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Influence of Management Skills of Community Based Water Managers on Performance of Rural Piped Water Projects in Nyando Sub-County, Kisumu County, Kenya

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***Abstract*-** The department of water, Kisumu County report, recorded a 35.4% success rate of rural based water projects initiated in Kisumu County which is below average. Therefore, rural based water projects in Kisumu County need sound community water management skills to enhance performance. The purpose of this study was to assess influence of management skills of community based water managers on performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. The specific objective was; to establish the influence of community based water managers' technical management skills on performance of rural piped water projects. The study applied the path goal theory and the theory of subsistence poverty. A mixed method approach design was adopted. The respondents were the managers and employees working in the rural piped water projects. A key informant interview guide was adopted for the managers and a semi-structured questionnaire for the employees. Results obtained from key informant interviews revealed other factors that influence performance of the rural piped water projects: corruption, nepotism, lack of donor funding, financial constraints and litigation on issues of land, revenue and billing. Pearson's correlation results showed that technical management skills, positively correlated to performance of rural piped water projects. The coefficient of determination was 0.618, indicating 61.8% joint proportion of variation associated to performance of rural piped water projects. The resulting model from regression analysis showed technical management skills at 0.087 deviations. The conclusion was that technical management skills had the least influence on performance of rural piped water projects. The recommendation was that the government of Kenya should intensify the monitoring of existing set benchmarks to enhance efficient performance of rural piped water projects. The findings and recommendations could be adopted by water sector institutions and other related water partners.

***Keywords*:** Management Skills, Technical Skills, Community Based Water Managers and Performance of Rural Piped Water Projects

I. INTRODUCTION

In 2015, the Millennium Development Goals (MDGs) came to an end and a post-2015 agenda; comprising 17 Sustainable Development Goals (SDGs), took their place. Among the SDGs, goal six seeks to ensure availability and sustainable management of water and sanitation for all [1]. This target has been a key factor in many governments and organizations undertaking efforts to improve drinking water access to urban and rural populations in developing countries [2].

Water is also an essential resource for survival and to secure good health [3]. However, people around the world face problems of water scarcity. This scarcity of water forces the people to use unsafe water for drinking and other domestic purposes [4]. Poor access to clean and safe drinking water is a widespread problem facing the world today, with a disproportionate effect on developing nations. The World Health Organization estimates that more than 780 million persons, approximately 11% of the world population, do not have access to safe drinking water [4].

Along with poor sanitation and hygiene, unsafe drinking water is one of the three main health risks in developing countries that contribute to 88% of diarrheal disease in the world [4]. Several studies have shown that interventions that improve water quality can reduce diarrheal disease morbidity by more than 30% [5].Essentially, management styles in water projects owes much of its origin from the neo-liberal traditions of a reduced role of the state, human rights and empowerment approaches to development [6].

In Europe, the rural domestic water supply focuses on community participation (CP) and Community Management (CM) or Community –based management which are often combined with the Demand Responsive Styles (DRS) in an

endeavor to promote performance of projects [7]. In addition, these concepts are utilized as tools for enhancing citizen rights to participation in making decisions that affect them, or as tools for enforcing citizen participation in self-development in form of direct contributions [6]. The concepts often end up categorized into four namely financial, technical, human resource and social.

However, whether understood as complementary styles or not, some studies done in Europe and America indicate that management skills do not necessarily deliver good results for rural water projects [8]. In Asia, international aid organizations and government programs have focused on providing adequate water resources to the millions of persons without the water resources. Moreover, many people in India and Pakistan have turned to household or point-of-use (POU) water treatment methods. Biosand filters (BSFs) are some of the most widely used POU treatments in India and Pakistan [9]. It is imperative to note that while management styles for community water projects may be working well in some developing countries such as Asia, the results in sub-Saharan Africa are still poorly promising [10].

In Africa, Integrated Water Resources Management (IWRM) currently serves as the foremost entry point into water resources [3]. The effective management of fresh-water resources in Africa involves satisfying the often divergent needs of the environmental, socio-cultural and political sectors [11]. These disparate players are routinely engaged in an ongoing exchange to achieve the sustainable and equitable allocation of a finite water supply.

Issues of equitable allocation in Africa are severely complicated by naturally occurring water variability and dynamic political and geographic divides, which result in the need for trans-boundary collaborations [12]. A study by [13] in the Amhara region of Ethiopia put up that most water activities decrease in execution soon after outer support is pulled back. He prescribed that further review be done on elements that impact execution of community water extends in other provincial parts of different nations in Africa with a specific end goal to bring a speculation of the discoveries.

