Brainae Journal
ISSN "2789-374X (print)" "2789-3758 (online)
Volume 8, Issue 3, March 2024
www.brainajournal.com
info@brainae.org

ASSESSMENT OF THE FACTORS AFFECTING WATER SUPPLY PROJECTS PERFORMANCE IN RWANDA: A CASE OF KARUMUNA-KANZENZE WATER SUPPLY NETWORK EXTENSION PROJECT

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***Received:** March 5th, 2024**; Accepted:** March 27th 2024**; Published:** March 28th, 2024*
DOI: https://doi.org/10.5281/zenodo.10892064

ABSTRACT:
The study investigated the performance of the Karumuna-Kanzenze water supply network extension project in Rwanda, focusing on community participation, water infrastructure, project management, and maintenance funds as key determinants. A descriptive and correlative research design was employed, involving 120 respondents in a census survey to comprehensively understand their perspectives. Data collection utilized questionnaires and documentary reviews, while analysis employed Statistical Package for the Social Sciences (SPSS) and Excel, incorporating descriptive statistics, Pearson's correlation, and multiple linear regression. The findings showed an average mean score of 3.9583 indicates that respondents generally perceive effective community participation factors in the project. This "high mean" suggests substantial evidence of these factors, reflecting a positive perception of community involvement. The standard deviation of 1.280635 implies some variability in how respondents perceive these community participation factors. This means that there's a positive perception, differences in individual viewpoints warrant further investigation. The findings presented high average mean score of 4.1236 indicates a very positive perception of the water infrastructure factors in the project as this suggests strong evidence of the effectiveness of these factors, demonstrating robust implementation. The standard deviation of 1.206418 suggests a general consensus among respondents about the effectiveness of water infrastructure factors, with relatively little variability in their perceptions. The findings confirmed that the high average mean score of 4.35973 reflects a very positive perception of the project management factors in the project. This indicates strong evidence of the presence and effectiveness of these factors, suggesting highly successful project management. The moderate standard deviation of 0.9977 indicates some variation in responses but not to a high degree. This suggests a consensus among respondents regarding the excellence of project management, which is an asset for the project's successful implementation and outcomes. The findings for overall average mean score of 4.2597 is categorized as a "very high mean," indicating that, on average, respondents hold a highly positive perception of the project's maintenance funds-related factors. This suggests that maintenance funds have been effectively utilized to meet the project's objectives. The standard deviation of 1.03315 suggests some degree of heterogeneity in responses, signifying that while the overall perception of maintenance funds is positive, there is variability in how individual respondents perceive these factors. Correlative analysis reveals strong and statistically significant relationships between predictor variables (community participation, water infrastructure, project management, and maintenance funds) and

project performance. Multiple linear regression explains 92.3% of the variance, with community participation and project management exerting substantial and significant positive influence.

1. INTRODUCTION TO THE STUDY

Management of water projects is an important aspect of sustainable delivery of water resources to both the rural and urban populations in worldwide. Access to safe drinking water and sanitation is a global concern, especially as a Millennium Development Goal, and in recent years, it has been increasingly addressed as one of the basic human rights of nations (UNDP, 2015).

Water in EAC countries is the backbone for all known forms of life and therefore it is important to ensure adequate supply in the right quantity and quality. The Government of Kenya recognizes that for the country to meet its poverty-reduction strategies and achieve the MDGs, water has to be made available, accessible and affordable, especially to the poor (Owuor, S.O &Foeken, D. W. J. , 2009). In Kenya, just like in other parts of Africa, water is scarce in some parts of the country forcing women and children to trek long distances to fetch water. The exact groundwater potential of the country is unknown, but it has been estimated to be approximately 2.6 billion m3 (ADF, 2015).

The figures of operational failure rates of water projects supply from individual African countries that ranging from 30% to 60%. It is estimated that 55% of all rural water supplies/projects in Kenya, Tanzania and Uganda are not functioning, and despite the frequency with which it appears in development discourse, the reality of sustainability of water supply projects remains indefinable. The widespread failures in water supplies have been attributed to a number of flaws in the water projects; the intervention was not desired by the community, the capital and/or re-current costs are too high for the community, lack of ownership results in neglect of maintenance and repairs, the promised benefits don't materialize, education programs in the construction and maintenance of water projects infrastructure are too short and trained members of the community move away or lose interest (Mercy Wacheke Muraya, 2011).

Management of water points is an important aspect of sustainable delivery of water resources to both the rural and urban populations in Kenya. Currently, there seem to be low level of community participation of rural water supply in Kenya, leading to low levels of ownership at community level. The sustainability rate on water projects in developing countries is alarmingly low, due to a lack of resources, capabilities and spare parts for service and maintenance (Margaret Nduta et al., 2018). Government of Rwanda ensures the increased sustainability and access to safe and clean water through improving operations and maintenance of existing water supply infrastructure and providing new water facilities (MINEFRA, 2019).

According to the Water Resources Management Sub-Sector Strategic Plan (2011–2015), the main drivers for water demand in Rwanda are rapid population growth, poverty, and climate change. Environmental degradation in wetlands is high due to uncontrolled poor settlements, and water pollution is abundant, as storm water protection systems and disaster management is barely existent. Historically, water management and water supplies and sanitation were managed by one water unit; however, since the separation of water supply and water resources management (under MINIRENA, established in 2011) the different mandates are clearly defined and anchored in relevant enabling policies and strategies for each water sub-sector (MINIRENA, 2012).

