

Influence of Adherence to Quality Management System Standards on Access to Water and Sanitation Services in Kenya

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Abstract: In Kenya, over 3,100 children die annually for using unsafe water and poor sanitation. In the 2015/2016 financial year, access to water in Kenya stood at 54% for urban and 51% for rural areas. This low access to water and sanitation services could be as a result of the management practices in the water services providers. Previous studies have revealed the unsuccessful attempts to improve access of water and sanitation services through privatization and structural reforms in the water sector. These studies did not assess how management practices such as the quality management system can enhance access to water and sanitation services. The objective of the study was to determine the influence of the level of adherence to quality management system standards on access to water and sanitation services. The study adopted a combination of descriptive and explanatory research designs. The target population consisted of the 86 water service providers in Kenya. The sample comprised 70 water service providers who were selected using the stratified random sampling. The respondents of the study included the 70 general managers of the selected water service providers. Primary data was collected by the use of questionnaires. Secondary data was obtained from the 2016 /2017 WASREB report. The instruments were tested for validity and reliability through the content validity index (CVI=0.833) and the Cronbach alpha's internal consistency index ($\alpha=0.773$) for reliability. The study found that the level of adherence to quality management system standards significantly influenced the access to water and a sanitation service in Kenya ($t=15.7$, $p<0.05$). The study recommended that the management of the water service providers should strengthen the level of adherence to quality management system standards to enhance access to water and sanitation services to the members of the public.

Keywords: Adherence, Quality Management System Standards, Access to Water and Sanitation Services, Water Service Providers

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I. BACKGROUND OF STUDY

To enhance efficiency, competitiveness and customer satisfaction an increasing number of company's water service providers included are developing or adopting quality management systems (Magd 2008). According to Anderson (2013), a quality management system (QMS) is a collection of business policies focused on achieving policy and quality objectives to meet customer requirements.

The water and sanitation crisis claims more lives through disease than any war claims through guns (UNDP, 2006). According to the United Nations (2006), about 1.1 billion people in the world do not have access to safe drinking water and approximately 2.4 billion people lack adequate sanitation. Supply and sanitation in Kenya is characterized by low levels of access, as well as poor service quality in the form of interrupted water supply (Bichanga, 2013). This has given rise to over 3,100 children dying annually from diarrhea (UNDP, 2012). In the 2015/2016 financial year, water coverage in Kenya stood at 54% in the urban areas and 51% in the rural areas (WASREB, 2016). These statistics are too grim to be ignored and, therefore, they warranted investigation on possible causes and remedies. This study sought to relate this situation with quality management system.

As a means of improving access to safe water, many governments, Kenya included, have supported privatization of the water sector. The motivation behind privatization has largely been the perceived potential efficiency gains which is hoped could translate into increased access and improved service quality (Asingo, 2005). Despite the privatization of water provision units by the government, the provision of water services, considered in terms of area coverage, water quality and hours of continuous supply is still unsatisfactory. In Zambia, for example, after the commercialization of water services, the accessibility to safe water decreased

from 73% in 1990 to 53% in 2005 (World Bank, 2006). According to the impact report data on continuity of water supply in 2006-2007 financial year, only seven (7) out of 122 WSPS in Kenya were water supply continuous. Nevertheless, instances of water scarcity were still prominent in Kenya as shown by statistics on Eldoret, Homa bay, Kisumu, Nakuru, and Kisumu (owuor, 2009). This shows that privatization as an intervention in the water sector did not yield the desired results.

Over the recent years, the number of organizations certified for ISO 9001:2008 in many countries has grown tremendously (Heizer& Render, 2009). Quality Management Systems (QMS) is an emerging field of study that has gradually gained momentum in the recent years due to the competitive demand for quality services but not yet fully developed and understood (Bayati&Taghavi, 2007). It was, therefore, worthwhile to investigating the extent to which quality management system has impacted on the access to water and sanitation services.