East Africa's basins are under increasing demand from growing urban populations and an agricultural sector striving to meet the demands of economic development in an environment of increasing climatic variability related to global climate change [13]. The cultural, political and geographic complexity inherent in the management of shared water resources is being further exacerbated by changing political boundaries, policies and priorities, international and intra-national conflict, poverty, population migration and inadequate distribution capacities [12].Poor performance of water projects in East Africa is a phenomenon that is caused by a myriad of factors [3].

In Kenya, community participation in the management of water resources was as a result of global shift in the management of water resources which occurred in the 1990s. In 1999, the Kenyan government initiated a water sector reform which culminated in the revision of the then water act. In 2002, the revised water act created new water sector institutions which took over some of the functions under the ministry of water. Some of the created institutions include water service providers (WSPs), water services regulatory board (WASREB), water services board (WSB), water appeals board (WAB) and water services trust fund (WSTF).

The ministry of water remained a policy formulator and funder. Water Services Regulatory Board (WASREB) has provided guidelines on the administrative organization and standard operations to water service providers for both urban and rural water projects in Kenya (Water Act, 2002).since then, the management of urban water projects are vested with commercially minded water companies while rural water projects are managed by community based organisations.

In a study, [14], 2.5 million avers that Kenyans get their water from community managed water projects. These systems have always relied on a few enterprising individuals for their initiation and community organization. The success or failure of a community water project management can be influenced by level of community participation, training and education of the project leaders, governance structure and basic management skills among other factors such as financial and technical support [3].

1) 1.1 Concept of Management Skills of Community Based Water Managers

Management skills of Community based water managers refers to the technical, social, human resource and financial skills which are necessary for the improved performance of rural piped water projects. A study conducted by [15] concluded that, when local communities participate directly in planning their own water supply systems, these systems are more likely to perform than systems that are imposed on them by the government or donor organizations. When communities are engaged in the planning process they are more likely to select supply options that they are willing and able to operate and maintain [16].

Furthermore, according to [17], social capital which is a set of shared community norms, expectations and pattern of interaction; within a rural community is also one of the factors that affect performance and sustainability of rural water supply systems. In addition to social factors, administrative, financial and technical capacities are essential criteria for rural water supply systems to ensure a system operates effectively over time and at reasonable cost [17].

a) 1.1.1 Technical Management Skills

In this study, technical management skills refer to information, communication, technological knowledge and practice the community based managers use to execute their responsibilities. A study conducted in Laikipia East District, Laikipia County, Kenya by [18] established that technical skills in monitoring and evaluation can help water projects like any other projects to be sustainable. According to the

study, technical skills in monitoring and evaluation can be used to improve the way governments and private organizations achieve results and ensure project sustainability. The study further concluded that performance of water projects can be enhanced by investing in and strengthening a national system for enhancing technical skills in monitoring and evaluation, [18].

b) 1.2 Performance of Rural Piped Water Projects

In this study, performance of rural piped water projects refers to the quantity of water produced in cubic meters per day, revenue collected, number of consumers connected and receiving water, and number of pumping hours per day or ability to uphold and prolong water supply. According to [19], the community water supply systems are engineered solutions that operate through social cooperation and that the technical adequacy is the first and most critical for long- term performance of water system.

B. A study by [3], opines that a water and sanitation system is considered to be performing when it continues to function over a prolonged period of time and is able to give appropriate level of benefits like quality, quantity, continuity and health to all. Performance is only valid if the management of the water project is institutionalized while its operation, maintenance and administrative cost are recoverable at local level [19].[15] Concluded in their paper that, when local communities participate directly in planning their own water supply systems, these systems are more likely to perform than systems that are imposed by the government or donor organizations. When communities are engaged in the planning process they are more likely to select supply options that they are willing and able to develop, operate and maintain [19].

C. 1.11 Organization of the Study

The project was organized into five chapters which follow the typical process of an empirical study: Chapter one is the introduction which focuses on the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, hypothesis, significance of the study, basic assumptions of the study, limitations of the study, delimitations of the study and definition of significant terms used in the study. Chapter two reviews literature related to the study thematically and in line with the study objectives. It looks at the concept of community based water managers' management skills; it then examines how community based water managers' technical management skills influence the performance of rural piped water projects; finally, it investigates the moderating influence of government policy on the relationship between management skills of community based water managers and performance. The chapter then establishes the theoretical and conceptual framework, which is the foundation of the analysis to fill the knowledge gap. Chapter three describes the methodology that was used for the analysis throughout this work; it comprises of the introduction; research design; target population; sample selection, size and sampling technique; research instruments; validity of instrument and reliability of instrument; data collection procedures; data analysis techniques; and ethical considerations. Chapter four covers the response rate; demographic factors such as age, gender, duration of work, name of projects; technical management skills and performance of rural piped water projects; government policy, management skills and performance of rural piped water projects; and performance of rural piped water projects. Finally, Chapter five contains summary of findings, conclusions, recommendations and future scope of the study.