Rwanda is listed among members that experience water scarcity and access challenges, however as per the goal of Ministry of infrastructure of Rwanda, 100% of households in Rwanda will access drinking water by 2024. The arid and semi-arid lands occupy 80% of Rwanda's land surface. Out of the country's population of 5 million people; 25% derive their livelihoods from the arid and semi-arid lands (GOK Survey, 2010). Several development projects in Rwanda were started by multilateral and bilateral donors, country and national governments, public private partnerships, and non-state actors to reduce the impacts and mitigate the effects of water scarcity in Rwanda. Water accessibility and availability to rural households are one of the main strategic interventions that have always been considered by the Government of Rwanda (MINEFRA, 2019).

Kanzenze Water Supplies is in Ntarama Sector; Bugesera District which has benefited with the development of various water projects through the neighboring communities of Kanzenze. the Kanzenze-Karumuna water supply system of 35kms was also extended. The Construction, extension, rehabilitation of 352.2 kms of WSS in Rural Areas to serve 190,947 people and the rehabilitation of 36 non-functional rural water supply systems. The projects developed is guided by the existing water policies for ensuring sustainability and government ownership. It is only by promoting an integrated water management approach and development of proper planning mechanisms that ensures water resources are managed sustainably to enhance accessibility and conservation of catchment areas that most water projects developed in the rural areas have lasting impacts (Bugesera DDP, 2018).

Kanzenze Water treatment Plant is in operation since 10th February 2021. Currently, in order to balance the incoming water from the Plant to the existing network while optimizing the plant to its full production capacity, the plant is to produce water gradually, from 5,000m3/day to 40,000 m3/day by the 1st week of March 2021. Water shortage issues in the City of Kigali and Bugesera District by replacing existing old water networks and constructing new ones, to reduce water scarcity.

2. STATEMENT OF THE PROBLEM

Despite efforts by the Government of Rwanda and other partners to implement water supply projects, nearly twenty-five to thirty per cent of newly completed projects in rural areas are reported as not functioning within the first three years after completion. Shockingly, statistics indicate that 63% of water projects fail shortly after implementation, adversely affecting project sustainability (ODA, 2014).

The prevalence of non-functional water supply projects is a common phenomenon across the country, posing a significant threat to effective water coverage and access for communities. If the current trend of poor performance of water supply projects persists, rural water facilities risk becoming entirely non-functional, further exacerbating the challenge of access to safe water. This deterioration in project functionality is evident in cases such as the Kanzenze-Karumuna water supply projects in the Bugesera District, where many projects have either ceased operations or require extensive rehabilitation efforts to restore functionality (ODA, 2014).

Additionally, approximately 30-40% of community water supplies struggle to provide services due to issues related to poor governance, conflicts among members or management committees, and inadequate maintenance regimes (ODA, 2014).

Without targeted interventions to improve project performance and address governance challenges, the goal of providing universal access to safe water and sanitation services in Rwanda will remain elusive, perpetuating the cycle of water insecurity and hampering socio-economic development efforts. According to the background and the studies reviewed of literature, they have contributed much to current study in water supply projects; but, none of these studies has looked at determinant of water supply projects performance in Rwanda especially Bugesera District, as an indicator of scarcity/shortage of the studies talking factors affecting water supply extension projects in Rwanda. Therefore, the study assessed the factors affecting water supply projects performance in Rwanda with case study of Karumuna-Kanzenze water supply network extension project in Bugesera District.

3. OBJECTIVES OF THE STUDY

The general purpose of this study assessed the factors influencing water supply projects performance in Rwanda.The specific objectives of this study were as follows:

[1] To determine how community participation, affect performance of Karumuna- Kanzenze water supply network extension project;
[2] To establish how water infrastructure, affect performance of Karumuna- Kanzenze water supply network extension project
[3] To establish the effect of project management on performance of Karumuna- Kanzenze water supply network extension project
[4] To assess the influence of maintenance funds on performance of Karumuna- Kanzenze water supply network extension project.

4. RESEARCH HYPOTHESIS

This study verified the following null hypothesis:

[1] **Ho1:** The community participation does not affect the performance of Karumuna- Kanzenze water supply network extension project;
[2] **Ho2:** Water infrastructure does not affect the performance of Karumuna- Kanzenze water supply network extension project;
[3] **Ho3:** There are no significance effects of project management on the performance of Karumuna-Kanzenze water supply network extension project;
[4] **Ho4:** There are no significance influence of maintenance funds on the performance of Karumuna- Kanzenze water supply network extension project.

5.CONCEPTUAL REVIEW

Water Supply Projects Performance: According to Lockwood (2014), Water supply project means any work relating to the acquisition, construction, improvement, repair or reconstruction of all or part of any structure, facility or equipment, or real or personal property necessary for or ancillary to water supply facilities that meets the requirements. Water supply project means the planning, design, construction, improvement, or acquisition of facilities, equipment, sites, or buildings for the supply, control, treatment, distribution, and transport of water supplies to ensure the integrity and quality of such water including compliance with the federal Safe Drinking Water Act and other applicable federal and State drinking water supply standards (Kumar, 2012).