Magd et al. (2012) carried out a study on factors motivating the implementation of quality management systems in UAE organizations. The study found that organizations implements ISO standards both for internal and external reasons. The study also found out that internal reasons were found to be more dominant than external reasons. Kim et al. (2012) carried out a study on ISO 9000 certified manufacturing and service firms in Japan. The study found a positive relationship between QM practices and innovation. Kaynak et al. (2005) found out that high performing firms had implemented QM practices to a greater extent than low performing firms, which shows that QM practices can definitely add advantage. Lo et al. (2009) revealed that ISO 9000 standards implementation in us manufacturing firms led to decrease in number of inventory days and significant improvement in overall operating cycle time. Zeng et al. (2005) carried out a study on implementation of ISO 14000 standards on selected Chinese industries. The results reveal that much motivation of companies was just to enter international market, although other benefits were also found. Martínez - costa et al. (2008) studied implementation of TQM practices and ISO 9000 standards together, rather than separately, as done in many research studies. It was found that internal motivation to implement ISO 9000 standards resulted in high performance, whereas external motivation did not.

Psomas and Kafetzopoulos (2012) carried out in ISO certified and non-certified manufacturing firms in Greece. The study findings found out that ISO certified manufacturing firms significantly outperformed the non-certified ones with regard to product quality, firm performance, operational, market and financial performance. Psomas, Pantouvakis and Kafetzopoulos (2012) carried out a study on the effect of quality management practices on operational performance of service industries in Greece. The findings revealed that the product quality and operational performance of the service firms are positively and significantly influenced by ISO's effectiveness. Kagumba and Gongera (2013) conducted a study to establish the effectiveness of ISO certification on firm performance, employee productivity, inflow of revenue and internal procedures and processes in Kenyatta University. The study established that appreciation and participation in ISO certification resulted in improved firm performance. Anyango, Wanjau and Mageto (2010) established that quality management practices influenced positively the financial resource management and firm performance. Mungula (2013) undertook a study on effect of quality management system on the organization performance in Tanzania. The study found out that the quality and quantity of the organizations that had implemented quality management system had significantly improved. Matata (2015) undertook a study on the effect of Quality Management System on the performance of Kenya Ports Authority. The study found out that there is a significant positive impact on the performance of the organization through improved service delivery. Ikay and Aslan (2011) carried out a study on the difference between ISO-certified and non-certified firms on performance. The results showed no statistically significant difference between certified and noncertified firms in terms of performance.

Studies done by Psomas and Kafetzopoulos (2012); Kagumba and Gongera (2013); Anyango, Wanjau and Mageto (2010); Mungula (2013); Matata (2015) and Ikay and Aslan (2011) are similar in the sense that they investigated the influence of quality management system on organizations performance. These findings were different in the sense that while Ikay and Aslan (2011) found out that there is no statistically significant difference between certified and noncertified firms in terms of performance, Kafetzopoulos (2012); Kagumba and Gongera (2013); Anyango, wanjau and mageto (2010); Mungula (2013); Matata (2015) found that quality management system leads to increased customer satisfaction, increased profits and reduced wastes. However, none of these studies investigated how quality management system can enhance the access to water and sanitation services.

STATEMENT OF THE RESEARCH PROBLEM

In Kenya, over 3,100 children die annually for using unsafe water and poor sanitation. In the 2015/2016 financial year, access to water in Kenya was 54% for urban and 51% for rural areas. This marked a growth rate of 1% per annum which pales in comparison with the sustainable development goals (SDGS) target of ensuring availability and sustainable water and sanitation for all. This low access to water and sanitation services could be as a result of the management practices in the water services providers. Previous studies have

revealed the unsuccessful attempts to improve access of water and sanitation services through privatization and structural reforms in the water sector. These studies, however, concentrated on industrial organization factors such as legal and regulatory framework as means of improving access to water and sanitation services ignoring management practices such as the quality management system. Prior studies have sought to establish the effect of quality management system on organization performance as well as the effect of employees' skills, infrastructure and operating efficiently on service delivery. However, none of these studies sought to establish how level adherence to quality management system standards influences the access to water and sanitation services in Kenya.

II. METHODOLOGY

The research adopted combination of descriptive and correlation research designs in seeking to establish the influence of level of adherence to quality management system standards on access to water and sanitation services in Kenya. The target population consisted of the 86 water service providers in Kenya. The sample comprised of 70 water service providers who were selected using the stratified random sampling. The respondents of the study included the 70 general managers of the selected water service providers. A questionnaire was used to collect data. The questionnaire comprised closed ended questions. The questionnaire was pretested before data collection for validation and reliability. Data was analyzed using descriptive and inferential statistics. The analyzed data was presented using tables. The statistical package for social sciences was used.