II. RELATED WORK

This chapter presented a review of related literature based on empirical and theoretical data with regard to the subject under study on the concept of community water management skills, and performance of rural piped water projects. Under community water management skills, literature was reviewed on technical management skills and finally on performance of rural piped water projects with reference to water production in cubic meters per day; revenue collection; number of consumers connected and metered; and number of pumping hours per day.

A. 2.2 The Concept of Management Skills of Community Based Water Managers

In this study, technical skill was the indicator of focus in relation to performance of rural piped water projects. A number of empirical and theoretical studies were reviewed in line with management skills for community based water managers and performance of rural piped water Projects.

A study conducted by [20] to identify and assess the impact of project managers' communication, interpersonal, coordination, team building and delegation, problem finding, analyzing, solving skills on project success among 178 individuals associated with organizations related to projects found that there was a statistically significant positive relationship existing between each of identified soft leadership skills and success of projects. The study which was conducted in Pakistan highlighted the importance of project mangers having coordination skills alongside problem finding, analysis and solution skills [20]. This study focused on soft skills in management, while the current study considered technical skills.

In a study that was conducted to examine precise issues of leadership among nurses that were linked to their intention to resign in public acute care hospitals, [22] established that nurses appreciated human skills including concerns for their welfare, clarity and being involved in decision making and encouragement at work more than any other managerial characteristics. In a longitudinal study that was conducted among 1,673 nurses drawn from medical, surgical, and mixed units across eleven public acute care hospitals in Australia, [23] noted that when the nursing unit managers exhibited strong management skills, there would be increased

job satisfaction, a reduction in the nursing staff turnover and improved performance. This study was conducted in a non water sector, while the current study focused on the rural piped water projects in the water sector.

In a study undertaken to assess the role that management skills plays in present day entrepreneurship world by [24] opined that although universities and tertiary institutions churn out many graduates annually, a majority of them lack professional or management skills which can help them survive without having formal jobs. The study cited some of the important skills that are critical for self employment as being financial management skills, decision and control skills, personnel skills, resource management skills, marketing skills, risk and security management skills, computer management skills, time management skills and manipulative skills [24]. The study was conducted in entrepreneurship sector; the current study focused on rural piped water sector.

A study that was conducted by [25] found that business managers normally require financial management, human resource management, social and interpersonal skills to successfully run their businesses. The study further cited business management skills; start-up, marketing, technical, personality and leadership skills as being crucial in enterprise management. The mixed study which sought to establish the method crucial skills among South African entrepreneurs was conducted among 250 entrepreneurs and six national entrepreneurs in South Africa. This study focused on managers of rural piped water projects in Kenya.

A number of Socio-economic and demographic factors have been found to determine and influence the incidence of community water management skills in rural piped water projects which is a significant employer in many countries. The study by [27], the extensiveness of supply and demand factors make eradication of problems associated with water projects difficult. The study further notes that community water management skills can improve performance of water projects. [27] opine that the deprivation of education and negligent accumulation of social and economic capital over long period of time have resulted in lack of adequate water management skills among many communities.

In a different study, [28] established that socio-economic factors including female literacy, fertility rates, family size, adult wage rates, diversification of the rural economy and female work participation rates are important determinants of community water management skills. Economic development is another variable which is supposed to increase capacity of local communities handling water projects by providing better opportunities for adult laborers and increasing education for children [28].

When local communities participate directly in planning their own water supply systems, [15] aver that these systems are more likely to perform than those systems that are imposed on communities by the government or donor organizations. Communities are more likely to be willing and able to operate and maintain the projects in which they are engaged in the planning process [16]. A different study by [17] established that social capital which includes shared community norms, expectations and pattern of interaction within a rural community is also one of the factors that affects performance and sustainability of rural water supply systems.

In a related study, [16] further cite administrative, financial and technical capacities as essential criteria for the effective operation of rural water supply at a reasonable cost. Additionally, the performing systems are likely to be found where the communities and project operators have adequate financial and administrative capacity to facilitate system operations and maintenance [16].

B. 2.3 Technical Management Skills of Community Based Water Managers and Performance of Rural Piped Water Projects

Technical management skills refer to information, communication, technological knowledge and practice the community based water managers use to execute their responsibilities. Empirical and theoretical studies reviewed established that there was an association between technical management skills and performance of rural piped water projects.

A study conducted in Laikipia County, Kenya to illustrate how technical skills in monitoring and evaluation can help water projects to be sustainable, [18] established that technical skills in monitoring and evaluation can be used to improve the way governments and private organizations achieve results and ensure project sustainability. The study further concluded that the performance of water projects can be guaranteed by investing in and strengthening a national system aimed at enhancing technical skills in monitoring and evaluation, [18]. This study focused on technical skills in one area only; which is monitoring and evaluation; the current study focused on technical skills that are necessary for the general performance of rural piped water projects.