Community participation: according to Munguti (2014), Community participation can be loosely defined as the involvement of people in a community in projects to solve their own problems. Community Participation is defined as the involvement of people in a community in projects to solve their own problems. People cannot be forced to 'participate' in projects which affect their lives but should be given the opportunity where possible. The focus of this chapter is to provide an explanation for the term "community participation," a concept central to this research report. The definitions presented by various theorists have been presented in an effort to give a comprehensive overview of the term. Following closely the definition of community participation, are also discussed critical issues related to it such as the stages and levels of participation and the need for it.

Passive type of participation: there is an appropriate place for even the most passive type of participation. The newsletters and email blasts you send out to your community, for example, are a form of Passive Participation. There is no need for these types of communication to be two-way. Indeed, many of the recipients (audience) probably prefer to keep their participation at this level. Likewise, Information Giving is what often happens when you conduct surveys of your community. For example, when you collect feedback after an event.

Participation for Incentives: according to Nyong &Kanaroglou (2011), Participation for Incentives is where things start to get tricky. It's also where a lot of communities often get stuck. While incentives are the easiest way to motivate communities, it's not very sustainable. Most incentives can't last forever, so it takes quite a bit of overhead to keep the community going by relying on them. Instead use Participation for Incentives for short-term endeavors with a clear goal for example, offering a free course that introduces new people into your community.

Functional Participation: according to Owuor & Foeken, (2009), Functional Participation gets you a lot closer to sustainability. However, leadership (i.e., decision-making) is still stimulated externally from the community. This type of participation is sort of like hand holding, where the community manager still needs to do quite a bit of the back-end work in order to motivate the community to take charge. It's also often a means to an end, such as when you've got a project with a clear goal that benefit from a community-based approach.

Interactive Participation: according to Prokopy S., (2015), iinteractive Participation is where you want to be for community activation. It means that you've made the right amount of space to empower people, and created systems of autonomy for your community. With Interactive Participation, people feel comfortable making decisions that affect the community overall, and don't feel like they need your permission to do so.

Water Infrastructure: Water infrastructure is a broad term for systems of water supply, treatment, storage, water resource management, flood prevention and hydropower. The term also includes water-based transportation systems such as canals. The infrastructure consists of vast numbers of groundwater wells, surface-water intakes, dams, reservoirs, storage tanks, drinking-water facilities, pipes, and aqueducts (Suddaby, 2010).

Project Management: Project management is the application of processes, methods, skills, knowledge and experience to achieve specific project objectives according to the project acceptance criteria within agreed parameters. Project management has final deliverables that are constrained to a finite timescale and budget (Redclift, 2014).

Maintenance Funds: Maintenance fund means the proceeds of a special assessment to be levied annually for the purpose of upkeep, administration, and current expenses (Sirmon, & Ireland, 2013).

6.THEORETICAL REVIEW

Community Participation Theory

Douglas McGregor formulated the community participation theory. He gave two distinct views of human being based on participation of workers. Midgley et al (1986) suggested that the historical antecedents of community participation include: the legacy of western ideology, the influence of community development and the contribution of social work and community radicalism. Community participation theory propounded by Khwaja (2014) is also consulted and used for the present study. The community participation theory assumes that community participation has a real influence on the decision, that is: greater community participation makes it less likely that the decision is determined by the external agency (Khwaja, A. I., 2014).

Participation of people is of utmost essence while identifying a project. If their participation is ensured, they can best fit the need, nature and type of project according to their own need as well as challenges and constrains. Moreover, their participation in project identification imbibes the sense of ownership among them which help during the implementation of the project in question (Harvey and Reed, 2013). In community participation theory, focuses are given on the participation of beneficiaries, and not that of government personnel in the development project. The joint or collaborative involvement of beneficiaries in groups is a hallmark of community participation; and that community participation refers to a process and not a product in the sense of sharing project benefits. Community Participation theory stands for the general assumption that the higher the community participation in a decision, the lower the likelihood of the interferences of external organizations on that decision (Munguti, J.M. , 2014).

Institutional Theory

Institutional theory is a predominant theoretical tool within the field of organization studies. Institutional theory has its roots in the scholarly understanding of institutions as monolithic, permanent structures invested with socio-cultural meaning, and governing social behaviors. Institutional theory was introduced in the late 1970s by John Meyer and Brian Rowan as a means to explore further how organizations fit with, are related to, and were shaped by their societal, state, national, and global environments. The theory was developed to study what were perceived by scholars as the institutional qualities of organizations: their stability, and the rule-like structures they exhibit which shape and constrain members' behaviors (Batchelor, S., McKemey, K. & Scott, N., 2010).

Institutional theory was subsequently used to examine how organizations and their behaviors acquired myths and meanings which contribute to formal organizational structure, but which are not able to be understood as the products of organizations' practical demands. The scope of institutional theory has steadily expanded to include its application to the study of how, through institutional pressures, organizations come to resemble each other, how individuals exercise power within institutional environments, and how institutions change. Institutional theorist Roy Suddaby even goes so far as to say that institutional theory has become ubiquitous within organization studies, being applied by default to any and all questions within the field (Suddaby, R., 2010).