III. FINDINGS

The study sought to establish the relationship between level of adherence to quality management system standards and access to water and sanitation services in Kenya. Pearson product moment correlation coefficients were used to establish whether a relationship existed between the level of adherence to quality management system standards and access to water and sanitation services. to start with the three dimensions of quality management system were correlated with access to water and sanitation services. All the correlation was deemed significant at a set value of 0.05. The results are presented in table below.

Correlation Analysis of Level of Adherence Quality Management System Standards and Access to Water and Sanitation Services

	Access to Water & Sanitation (AWS)	Infrastructure Standards (IS)	Employee Skills (ES)	Operational Efficiency (OE)
Access to Water & Sanitation (AWS)	1			
Infrastructure Standards (is)	.729**	1		
	0.00			
Employee Skills (ES)	.609**	0.225	1	
	0.00	0.102		
Operational Efficiency (OE)	.744**	.332*	.453**	1
	0.00	0.014	0.001	

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

* Correlation is significant at the 0.05 level (2-tailed).

Adherence to operational efficiency standards had the highest positive relationship with access to water and sanitation services ($r=0.744$, $p=0.00$) followed by level of adherence to infrastructure standards ($r=0.729$, $p=0.00$) and adherence to employees skills had the lowest positive relationship with the access to water and sanitation services ($r=0.609$, $p=0.00$). This implied that an increase in the level of adherence in all the three dimensions of the quality management system standards leads to an increase in access to water and sanitation services. The hypothesis was further tested over the three dimensions of the quality management system.

Level of Adherence to Infrastructure Standards and Access to Water and Sanitation Service

The study tested the **hypothesis one (a)** that there is no significant influence of the level of adherence to infrastructure standards on the access to water and sanitation services in Kenya. This was tested using the model

Equation 1; $y = \beta_0 + \beta_1 X + \varepsilon$ where

Y- Access to water and sanitation services

β_0 = The intercept

β_1 = Regression coefficients shows the change in the value of y for a unit change in X

X- Level of adherence to infrastructure standards

ε = random error

The model represented a value of r^2 which show the proportion of variation in dependent variable explained by the regression model. Table 4.10 show that the level of adherence to infrastructure standards had a coefficient adjusted $r^2=0.52$ this indicates that 52% of the variation in access to water and sanitation service can be accounted for by the level of adherence to infrastructure standards.

Level of Adherence to Infrastructure Standards and Access to Water and Sanitation Service

Model	R	R Square	Adjusted R Square	Std. Error Of The Estimate
1	0.73	0.53	0.52	0.69

a Predictors: (Constant), Infrastructure Standards (IS)

c Dependent Variable: Access to Water & Sanitation (AWS)

Coefficients of Level of Adherence to Infrastructure Standards

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.88e-17	0.09		0.00	1
	Infrastructure Standards (IS)	0.73	0.10	0.73	7.68	0.00

a Dependent Variable: Access to Water & Sanitation (AWS)

Data from table 4.13, x_1 the independent variable which is adherence to infrastructure standards contributed to $r=0.73$ and adjusted $r^2=0.52$. The final model is $Y = 1.88E-17 + 0.73 X_1$ where Y = access to water and sanitation services and X_1 = infrastructure standards (IS). For the hypothesis that there is no significant influence of the level of adherence to infrastructure standards on the access to water and sanitation services in Kenya, The study found the relationship to be statistically significant. Therefore rejecting the null hypothesis and accepting the alternative hypothesis that the level of adherence to infrastructure standards significantly influences the access to water and sanitation services. This means that an increase in level of adherence to infrastructure standards of one unit influenced the level of access of water and sanitation services by 73%. This indicated that there is positive linear relationship between level of adherence to infrastructure standards and access to water and sanitation services. This was in agreement with Asante (2010) who found a significant relationship of infrastructure and sustainable water service delivery in the rural sector of Ghana. Vondach (2007) also established a positive relationship between infrastructure development and access to water and sanitation services in Kenya.