A study that was conducted by [29] to assess the sustainability of rural water services in Ethiopia and find solutions to factors threatening their sustainability, established that sound legal framework, ownership feeling, community participation, community's independent scheme management, willingness to pay and women empowerment are all factors that influence the sustainability of a water project. The study was important to Community-led accelerated WASH (COWASH) of Ethiopia since it enabled them to check the sustainability of water services implemented in rural areas of Amhara region of Ethiopia using the Community Managed project Approach (CMP), [29]. However, the study focused on sustainability and not performance; a gap this current study sought to fill.

In a different study that was conducted to determine water project management, priorities and participation in rural water schemes in Sub-Saharan Africa, [30] established that technical management skills were positively related to the

sustainability of the water project. In the study, 68% of the respondents indicated that they knew the technical skills expected of them at work in terms of water project operations, while 67% indicated that there was someone at work who dictated technical operations. At the same time, 67% of the respondents agreed that they had an opportunity to learn the technical operations over the past one year, while 61% of the respondents strongly agreed that their associates or fellow staffs were committed to doing quality operational work and 57% agreed that they were recognized or praised for proper operations [30]. However, the study focused more on project sustainability than performance; a gap this current study sought to fill.

A cross sectional study was conducted by [31] to assess the skills of financial and budget management of Iran's Ministry of Health from the view of resource development assistants of universities of medical sciences in the country. The study emphasized on the importance of Operational level managers, including financial and budgetary managers to acquire more technical skills to enable them carry out their *A.* mandates since the managerial effectiveness normally depends on the knowledge and skills that the managers have. The study found significant relationship between perception skills of financial managers and budgeting and performance monitoring managers at (p= 0.014). [31] concluded that the universities should promote technical skills and awareness of managers within organizations through organizational training courses and distribution of educational materials such as brochures. This study was conducted in universities in Iran, while current study was conducted among rural piped water projects in Kenya.

In a study that was in Italy, conducted to ascertain the educational and professional backgrounds of the repository managers and the skills set required to implement successful institutional repositories,[32] found that technical skills are a major requirement to help deal with inter-operation ability standards and protocols. According to [32], traditional librarian skills are no longer sufficient to run successful repositories, a richer set of skills including management and communication skills, technical skills, and expertise with regard to access rights and preservation of digital content is needed for success. The study further established that Italy's academic curricula does not meet the repository managers' educational needs, and the academic programmes should be developed to include communication, project management and team work skills and pay more attention to copyright issues [32]. This study was conducted in repositories in Italy, the current study focused on rural piped water projects in Kenya.

III. METHODOLOGY

The methodology that was used to carry out the study focused on the research design, target population, sample size and sampling procedures, data collection instruments, data collection procedures, and data analysis techniques. The study adopted a mixed methods approach whereby the researcher used a combination of qualitative and quantitative approaches while focusing on the research objective and hypothesis. According to [33], the mixed method design normally concentrates on the collection, analysis, and the mixing of both quantitative and qualitative data in the study on the premise that a combination of the two would provide a better perception of the hypothesis. [34] recommend mixed methods approach because it produces information about aspects that interest policy makers and researchers.[35] says descriptive surveys provide quick, inexpensive statistical, efficient and accurate means of accessing information about the population. The limitations of this study include the fact that it can be time consuming, and it could be difficult to decide on who to sample and the criteria to be used for the qualitative study sample selection. The study managed these limitations by piloting which facilitated the regulation of time for filling the instruments, use of simple random sampling and the Krecjie and Morgan formula.

The target population was 189 obtained from census data comprised; the managers and the employees of community based rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. The population size of community based water managers of rural piped water projects in Nyando Sub-County was 21 while that of employees was 168. Nyando sub-county was deemed fit for this study because it is the sub-county with the highest number of water projects as compared to other sub-counties in Kisumu county.This raised the probability of generalizing the study findings to other areas in the county.

The study determined the appropriate sample according to [36], a sample is a small proportion of a population selected for observation and analysis. In this study, a census survey was adopted for the managers due to the small population size. However, for the employees, Krecjie and Morgan (1970) sampling technique (formula) was used to compute the required sample size. A semi- structured questionnaire was used to collect primary data from the staff of the community based water projects while a key informant interview guide was used to collect data from the managers of the water projects. The questionnaires were preferred in this study because respondents of the study were assumed to be literate and able to respond adequately. The questionnaire contained a mix of questions, allowing for both open-ended and specific responses. The questionnaire had seven sections; section A, Demographic profile on age brackets, gender, years worked, and other details like; job title, name of project. Sections B, C, D, E, F,G contained Independent variables; Technical management skills, Social management skills, Human resource management skills, Financial management skills, Government Policy and Performance of Rural Piped Water Projects each having four questions for each indicator. The informant interview guide had 5questions on the 5 variables. A five likert scale was adopted; 1=not at all, 2=small extent, 3=medium extent,4=large extent and

5=very large extent. [37] terms the questionnaire as the most appropriate instrument due to its ability to collect a large amount of information in a reasonably quick span of time. It guarantees confidentiality of the source of information through anonymity while ensuring standardization [38]. It is for the above reasons that the questionnaire was chosen as an appropriate instrument for this study.