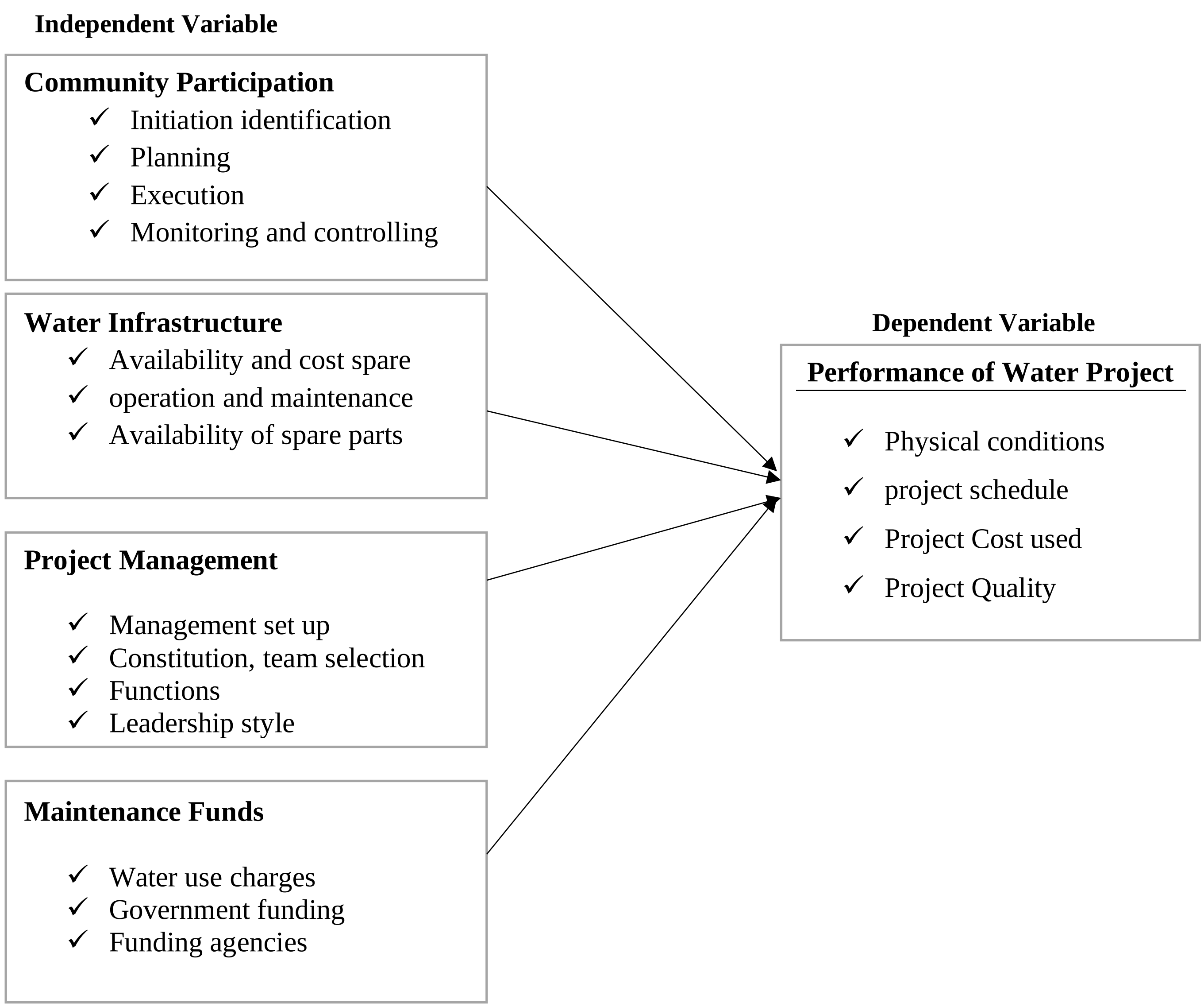
Resource-based theory

The theory grew largely out of Penrose's (1959) study, in which she cites unused managerial resources as the primary driver of growth. Penrose recognized that internal managerial resources are both drivers and limits to the expansion any one firm can undertake. The currently dominant view of resource-based theory is based on the concept of economic rent and the view of the company as a collection of capabilities. This view of strategy has a coherence and integrative role that places it well ahead of other mechanisms of strategic decision making (Kay, J., 2015). The theory offers critical and fundamental insights into why firms with valuable, rare, inimitable, and well-organized resources may enjoy superior financial performance. The main contribution of the resource-based view lies in the notion of competitive advantage. The resource-based view of the firm, which envisions firms as a bundle of resources, is probably the dominant theory for explaining differences in performance among firms today (Barney, J. B. &Arikan, A. M., 2011).

Despite the varied positioning of early resource-based contributions, each focused on the distinctive resource profiles of heterogeneous firms and the question of why some firms consistently outperform others (Carmeli, A. , 2010). A portion of the most important of the research to shape resource-based thought is rooted in the early research on distinctive competencies, Ricardian economics, and the theory of firm growth proposed since concepts from that historical research influenced the fundamental assumptions of the model. The resource-based view suggests that a firm can create sustainable competitive advantage through developing its unique resources and capability. The difference between providing short-term competitive advantage and that which is sustainable resides in the notion that these resources are heterogeneous in nature and not perfectly mobile (Barney, J. B., 2012). Managers are not static in the RBV, but instead they are called upon to structure, bundle, and leverage their valuable resources in unique ways to maximize their contribution to providing sustained advantage. Literature on the resource-based view already provides resources which contribute to the formulation of sustainability-related strategies, such as continuous improvement, a shared vision within the church-based organizations, high order learning, relationships with external stakeholder's involvement green supply chain management practices, international experience, working capital management skills, organizational slack and political management capabilities. However, this literature emphasizes how these resources affect an organization's environmental or social performance and ultimately its financial sustainability (Sirmon, D. G., Hitt, M. A. & Ireland, R. D. , 2013).