Level of Adherence to Employee’s Skills Standards and Access to Water and Sanitation Services

The study tested the **hypothesis one (b)** that there is no significant influence of level of adherence to employees’ skills standards on access to water and sanitation services. To test this, the following model was used.

Equation 2

$Y = \beta_0 + \beta_2 X + \varepsilon$ where

Y_1 - Access to Water and Sanitation Services

β_0 = The intercept

β_2 = Regression Coefficients (Shows the Change In the Value of Y for a Unit Change in X)

X- Level of Adherence to Employees' Skills Standards

ε = Random Error

The model represented the value of r^2 which show the proportion of variation in dependent variable explained by the regression model. Table 4.13 show that level of adherence to employees skills standards had a coefficient of adjusted $r^2 = 0.36$. This indicates that 36% of the variation in access to water and sanitation service can be accounted for by the level of adherence to employees skills standards.

Level of Adherence to Employee's Skills Standards					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.61a	0.37	0.36	0.80	

A Predictors: (Constant), Employee Skills (ES)

C Dependent Variable: Access to Water & Sanitation (AWS)

Coefficients of Level of Adherence to Employees Skills Standards.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	2.94e-17	0.109		0.00	1
	Employee Skills (ES)	0.61	0.11	0.61	5.54	0.00

A Dependent Variable: Access to Water & Sanitation (AWS)

Y_1 = Access to Water and Sanitation Services and X_2 = Employee Skills (ES)

Data from table 4.15, X_1 the independent variable which is adherence to employees skills standards contributed to $r^2 = 0.37$ and adjusted $r^2 = 0.36$. The final model is $Y = 2.94E-17 + 0.61X_2$ where Y_1 = Access to water and sanitation services and X_1 = employees skills standards (ES). For the hypothesis that there is no significant influence of the level of adherence to employees' skills standards on the access to water and sanitation services in Kenya. The study found that the relationship to be statistically significant, therefore rejecting the null hypothesis and accept the alternative hypothesis that the level of adherence to employee skills standards significantly influence the access to water and sanitation services. This means that an increase in level of adherence to employees' skills standards of one unit influenced the level of access of water and sanitation services by 61%. The findings differed with Salleh, Yakuub and Dzulkifi (2011) who found out that job performance of public service employees in Malaysia had no relationship with the skills level. The findings were in agreement with Red and Reenen (2005) who found out that training is significantly associated with high productivity. Survery and Luks (2004) also found out those firms regarded skills as an important precursor for improved productivity. Matata (2015) found out that there is a significant positive impact of employee's skills on organization through improved service delivery, quality production and hence giving an organization competitive edge in the market.

Relationship between the Level of Adherence to Operation Efficiency Standards and Access to Water and Sanitation Services in Kenya

The study tested the **hypothesis one (c)** that there is no significant influence of level of adherence to operational efficiency standards and access to water and sanitation services. To test this, the following model was used.

Equation 3

$Y = \beta_0 + \beta_3 X_3 + \varepsilon$ where

Y- Access to Water and Sanitation Services

β_0 = The intercept

β_3 = Regression Coefficients (Shows the Change in the Value of Y For A Unit Change in X)

X- Level of Adherence to Operational Efficiency Standards

ε = Random Error

The model represented the value of r^2 which show the proportion of variation in dependent variable explained by the regression model. Table 4.16 show that level of adherence to operational efficiency standards had a coefficient of adjusted $r^2= 0.55$ this indicates that 55 % of the variation in access to water and sanitation service can be accounted for by the level of adherence to operational efficiency standards.

Level of Adherence to Operation Efficiency Standards Access to Water and Sanitation Services

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.74a	0.56	0.55	0.67

A Predictors: (Constant), Operational Efficiency (OE)

C Dependent Variable: Access to Water & Sanitation (AWS)

Coefficient of Level of Adherence to Operation Efficiency Standards on Access to Water

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-1.81E-16	0.09		0.00	1
Operational Efficiency (Oe)	0.74	0.09	0.74	8.03	0.00

A Dependent Variable: Access to Water & Sanitation (AWS)

Y= Access to Water and Sanitation Services and X₃= Operational Efficiency (OE)