A pilot study was conducted in one project in Kisumu Central Sub-county which is a neighboring Sub County to Nyando Sub County for a population comprising 11 people. [38] advises that 10% of the population sample is sufficient for pre-testing of a survey instrument. All the population was sampled because the subjects were all available at the time of administration of the instruments. The aim of the pilot survey was to test whether the design of questions was logical, if questions were clear and easily understood, not ambiguous, whether the stated responses were exhaustive and how long it would take to complete a questionnaire. Views given by the respondents during pilot study were used to improve the instrument quality before actual collection of data.

The data collection procedure entailed aspects before, during and after data collection. The researcher obtained authorization from statutory body for data collection.. The researcher with the help of research assistants delivered the questionnaires to the respondences and had them filled in their presence and provided assistance where sought thus raising the reliability of the instruments. The key informant interview guides were also administered to the managers and their responses were appropriately captured. The researcher and the assistants then collected the questionnaires from the respondences and thereafter started the data entry process which was followed by analysis.

The process of data analysis involved coding, tabulating, and processing by use of a computer Statistical Package for Social Science (SPSS) programme; version 21 and the findings were presented in tables of frequency percentages, standard deviation and means. Descriptive statistics included the means, standard deviations, and frequency percentages. Inferential statistics; simple linear regression included ANOVA, correlation, and differential coefficients. Regression analysis was computed to determine the relationship or associations between the independent variables and the dependent variable. Multiple regression analysis was also conducted to determine the relationship, if any, between the moderating influence of government policy on the relationship between management skills and performance of rural piped water projects. The relationship between management skills and performance of rural piped water projects was tested using Pearson's correlation and multiple linear regression model.

Ethical considerations were observed to ensure the dignity of the respondents remained respected. The objective of the research was explained to the respondents in advance before filling the questionnaires. The researcher specifically reiterated to the respondents that the information given was purely for academic purposes and no information was traceable back to the research subjects. The respondents were assured that no one would re-track the information they voluntarily shared, client confidentiality and voluntary participation were guaranteed. No respondent was coerced into providing information at all .

IV. Results and Discussion

5.1 Introduction

This chapter presented the findings in line with the study objectives. It contains the response rate; demographic factors including the age, gender, work experience, name of project; and technical management skills and performance of rural piped water projects; government policy, management skills and performance of rural piped water projects, response from key informant interview guide, and management skills and performance of rural water projects.

5.2 Response Rate

The study collected a total of 112 questionnaires out of a target of 117 questionnaires. The 112 questionnaires were fully filled with relevant information that could be entered for analysis. This represents a response rate of 95.73% as shown in Table 4.1. This response rate is acceptable according to [39] who provided 80% as a critical appraisal of response rate (RR) in business and management research. The Key informant interview guides were 21.

Table 5.1: Questionnaire Return Rate

Questionnaires distributed	Filled and returned questionnaires	Percentage
117	112	95.73

Table 5.2 Distribution of Respondents per designation

Designation	Sample Size	Returned Instruments
Pipe Fitters	29	28
Revenue clerks	29	28
Line patrollers	15	14
Customer care	15	14
Pump Attendants	15	14
Watchmen	15	14
Sub Total	**117**	**112**
Managers	21	21
Total	**138**	**133**

5.3 Demographic Factors

This sub-section contains age of respondents, gender of respondents, duration and name of the projects. The results are presented in Table 4.3 up to Table 4.6.

1) 5.3.1 Age of Respondents

The study sought to determine the age of the respondents. The respondents were asked to state their ages and the results were as shown on Table 4.3.

Table 5.3: Age of Respondents

Age	Frequency	Percent
21-30	19	17.0
31-40	47	42.0
41-50	35	31.3
Above 50	11	9.8
Total	112	100.0

Table 4.3 reveals that majority 47 (42%) of the respondents were in the age bracket of between 31 to 40 years; followed by 35 (31.3%) of the respondents who were in the age bracket of between 41to 50; followed by 19 (17%) of the respondents were in the age bracket of between 21 to 30 years while the minority 11 (9.8%) of the respondents were aged above 50 years. These findings reveal that majority of the respondents were in the productive age bracket with appropriate work experience needed in management of water projects.