7. CONCEPTUAL FRAMEWORK

The independent variables included community participation, water infrastructure, project management and maintenance. They were considered as independent variables and analyzed in relation to how they influence the dependent variable which in this case is performance of water supply project in Rwanda. This was represented in the following schematic form, as developed in figure 1 below.



Source: Researcher conceptualization (2023)

Figure 1: Conceptual Framework

8. RESEARCH METHODOLOGY

Descriptive research is a study designed to depict the participants in an accurate way. More simply put, descriptive research was all about describing people who take part in the study. Descriptive survey design was considered in this study to demonstrate associations or relationships between the variables. This research design was measured most appropriate since the unit of analysis was the community water project in Kanzenze. This design involved description of the possible behaviors, characteristics, values and attitudes of a particular phenomenon, and the researcher used correlative approach to establish the assessment of determinants of water supply project performance in Rwanda, having Kanzenze-Karumuna water supply project.

A sample is as a smaller group or sub-group obtained from the accessible population. The study used all population of 120 respondents as sample size using universal sampling technique or census survey. To select the respondents participated in this research, the researcher used purposive sampling technique. Purposive sampling also known as judgment, selective or subjective sampling which is a sampling technique in which researcher relied on his or her own judgment when choosing members of population to participate in the study. The questionnaire had four major parts section and each section contained concerning each objective.

Questionnaire in this study is a set of related questions design to collect information from respondents. A sequence of questions is designed to gather information about this study. Questionnaire was chosen because of the following advantages: it saves time since many respondents are dealt with at once, it allowed easy analysis of data collected, it is easy to administer when the sample is literate. Documents in this study referred to any written materials that may be used as a source of information about the subject. Data were revealed from documentary review especially textbooks, magazines, internet source, and any other documents that was deemed necessary and reading books. These techniques allowed to collect data and information from different books, reports, texts and dissertations as well other documents regarding project implementation. In editing the researcher scrutinized and verified the questionnaires in order to avoid errors and repetitions. Tabulation means putting data in some kinds of statistical tables through which the number of occurrence of responses to a particular question is shown. Statistical Package for the Social Sciences (SPSS) and Excel were used by researcher in processing and analysis, of data which informed the presentation of findings, analysis and interpretation. The descriptive Statistic methods were the term given to the analysis of data that helped to describe, show or summarize data in a meaningful way.

The Spearman (Pearson) correlation coefficient measured the extent to which, as one variable increases, the other variable tends to increase, without requiring that increased to be represented by a linear relationship. Statistical correlation is measured by what is called coefficient of correlation. Its numerical value ranges from +1.0 to -1.0. It gives us an indication of the strength of relationship. In general, $r > 0$ indicates positive relationship, $r < 0$ indicates negative relationship while $r = 0$ indicates no relationship (or that the variables are independent and not related). Multiple Linear Regression analysis models was adopted to show relationship using equation econometric models as formulated: Y is Water Supply Project Performance; X: factors of water supply project performance:

x1: Community participation

x2: Water infrastructure

x3: Project management

x4: Maintenance funds; however, y=f(x) so, $Y= \beta 0+ \beta 1\chi 1+ \beta 2\chi 2+ \beta 3\chi 3+ \beta 4\chi 4 +\alpha$

9. FINDINGS AND DISCUSSIONS

Data were collected from 120 respondents responded to the questions. Findings showed the participation rate of 100.0% in responding, and this allowed to continue the study with data editing, coding recording, classifying and make statistical tables and graphs as analyzed quantitatively using computer software of SPSS IBM 23.0 version.

Table 1: Socio-Demographic Characteristics of Respondents

Respondents profile	Data	Frequencies	Percentages
	20-29years	17	14.2
Age	30-39years	52	43.3
	40-49years	31	25.8
	50-59years	17	14.2
	60years and above	12	10.0
	Total	**120**	**100.0**
Gender	Male	63	52.5
	Female	57	47.5
	Total	**120**	**100.0**
	Master's degree and above	14	11.7
Level of Education	Bachelor's Degree (A0)	61	50.8
	Diploma (A1)	45	37.5
	Total	**120**	**100.0**
Experience in the Water Projects	Less than 1year	9	7.5
	1-5years	73	60.8
	5-10years	30	25.0
	Over 10years	8	6.7
	Total	**120**	**100.0**
Number of executed water projects in the last 10 years	0-3 projects	23	19.2
	3-5 projects	48	40.0
	More than 5 projects	49	40.8
	Total	**120**	**100.0**
Experience in recording major variations between cost, time and quality	Yes	62	51.7
	No	58	48.3
	Total	**120**	**100.0**
	1 time	12	10.0
How many times have recorded major variations between cost, time and quality;	2 times	8	6.7
	3 times	52	43.3
	4 times	31	25.8
	5 times	17	14.2
	Total	**120**	**100.0**

