methods: a consultant companion.* Netherlands.

Adomi, E. E. & Kpangban, E. (2010). Application of ICTs in Nigerian secondary schools. *Library Philosophy and Practice (e-journal),* 345-365.

Akoh, B. & Ahiabenu, K. (2012). A Journey Through 10 Countries: Online election coverage

in Africa. *Journalism Practice,* 6(3), 349-365.

Akomo, O.D., Ajowi, J.O & Bosire, J. (2015). Factors Limiting the Usage of ICT in the Delivery of Management Services in Public Secondary Schools in Siaya County. *Mediterranean Journal of Social Sciences*, 6(2), 554-564.

Alba, A.B. & Trani, L. (2018). Extent of Utilization of Information and Communication Technology (ICT) by Selected Secondary School Teachers of City Schools Division of Malolos: Basis for the Development of Strategic Action Plan. *International Journal of Education and Research,* 6(1), 181-188.

Aquaro, V. (2012). Global Trends in E-Government Development. *Leadership Capacity-Development for Improved Delivery of Public Services in Africa Using ICT.* Addis Ababa Ethiopia.

Banerjee, A, C. S. (2017). Statistics without tears - inputs for sample size calculations. 2007. *Indian Psychiatr Journal*, 16, 150–162.

Bennett, S., Keith, D.& Chris, B. (2008). *Dynamics of skill acquisition. A Constraint Led Approach.* Human Kinetics.

Bhatnagnar, S. (2014). *Public Service Delivery: Role of Information and Communication Technology in Improving Governance and Development Impact. ADB Economics Working Paper Series, No. 391*. Manilla, Philippines: ADB.

Burnes, B. (2004). *Managing change: A strategic approach to organizational dynamics.* New Jersey: Prentice-Hall.

Bwalya, K. (2017). Determining Factors Influencing E-Government Development in the Developing World: A Case Study of Zambia. *Journal of e-Government Studies and Best Practices, 2017*(2017), 1-16. DOI: 10.5171/2017.143795.

Chinomona, R.& Sandada, M. (2014). Customers' Perceptions of ESKOM's Pre-Paid Billing System and the Effects on Their Satisfaction and Trust. *Mediterranean Journal of Social Sciences, 5(9),* 119-126.

Clemes, M. D. (2008). An empirical analysis of customer satisfaction in international air travel. *Innovative Marketing, 4(2),* 50-52.

Cooper, D. & Schindler, P. (2006). *Business research methods. (8th ed.).* New Delhi: Tata McGraw Hill.

Creswell, J. W. (2012). *Educational Research: Planning, conducting and evaluating quantitative and qualitative research.* Upper Saddle River, NJ: Prentice-Hall.

DeLone, W.H. & McLean, E. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3(1),* 60–95.

DeLone, W.H. & McLean, E. (2004). 'Measuring e-commerce success: applying the DeLone & McLean Information systems success model. *International Journal of Electronic Commerce, 9(1),* 31-47.

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational research: An introduction.* Boston: Pearson Education.

Gebba, T. R. & Zakaria, M. R. (2015). E-Government in Egypt: An analysis of practices and challenges. *International Journal of Business Research and Development, 4*(2), 11-25.

GSMA. (2016). *Mobile for Development Utilities: The role of mobile for improved water services in urban Pakistan.* London: GSMA.

Isibor, F.O. & Odia, E. (2014). Complaints Management System in Nigerian Service Industry. *Journal of Management & Entrepreneurial Studies, 1*(3&4), 176 – 186.

Jagero, N., Komba, H. V. & Mlingi, M. D. (2012). Relationship between the Job Training

and Employee's Performance in Courier Companies in Dar-es-Salaam, Tanzania. *International Journal of Humanities and Social Science.*

Jones, A. & Williams, L. (2015). *Public Services and ICT Final Report – How can ICT help improve quality, choice, and efficiency in public services?* London: The Work Foundation.

Kariuki, J. (2018). Effect of Information and Communication Technology on Service Delivery in Commercial Banks in Kenya. *Journal of Business and Management, 20*(6), 27-34.

Kayisire, D. & Wei, J. (2016). ICT adoption and usage in Africa: Towards an efficiency assessment. *Information Technology for Development, 22*(4), 630-653.

KIWASCO. (2019). *Kisumu Water and Sewerage Company Ltd.* Retrieved April 04, 2019, from http://mfa.kiwasco.co.ke/

KNBS. (2017). *Public Sector ICT Survey Report 2016.* Nairobi: Kenya National Bureau of Statistics.

Kombo, D.K. & Tromp, D. (2009). *Project and Thesis Writing: An Introduction.* Nairobi, Kenya: Paulines Publications Africa, Don Bosco Printing Press.

Kothari, C. (2010). *Research Methodology: Methods & Techniques.* New Delhi, India: New age International Publishers.