Data from table 4.16, X₃ the independent variable which is adherence to operational efficiency standards contributed to $r^2=0.56$ and adjusted $r^2 = 0.55$.the final model is $Y= -1.81E-16+ 0.74X_3$ where Y= Access to Water and Sanitation services and X₃ = operational efficiency standards (Es). for the hypothesis that there is no significant influence of the level of adherence to operational efficiency standards on the access to water and sanitation services in Kenya, the study found the relationship to be statistically significant. Therefore rejecting the null hypothesis and accept the alternative hypothesis that is, the level of adherence to operational efficiency standards significantly influence the access to water and sanitation services. This means that an increase in level of adherence to operational efficiency standards of one unit influenced the level of access of water and sanitation services by 74%.

This was in agreement with Bichaga (2013) who found out that operational efficiency contributed to access to water and sanitation services. These finding also concurred with Kayanga and Njiru (2007) who found out that bloated staff was a major course of operational inefficiency and impacted negatively on the performance of water and sanitation sector.

Influence of Adherences to Quality Management System Standards on Access to Water and Sanitation Services

The study tested the overall **hypothesis one** that there is no significant influence of level of adherence to quality management system standards and access to water and sanitation services. To test this, the following model was used.

Equation 4

$Y= \beta_0 + \beta X+ \varepsilon$ where

Y- Access to water and Sanitation Services

β_0 = The intercept

β_3 = Regression Coefficients (Shows the Change in the Value of Y for a Unit Change In X)

X₃- Level of Adherence to Operational Efficiency Standards

ε = random error

Model Summary of Influence of Adherences to Quality Management System Standards and Access to Water and Sanitation Services

Model	R	R Square	Adjusted R Square	Std. Error Of The Estimate	Change Statistics				
					R Square Change	F Change	Df 1	Df 2	Sig. F Change
1	.91a	0.83	0.82	0.42	0.83	247.98	1	52	0.00

1. Predictors: (Constant), QMS

Table 4.21: Coefficients of Influence Strategic Management Practices On the Relationship between Adherences to Quality Management System Standards

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	4.11e-17	0.06		0.00	1.00
	Qms	0.91	0.06	0.91	15.75	0.00

QMS (Quality Management System)

The results in table 4.19 show that quality management system accounts for 82% of the variation of access to water and sanitation services (Adjusted $r^2=0.82$). The results show a statistical significance for the effect of quality management system on access to water and sanitation services ($t= 15.75$, $p<0.05$). The study there for rejected the hypothesis that there is no significant influence of quality management system standards on access to water and sanitation services in Kenya. These research findings were in agreement with White et al. (2009) who examined the rationale for establishing a quality management system in non-profit small to medium enterprises in the United Kingdom. The study found out that through correct development of quality management systems, organizations were able to generate bottom-line savings and business performance enhancement. it was also in agreement with Mungula (2013) who undertook a study on effect of quality management system on the organization performance in Tanzania. The study found out that the quality and quantity of the organizations that had implemented quality management system had significantly improved. Matata (2015) undertook a study on the effect of quality management system on the performance of Kenya ports authority. the study found out that there is a significant positive impact on the performance of the organization through improved service delivery, quality production; hence, giving the organization a competitive edge in the market. These research findings contradicted (Mead, 2011) who indicated that quality management system is a mere waste of time and does not encourage business improvement.

IV. CONCLUSION

The study concluded that the influence of level of adherence to quality management system standards on access to water and sanitation services was statistically significant. The study also concluded that the level of adherence to quality management system standards on employees' skills was the highest followed by infrastructure standards and operational efficiency standards was the lowest

V. RECOMMENDATIONS

The study sought to establish the influence of level of adherence to quality management system standards on access to water and sanitation services. In regard to this the study recommended that the water service providers should focus their efforts in enhancing the level of adherence quality management standards on infrastructure , employees skills and operational efficiency which will influence the access to water and sanitation services. The study also recommends that the water service providers should actualize their non-revenue water reduction plans based on the water and sanitation regulatory board (WASREB) circulated non-revenue water reduction standards. Since the findings are that adherence to QMS standard was established to have significant influence on access to water and sanitation services the study recommends that the national

government should develop nationwide standards for the infrastructure, employees' skills and operational efficiency for improving the access to water and sanitation services

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