Source: *Primary data (2023)*

Findings present social demographic characteristics of respondents; regarding to age of respondents indicated by 14.2% respondents with age range from 20-29years; 43.3% respondents are ranged between 30-39years; 25.8% are from 40-49years; 14.2% are between 50-59years while 10.0% respondents have ages of 60years and above. Concerning to gender of respondents; 52.5% respondents were males while 47.5% of respondents were females. Based on the level of education of respondents; 11.7% have master's degree and above; 50.8% of respondents have bachelor's degree (A0); and the 37.5% respondents have diploma (A1). Experience in the water projects for respondents indicated by 7.5% have less than 1year of experience; 60.8% respondents have 1-5years; 25.0% respondents have 5-10years; and 6.7% respondents have over 10years. Findings show number of executed water projects in the last 10 years; 19.2% respondents have executed between 0-3 projects; 40.0% respondents have executed between 3-5 water projects; and 40.8% have executed more than 5 projects in the last 10 years.Experience in recording major variations between cost, time and quality; 51.7% respondents said "Yes" while 48.3% respondents said "no" about experience in recording major variations between cost, time and quality. The results on how many times have recorded major variations between cost, time and quality; 10.0% have recorded 1 time; 6.7% have 2 times; 43.3% have 3 times; 25.8% have 4times; and 14.2% have 5 times. Concerning gender of respondents; there appears to be a small discrepancy in the reported gender distribution. It's mentioned that 52.5% of respondents were males, while 47.5% of respondents were also males. This seems contradictory; one of these percentages may represent females, but it should be clarified. In regard to level of education; the education level of respondents shows a significant portion with bachelor's degrees (50.8%), followed by diploma holders (37.5%). A smaller percentage holds master's degree and above (11.7%). This information suggests that the majority of respondents have at least some form of higher education, with bachelor's degrees being the most common. In relation to Experience in water projects; the distribution of respondents based on their experience in water projects indicates that a substantial proportion (60.8%) has 1-5 years of experience, which suggests a relatively young workforce in this field. However, there are also respondents with more extensive experience, with 6.7% having over 10 years of experience. Number of executed water projects; respondents' experience in executing water projects over the last 10 years is quite evenly distributed, with 40.0% having executed between 3-5 projects and 40.8% having executed more than 5 projects. This suggests a relatively active group of professionals in the water project field. Experience in recording major variations; a majority of respondents (51.7%) reported having experience in recording major variations between cost, time, and quality in water projects, while 48.3% said they had no such experience. This split suggests that there may be differing levels of exposure to these challenges among the respondents. Frequency of recording major variations; among those who reported having experience in recording major variations, the frequency varies. The highest percentage (43.3%) reported recording major variations three times, indicating that these challenges are not uncommon in water projects. Other respondents reported various frequencies, with 10.0% recording only once and 14.2% recording five times.

Inferential Statistical Analysis

ANOVA provides an F-statistic and a p-value. If the p-value is less than a predetermined significance level (alpha), there are statistically significant differences among at least some of the groups.

Table 2: Correlations Coefficient Matrix between the variables

		Community Participation	Water Infrastructure	Project Management	Maintenance Funds	Performance of Water Project
Community Participation	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	120				
Water Infrastructure	Pearson Correlation	.773**	1			
	Sig. (2-tailed)	.000				
	N	120	120			

Project Management	Pearson Correlation	.808**	.962**	1		
	Sig. (2-tailed)	.000	.000			
	N	120	120	120		
Maintenance Funds	Pearson Correlation	.773**	1.000**	.962**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	120	120	120	120	
Performance of Water Project	Pearson Correlation	.888**	.900**	.934**	.900**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	120	120	120	120	120

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

The Pearson correlation coefficients provided in the table show strong positive relationships between various factors (Community Participation, Water Infrastructure, Project Management, Maintenance Funds) and the Performance of a Water Project. These relationships are statistically significant at a very high level, with a significance level (Sig.) of 0.000 for all the correlations, indicating a p-value of less than 0.01. When interpreting p-values, we often compare them to a predefined significance level (alpha), which is typically set at 0.05 or 0.01. If the p-value is less than alpha, we consider the result to be statistically significant. In this case, the p-values are much smaller than 0.01 ($p < 0.01$), which means that the correlations are highly statistically significant even at a stricter significance level. Here's an interpretation on the results with respect to the 0.01 significance level: Community Participation ($r = 0.888$) has a very strong positive correlation with the Performance of the Water Project, and the relationship is highly statistically significant at $p < 0.01$. Water Infrastructure ($r = 0.900$) also shows a very strong positive correlation with the Performance of the Water Project, and this correlation is highly statistically significant at $p < 0.01$. Project Management ($r = 0.934$) has an even stronger positive correlation with the Performance of the Water Project, and it is also highly statistically significant at $p < 0.01$. Maintenance Funds ($r = 0.900$) exhibit a strong positive correlation with the Performance of the Water Project, and this correlation is highly statistically significant at $p < 0.01$. The Combined factors' influence on Performance of Water Project ($r = 0.962$) has the highest correlation with the Performance of the Water Project, and it is also highly statistically significant at $p < 0.01$. In summary, all these correlations are not only very strong but also highly statistically significant, even when compared to the 0.01 significance level. This indicates that the relationships between these factors and the Performance of the Water Project are robust and unlikely to be due to random chance.