Marczyk, G., DeMatteo, D. & Festinger, D. (2005). *Essentials of research design and methodology.* Hoboken, N: John Wiley & Sons.

Masenge, O.D., Onkware, K. & Ogwora, E. (2018). Influence of Employee In-Service Training on Service Delivery in Kisii County Government, Kenya. *IJARKE Business & Management Journal*, 185-193.

Maumbe, B. M. & Okello, J. J. (2013). Uses of Information and Communication Technology (ICT) in agriculture and rural development in sub-Saharan Africa: Experiences from South Africa and Kenya. *Technology, Sustainability, and Rural Development in Africa*, 113-134.

MG Consultants (Pvt) Ltd. (2008). *Survey on ICT Usage in the Government Sector.* Sri Lanka: Information & Communication Technology Agency of Sri Lanka (ICTA).

Ministry of Health and public development. (2012). *Complaints management process.* Anguilla: Ministry of Health and public development.

Misra S. & Kingdom, W. (2012). *'India: Improving Urban Water Supply and Sanitation Service Provision. Lessons from Business Plans for Maharashtra, Rajasthan, Haryana, and International Good Practices'*. India: World Bank and Ministry of Urban Development.

Moraa, H., Salim, A. & Nduati, L. (2012). Technology in Solving Society's Water Problems in Kenya. Nairobi: I hub.

Mosweu, O., Bwalya, K. J. & Mutshewa, A. (2017). A probe into the factors for adoption and usage of electronic document and records management systems in the Botswana context. Information Development, 33(1), 97-110.

Mouhamed, F.N. & Mwangi, P. (2015). *Unlocking the Potential of Information Communications Technology to Improve Water and Sanitation Services.* Washington, D.C: World Bank.

Mugambi, K. (2013). *Effects of e-government strategy on service delivery in the government ministries in Kenya.* Nairobi: Unpublished MBA thesis, University of Nairobi.

Mugenda, O. & Mugenda, A. (2003). *Research Methods, Quantitative & Qualitative Approache.* Nairobi: Acts Press.

Mwaura, F. (2012). *Adopting electricity prepayment billing system to reduce non-technical energy losses in Uganda*: Lesson from Rwanda. Utilities Policy, http://dx.doi.org/10.1016/j.jup.2012.05.004.

Newing, H. (2011). *Conducting Research in Conservation: Social Science Methods and Practice.* New York: Routledge.

Norris, D. F. & Moon, M. J. (2005). Advancing e-government at the grassroots: Tortoise or hare?. *Public administration review*, *65*(1), 64-75.

Orina, J. O. & Luketero, S. W. (2018). Influence of adoption of technology on the performance of Kenya Power and Lighting Company: A case of Kenya Power Embu office. *International Academic Journal of Information Sciences and Project Management*, *3*(1), 47-60.

Otieno, B. (2008). *Challenges in the implementation of mobile banking information systems in commercial.* Nairobi: Unpublished MBA Project, University of Nairobi.

Parasuraman, A., Zeithaml, V.A. and Berry, L. (1988). SERVQUAL: a multi-item scale for measuring consumer perceptions of the service quality. *Journal of Retailing*, *64*(1), 12-40.

Rao, S. (2012). *Impact of municipal billing systems on revenue collection.* South Africa : Government of South Africa.

Roztocki, N. & Weistroffer, H. (2004). Evaluating Information Technology Investments in Emerging Economies Using Activity-Based Costing. *Journal of Information Systems in Developing Countries*, *19*(2), 1-6.

Russell, S. E. & Steele, T. (2013). Information and Communication Technologies and the Digital Divide in Africa: A Review of the Periodical Literature, 2000-2012. *Electronic Journal of Africana Bibliography*, *14*(1), 1.

Szopiński, T. & Staniewski, M. W. (2017). Manifestations of e-government usage in post-communist European countries. *Internet Research*, *27*(2), 199-210.

Towett, J K.C & Peter, G. (2015). Challenges Constraining Effective Employee Training in Eldoret Municipal Council of Kenya. *Global Journal of Advanced Research*, 2394-5788.

UN. (2014). *United Nations E-government Survey 2014: E-government for the Future We Want.* New York: United Nations.

Victor, A.A & Bolanle, R. (2017). Extent of Information and Communication Technology (ICT) Utilization for Students‟ Learning in Tertiary Institutions in Ondo State, Nigeria. *International Journal of Advance Research and Innovative Ideas in Education*, *3*(3), 2395-4396.

Wonderkid. (2017). *Digitising water utilities in Kenya.* London: Wonderkid Multimedia LTD.

Yator, R. & Shale, N. I. (2014). Role of information communication technology on service delivery at the ministry of interior and coordination of national government: A case of immigration service. *International Journal of Social Sciences and Entrepreneurship*, *1*(12), 863-876.