2) 5.3.2 Gender of the Respondents

The study sought to determine the gender of the respondents. The results are displayed in Table 5.4.

Table 5.4: Gender of the Respondents

Gender	Frequency	Percent
Female	55	49.1
Male	57	50.9
Total	112	100.0

Table 5.4 reveals that majority 57 (50.9%) of the respondents were men while 55 (49.1%) of the respondents were women. The implication was that the study composed of more men as compared to women, thus the majority of the people who worked in the water projects were male.

3) 5.3.3 Work Experience

The study sought to determine the work experience of the respondents. The results are displayed in Table 4.5.

Table 5.5: Work Experience

Duration	Frequency	Percent
1-5 yrs.	44	39.3
11-15 yrs.	17	15.2
6-10 yrs.	48	42.9
Less than 1yr	3	2.7
Total	112	100.0

Table 5.5 reveals that majority 48 (42.9%) of the respondents had worked in the water projects between 6 to 10 years; this was followed by 44 (39.3%) of the respondents who had worked in the projects for between 1 to 5 years; then17 (15.2%) of the respondents who had worked for between 11 to 15 years and the minority 3 (2.7%) of the respondents had worked in the water project for less than one year. The implication of this finding is that most of the respondents had worked long enough in the water projects and had good institutional memory and therefore the information obtained from them was relevant to this study.

4) 5.3.4 Name and Location of Projects

The study sought to find out the name and location of the water projects undertaken by the respondents. The results are displayed in Table 5.6

Table5.6: Name of Projects

Project	Frequency	Percent
Adede	11	9.8
Ahero multi-purpose	12	10.7
Ahero Catholic	1	0.9
Boya	18	16.1
Ebenezer	26	23.2
Lela	14	12.5
Migingo	7	6.3
Nyamware	1	0.9
Onjiko	22	19.6
Total	**112**	**100.0**

Table 4.6 outlines the names of the projects visited as Adede, Ahero multi-purpose, Ahero catholic, Boya, Ebenezer, Lela, Migingo, Nyamware and Onjiko. In addition, the findings reveal that majority 26 (23.2%) of those interviewed worked at Ebenezer project while the minority worked at two projects - Ahero Catholic and Nyamware.

B. 5.4 Performance of Rural Piped Water Projects

The dependent variable that was studied in this project was the performance of rural piped water projects (PRPWP) which had four indicators thus: the required production in cubic meters per day, adequate revenue, consumers metered and connected and recommended pumping hours. A five point likert scale was used such that: NA=Not at all; SE=Small extent; ME=Medium extent; LE=Large extent; VLE=Very large extent. From the descriptive survey analysis, the descriptive statistics results are displayed in table 5.7.

Table 5.7: Performance of Rural Piped Water Projects

		NA	SE	ME	LE	VLE	Mean	SD
PRPW-1	Production in cubic meters	0	29.5	38.4	25.9	6.3	3.0893	.89597
PRPW-2	Adequate revenue	0	16.1	42.0	35.7	6.3	3.3214	.81886
PRPW-3	Consumers metered and con.	0	22.3	35.7	34.8	7.1	3.2679	.89021
PRPW-4	Recommended pumping hours	0	9.8	22.3	56.3	11.6	3.6964	.80359
	Overall Mean						**3.3438**	

Table 5.7 presents findings from the performance of rural piped water projects (PRPWP). Out of the 112 respondents, 38.4% were of the view that community based rural piped water projects produce the required water in cubic meters per day to a medium extent, 29.5% to a small extent, 25.9% to a large extent while 6.3% to a very large extent. As indicated by a standard deviation of 0.89597 and a mean of 3.0893, it therefore suffices that community based rural piped water projects produce the required water in cubic meters per day. At the same time, 42.0% of the respondents felt that community based rural piped water projects generate adequate revenue to sustain them to a medium extent, 35.7% to a large extent, and 16.1 and 6.3 to a small extent and very large extent respectively. Subsequently, as indicated by a standard deviation of 0.81886 and a mean of 3.3214, the community based rural piped water projects generate adequate revenue to sustain them. Out of the total number of respondents, 35.7% and 34.8% felt community based rural piped water projects have connected and metered the targeted number of consumers respectively while 22.3% and 7.1% to small extent and 7.1 respectively. As indicated by a standard deviation of 0.89021 and a mean of 3.2679, community based rural piped water projects have connected and metered the targeted number of consumers.

Lastly, 56.3% of the respondents felt community based rural piped water projects attain the recommended number of pumping hours per day to a large extent, 22.3% to a middle extent while 11.6 and 9.8% to a very large extent and small extent respectively. As indicated by a standard deviation (SD) of 0.80359 and a mean of 3.6964, community based rural piped water projects normally attain the recommended number of pumping hours per day. These findings are consistent with study by [3], who opines that a water and sanitation system is considered to be performing when it continues to function over a prolonged period of time and is able to give appropriate level of benefits like quality, quantity, continuity and health to all.