Table 3: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.961[a]	.923	.921	2.37694	.503

a. Predictors: (Constant), Maintenance Funds, Water Infrastructure, Community Participation, Project Management
b. Dependent Variable: Performance of Water Project

The findings presented in the model summary table provide important information about a statistical model used to analyze the performance of a water project. The model includes four predictor variables: "Maintenance Funds," "Water Infrastructure," "Community Participation," and "Project Management," along with a constant (intercept). These variables are used to predict the "Performance of Water Project," which is the dependent variable. R: The R-value (correlation coefficient) of 0.961 indicates a very strong positive linear relationship between the dependent variable, "Performance of Water Project," and the independent variables (predictors) considered in the model. R Square: The R Square value of 0.923 represents the coefficient of determination. It tells us that approximately 92.3% of the variation in the performance of the water project can be explained by the predictor variables included in the model. In other words, the model does a good job of explaining and predicting the outcome variable. This is a modified version of R Square that takes into account the number of predictors in the model. The value of 0.921 is still very high, indicating that the predictors are relevant and collectively explain a significant portion of the variance in the dependent variable. This value (2.37694) is a measure of the accuracy of the model's predictions. It represents the typical error between the predicted values and the actual values. Lower values indicate a more accurate model, and 2.37694 is relatively low, suggesting that the model's predictions are close to the actual values. In summary, the model seems to fit the data very well, with a high R Square and a low standard error of the estimate. The model provides insights into which predictor variables are most influential in explaining the performance of the water project, which can be valuable for decision-making and further analysis.

Table 4: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7830.303	4	1957.576	346.482	.000[b]
	Residual	649.734	115	5.650		
	Total	8480.037	119			

a. Dependent Variable: Performance of Water Project

b. Predictors: (Constant), Maintenance Funds, Water Infrastructure, Community Participation, Project Management

In the context of the ANOVA (Analysis of Variance) table provided above, we have a regression model with null hypotheses (Ho1, Ho2, Ho3, and Ho4). ANOVA is typically used to test whether there are significant differences among the group means, which in this case, are related to the effects of the predictor variables on the dependent variable "Performance of Water Project." Null Hypothesis (Ho1): There is no significant relationship between "Maintenance Funds" and the "Performance of Water Project."

- Sum of Squares (SS) for Regression = 7830.303
- Degrees of Freedom (df) for Regression = 4
- Mean Square (MS) for Regression = 1957.576
- F-statistic = 346.482
- Significance (Sig.) = .000 (p-value)

Therefore, the p-value (Sig.) is very close to 0 (less than the common alpha level of 0.05), indicating that we can reject Ho1. This means there is a significant relationship between "Maintenance Funds" and the "Performance of Water Project." Null Hypothesis (Ho2): there is no significant relationship between "Water Infrastructure" and the "Performance of Water Project." The p-value (Sig.) is very close to 0, which allows us to reject Ho2. This implies a significant relationship between "Water Infrastructure" and the "Performance of Water Project." Null Hypothesis (Ho3): there is no significant relationship between "Community Participation" and the "Performance of Water Project." The p-value (Sig.) is very close to 0, leading to the rejection of Ho3. Therefore, there is a significant relationship between "Community Participation" and the "Performance of Water Project." Null Hypothesis (Ho4): There is no significant relationship between "Project Management" and the "Performance of Water Project." The p-value (Sig.) is very close to 0, meaning Ho4 is rejected. There is a significant relationship between "Project Management" and the "Performance of Water Project." In summary, based on the ANOVA results, we can conclude that all four null hypotheses (Ho1, Ho2, Ho3, and Ho4) are rejected. This suggests that each of the predictor variables, "Maintenance Funds," "Water Infrastructure," "Community Participation," and "Project Management," has a significant relationship with the "Performance of Water Project." These predictor variables collectively contribute to explaining the variation in the dependent variable.

Table 5: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.306	1.021		-3.239	.002
	Community Participation	.633	.072	.386	8.808	.000
	Water Infrastructure	-.021	.040	-.016	-.521	.604
	Project Management	.812	.146	.569	5.575	.000
	Maintenance Funds	.093	.145	.063	.644	.521

a. Dependent Variable: Performance of Water Project

The table provided shows the coefficients for a regression model with the dependent variable "Performance of Water Project" (Y) and four independent variables: "Community Participation" (X1), "Water Infrastructure" (X2), "Project Management" (X3), and "Maintenance Funds" (X4). These coefficients provide information about the strength and direction of the relationships between these independent variables and the dependent variable. Let's interpret and comment on the findings: The coefficient for the constant (-3.306) represents the estimated value of the dependent variable when all independent variables (X1, X2, X3, X4) are zero. The t-statistic (-3.239) and its associated p-value (.002) indicate that the intercept is statistically significant, meaning it is not equal to zero. This suggests that there is a non-zero baseline value for the "Performance of Water Project" even when all independent variables are zero. Community Participation (X1): The coefficient for "Community Participation" (0.633) indicates that for a one-unit increase in community participation, the "Performance of Water Project" is expected to increase by 0.633 units. The standardized coefficient (Beta) of 0.386 suggests that "Community Participation" has a moderate positive impact on the "Performance of Water Project." The t-statistic (8.808) and its associated p-value (0.000) show that "Community Participation" is highly statistically significant. It has a strong and positive effect on the dependent variable. Water Infrastructure (X2): The coefficient for "Water Infrastructure" (-0.021) suggests that for a one-unit increase in water infrastructure, the "Performance of Water Project" is expected to decrease by 0.021 units. The standardized coefficient (Beta) of -0.016 indicates that "Water Infrastructure" has a very weak negative impact on the "Performance of Water Project." The t-statistic (-0.521) and its associated p-value (0.604) show that "Water Infrastructure" is not statistically significant. It does not have a meaningful impact on the dependent variable. Project Management (X3): The coefficient for "Project Management" (0.812) suggests that for a one-unit increase in project management, the "Performance of Water Project" is expected to increase by 0.812 units. The standardized coefficient (Beta) of 0.569 indicates that "Project Management" has a strong positive impact on the "Performance of Water Project." The t-statistic (5.575) and its associated p-value (0.000) show that "Project Management" is highly statistically significant. It has a significant positive effect on the dependent variable. Maintenance Funds (X4): The coefficient for "Maintenance Funds" (0.093) suggests that for a one-unit increase in maintenance funds, the "Performance of Water Project" is expected to increase by 0.093 units. The standardized coefficient (Beta) of 0.063 indicates that "Maintenance Funds" has a weak positive impact on the "Performance of Water Project." The t-statistic (0.644) and its associated p-value (0.521) show that "Maintenance Funds" is not statistically significant. It does not have a significant impact on the dependent variable. In summary, "Community Participation" and "Project Management" appear to be the most influential factors in explaining the "Performance of Water Project." They have strong positive relationships with the dependent variable, and these relationships are statistically significant. "Water Infrastructure" has a weak and statistically insignificant effect, while "Maintenance Funds" also has a weak but statistically insignificant effect on project performance. The coefficients provide insight into the direction and strength of these relationships, aiding in the understanding and prediction of the dependent variable.

10. CONCLUSION AND RECOMMENDATIONS

Conclusion

The study findings provide valuable insights into the relationships between various factors and the performance of the water project. Pearson correlation coefficients demonstrate strong positive relationships between the factors of community participation, water infrastructure, project management, maintenance funds, and the performance of the Water Project. These relationships are not only strong but also highly statistically significant at a very strict significance level ($p < 0.01$). The regression model explains a substantial portion of the variation in the Performance of the Water Project (R Square = 0.923), indicating that approximately 92.3% of the variance can be attributed to the predictor variables. The model's accuracy, as indicated by the standard error of the estimate, is relatively low, suggesting that the model's predictions closely match the actual values. The ANOVA results reveal that each of the predictor variables, including Community Participation, Water Infrastructure, Project Management, and Maintenance Funds, has a significant relationship with the Performance of the Water Project. All null hypotheses related to these predictor variables were rejected, indicating their meaningful impact on the dependent variable. The coefficients provide detailed information about the direction and strength of the relationships between the predictor variables and the Performance of the Water Project. Community Participation and Project Management are identified as highly influential factors with strong positive effects, while Water Infrastructure and Maintenance Funds have weaker and statistically insignificant effects. In summary, the study findings suggest that improving Community Participation and Project Management can lead to better performance in water projects. These two factors have the most substantial and statistically significant positive impacts on project performance. Water Infrastructure and Maintenance Funds, while still important, have weaker and statistically insignificant effects.

Recommendations

Based on the study findings, here are some suggestions and recommendations for the Karumuna-Kanzenze water supply network extension project:

Community Participation Factors:

- ✓ Recognize and celebrate the positive perception of community participation in the project. This can serve as motivation for continued engagement.
- ✓ Address the challenges that respondents perceive regarding community involvement. Identify these obstacles and work on strategies to overcome them, ensuring effective and meaningful participation.
- ✓ Continue to actively involve key communities in budget allocation and project planning, as this is crucial for decision-making and fostering ownership.
- ✓ Consider providing training and capacity-building programs to enhance stakeholders' problem-solving skills and technical capacities further.

Water Infrastructure Factors:

- ✓ Maintain the robust implementation of water infrastructure factors that are perceived positively.
- ✓ Continue to emphasize effective planning and projections for water, sanitation, and hygiene infrastructure development.
- ✓ Ensure the proper treatment, rehabilitation, and maintenance of water supply infrastructure to guarantee a reliable and safe water supply.
- ✓ Focus on improving access to sanitation infrastructure facilities as part of public health initiatives.
- ✓ Continue the positive perception of the rehabilitation and upgrading of non-functional water supply systems, especially through cost-effective measures.
- ✓ Expand and improve water distribution networks to enhance access to clean water.
- ✓ Strengthen efforts related to spare parts disposal to maintain the sustainability of the water supply network.

Project Management Factors:

- ✓ Acknowledge and celebrate the positive perception of project management factors in the project.
- ✓ Maintain the strategic thinking and problem-solving capabilities of the project

management team to ensure successful project outcomes.
- ✓ Continue to emphasize the importance of technical and professional expertise within the project management team.
- ✓ Ensure roles and responsibilities are well-defined for project staff to enhance efficiency.
- ✓ Maintain effective and efficient resource utilization to ensure project finances and assets are managed prudently.
- ✓ Strengthen management control to maintain high-quality project implementation.
- ✓ Ensure timely and efficient fund disbursement to prevent financial obstacles.

Maintenance Funds Factors:

- ✓ Recognize the positive perception of maintenance funds-related factors and ensure their continued effective utilization.
- ✓ Address the variability in responses by conducting further investigations to understand the diverse perspectives among respondents.
- ✓ Establish comprehensive planning, budgeting, and management practices to address maintenance funds factors throughout the project's lifecycle, ensuring sustainability and the availability of clean water.

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