5.5 Technical Management Skills and Performance of Rural Piped Water Projects

The first objective of this study sought to establish the influence of community based water managers' technical management skills (TMS) on performance of rural piped water projects in Nyando Sub-County, Kenya. This was looked at from the perspective of operational, ICT, Qualification and experience skills. A five point likert scale was used such that: NA=Not at all; SE=Small extent; ME=Medium extent; LE=Large extent; VLE=Very large extent. From the descriptive survey analysis, the descriptive statistics results are displayed in Table 5.8

Table 5.8: Technical Management Skills and Performance of Rural Piped Water Projects

		NA	SE	ME	LE	VLE	Mean	SD
TMS-1	Operational and performance	0	14.3	51.8	24.1	9.8	3.2946	.83438
TMS-2	ICT and performance	0.9	47.3	31.3	19.6	0.9	2.7232	.81881
TMS-3	Qualifications and performance	0.9	12.5	40.2	37.5	8.9	3.4107	.85481
TMS-4	Experience and performance	0.9	28.6	34.8	17.0	18.8	3.2411	1.09253
	Overall Mean						**3.1674**	

Table 5.8 depicts that out of the 112 respondents, 51.8% were of the view that TMS-1 influence performance of the rural piped water projects to a medium extent, 24.1% to a large extent, 14.3% to a small extent while 9.8% to a very large extent; as shown by a standard deviation of 0.83438 and a mean of 3.2946. Therefore, if the management of the rural piped water projects lack TMS-1, performance of the rural piped water projects are influenced. With regard to TMS-2, 47.3% of the respondents opined that it influence performance of the rural piped water projects to a small extent, 31.3% to a medium extent, 19.6% to a large extent while 0.9% to a very large extent and none at all each. TMS-2 can contribute greatly to influence in terms of performance as depicted by a standard deviation of 0.81881 and a mean of 2.7232. On the influence of TMS-3 on performance of rural based water projects, 40.2% were of the view that TMS-3 influence performance of the rural piped water projects to a medium extent, 37.5% to a large extent, 12.5% to a small extent while 0.9% respondents to a very large extent and none at all each. There is a high chance of qualification influence in terms of operation as shown by a standard deviation (SD) of 0.85481 and a mean of 3. 4107.

Out of the 112 respondents, 34.8% were of the view that TMS-4 influences performance of the rural piped water projects to a medium extent, 28.6% to a small extent, 18.8% to a very large extent while 17% and 0.9% to a very large extent and none at all respectively. Evidently, TMS-4 of the manager contributes a lot in terms of the operations of the rural piped water projects; this is shown by a standard deviation of 1.09253 and a mean of 3.2411. The overall mean was 3.1674 signifying that indeed TMS influence performance of the rural piped water projects. This result demonstrates that managers in the rural piped water projects require experience in order to gain more skills. These findings support the findings of a cross sectional study by [31] who opined that operational level managers, including financial and budgetary managers need to acquire more TMS to enable them carry out their mandates since managerial effectiveness normally depends on the knowledge and skills that the managers have.

5.5.1 Correlating Technical Management Skills and Performance of Rural Piped Water Projects

The study sought to correlate the independent variables and the dependent variable. The interpretation of the results guided by correlation classification provided by [40] as outlined in Table 5.9a:

Table 5.9: Correlation- Technical Management Skills and Performance of Rural Piped Water Projects

		TMS-1	TMS-2	TMS-3	TMS-4	PRPWP
TMS-1	Pearson Correlation	1	.245**	.452**	.419**	.755**
	Sig. (2-tailed)		.009	.000	.000	.000
TMS-2	Pearson Correlation	.245**	1	.407**	.491**	.691
	Sig. (2-tailed)	.009		.000	.000	.339
TMS-3	Pearson Correlation	.552**	.607**	1	.479**	.627**
	Sig. (2-tailed)	.000	.000		.000	.000
TMS-4	Pearson Correlation	.319**	.491**	.479**	1	.724**
	Sig. (2-tailed)	.000	.000	.000		.000
PRPWP	Pearson Correlation	.455**	.091	.427**	.324**	1
	Sig. (2-tailed)	.000	.339	.000	.000	
	N	112	112	112	112	112

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

Table 5.9 shows that operational skills (TMS-1) had a Pearson Correlation of 0.755(strong) which rounds off to 1(perfect), ICT skills (TMS-2) had a Pearson Correlation of 0.691(strong) which rounds off to 1(perfect), qualifications skills (TMS-3) had a Pearson Correlation of 0.627(strong) which rounds off to 1 and experience (TMS-4) had a Pearson Correlation of 0.724(strong) which rounds off to 1.

1) Table 5.9 depicts that TMS-1, TMS-2, TMS-3 and TMS-4 are indeed correlated to performance of rural piped water projects. This is because all the indicators of TMS recorded a strong Pearson Correlation that when rounded off comes to 1; thereby indicating a positive (perfect) correlation, thus TMS has a statistically significant influence on Performance of Rural Piped Water Projects.

5.5.2 Regression for Technical Management Skills and Performance of Rural Piped Water Projects

Regression analysis was done focusing on relationship between TMS and PRPWP. The results are displayed in Tables 4.10, 4.11 and 4.12.

2) Table 5.10: Model Summary-Technical Management Skills and Performance of Rural Piped Water Projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.786[a]	.618	.604	.519

Table 5.10 displays the co-efficient of determination (R^2) as 0.618; which is 61.8 percent. Consequently, it can be concluded that the indicators of TMS jointly contributed to a 61.8% deviation on performance of rural based water projects. The implication of this finding is that TMS is an important variable since its influence on performance of rural based water projects is above 50% and therefore statistically significant. Therefore, hypothesis one; **Ho_1**: Community based water managers' TMS have no influence on PRPWP in Nyando Sub-County, Kisumu County, Kenya; stands rejected. An alternative hypothesis is thus preferable: **H_1**: Community based water managers' TMS influence PRPWP in Nyando Sub-County, Kisumu County, Kenya.

Table 5.11: ANOVA-Technical Management Skills and Performance of Rural Piped Water Projects

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.685	4	11.671	43.353	.000[b]
	Residual	28.806	107	.269		
	Total	75.491	111			

Table 5.11 shows that the model was statistically significant since the F calculated (43.353) was higher than the f critical. The implication of this finding is that the adopted regression model for technical management skills and performance of rural piped water projects is statistically significant

3) Table 5.12: Regression Coefficients-Technical Management Skills and Performance of Rural Piped Water Projects

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.122	.357		5.949	.000
	TMS-1	-.028	.112	-.022	-.247	.805
	TMS-2	-.417	.087	-.378	-4.808	.000
	TMS-3	.070	.088	.074	.798	.426
	TMS-4	.697	.081	.875	8.595	.000

Table 5.12 displays the regression coefficients which when used in the equation the resulting model is:

$Y=2.122-0.028X_1-0.417X_2+0.07X_3+0.697X_4$

The resulting model implies that TMS-1 caused -0.02 deviations on PRPWP, TMS-2 caused -0.41 deviations on performance of rural piped water projects, TMS-3 caused 0.07 deviations on performance of rural piped water projects and TMS-4 caused 0.697 deviations on performance of rural

piped water projects. The implication of this finding is that TMS-4 had the most influence on performance of rural piped water projects; followed by TMS-2, then TMS-3; while TMS-1 had the least influence on performance of rural piped water projects. Therefore, the conclusion of this finding is that TMS-4 of the water manager in any rural piped water project is very important in achieving any remarkable and meaningful performance of the rural piped water projects

The study sought to establish the influence of community based water managers' technical management skills on performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. The results from descriptive survey indicate an overall mean was 3.1674 signifying that indeed technical management skills influence performance of the rural piped water projects. From inferential statistics, the indicators of technical management skills recorded a Pearson Correlation of +1(perfect); thereby indicating a positive (perfect) correlation. The indicators of technical management skills; operational, ICT, academic qualification, and work experience gave a R square of 0.618(61.8%) deviation on performance of rural based water projects showing the proportion of deviation contributed jointly by the indicators of TMS on the dependent variable. The inference of this finding is that technical management skill has influence on performance of rural piped water projects in Nyando Sub-County,Kisumu County, Kenya.

IV. CONCLUSION AND FUTURE SCOPE

The study sought to establish the influence of community based water managers'technical management skills on performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. Results from regression analysis showed that community based water managers' technical management skills caused the least influence on performance of the rural piped water projects. Therefore, in this study, technical management skill is the least influential variable on performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. In conclusion, hypothesis one; $\mathbf{Ho_1}$: Community based water managers' technical management skills have no influence on performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya; was rejected. An alternative hypothesis was therefore adopted: $\mathbf{H_1}$: Community based water managers' technical management skills influence performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. This finding relates to the path–goal theory by Robert House (1996) which states that a leader's behavior is contingent to the satisfaction, motivation and performance of her or his subordinates.

The first study objective established that technical management skills was the least influential variable on performance of rural piped water projects in Nyando Sub-County, Kisumu County, Kenya. Therefore, the study recommended that the government of Kenya should intensify the monitoring of existing performance benchmarks to enhance efficient management and performance of rural piped water projects.

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