PROJECT COST CONTROL TECHNIQUES AND PERFORMANCE OF WATER PROJECTS IN KERICHO COUNTY, KENYA

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DECLARATION

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This project is my original work and has not been presented for a degree in any other University

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DEDICATION

I dedicate this project to my family; late father Mr. Nicholas Bichang'a, my mother Mrs. Julia Jepkosgei, late sister Miss. Betty Nyarangi, Princess Diana Nyaboke, my brothers Brian Ongeri and Elly Haron and friends Gilbert, Cynthia, Sharon and Tony.

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ABBREVIATIONS AND ACRONYMS

BIM:	Building Information Modeling
CBR:	Case-Based Reasoning Model
GDP:	Gross Domestic Product
KEWASCO:	Kericho Water and Sanitation Company
M&E:	Monitoring and Evaluation
PPP:	Public Private Partnership
WASREB:	Water Services Regulatory Board

OPERATIONAL DEFINITON OF TERMS

Project Cost Control: Involves measures and practices identified and adopted to reduce the costs and expenses incurred in project design, implementation and completion. The aim is to manage costs for improved performance outcomes and sustainability of the water projects

Project Cost Estimation: It is determining the volume of raw materials, working hours and labor needed to complete the water project. The cost forecast must consider fluctuations in pricing of products and market variations.

Project Budgeting: It is a formulated plan that compares the cost estimates and actuals and guide the project managers and team members on consumption of project material to avoid overruns, wastage and misappropriation

Monitoring and Evaluation: The action of tracking water project activities so as to identify challenges and mitigate them. It also looks to assessing the progress of the projects and making necessary adjustments.

Project Expenditure Control: Measures put in place and implemented by the water project managers and team members to reduce expenses and ensure costs do not spiral out of control. Regular reviews and setting limits minimize resource wastage and ensure projects keep to the approved budget for project success.

Project Performance: It is about delivery of projects on time and cost and the completed project is as per the standards and specification. A successful project is one that is of high quality and can be sustained for longer for locals to enjoy its benefits.

ABSTRACT

Projects are developed to carter for needs of the people and for socio-economic development of the population and communities. The project implementation phase incurs huge costs and hence the need to incorporate measures in the project plan that will manage costs and lead to successful projects. Many projects experience cost and time overrun, abandonment, stalling, incomplete and under-performing and delivery of poor-quality projects. The same applies to water projects and thus denies the general population and chance to enjoy benefits of the resource and improve their livelihood. As a means to improve project performance, this study focused on project cost control. The main objective was to investigate on project cost control techniques on performance of water projects in Kericho County, Kenya. Cost estimation, budgeting, monitoring and evaluation and expenditure control of projects were the specific objectives. The study variables were anchored on the organizational control theory and supported by the transaction cost theory and the theory of project management. The study applied the descriptive research design and targeted 16 completed water projects as the unit of analysis. Census of all the water projects and respondents were placed in strata hence stratified sampling was employed. There was use of semi-structured questionnaires that was first pilot tested and found to be valid and reliable in collecting primary data. The collected quantitative data was then analyzed using descriptive, multiple regression and Pearson correlation methods and content analysis was done on the qualitative data. Diagnostic test was done using multicollinearity, normality test and autocorrelation revealing the data set and model fit. The findings showed that improvements in performance of the water projects was due to cost estimation using different models, price variations and forecast that helped in reducing cost overruns. Findings showed project budgeting significantly influenced performance of the water projects based on the budget guidelines, reducing risks, budgets informing project decisions and maximum utilization of resources. The monitoring and evaluation function helped improve performance by regular checks on progress of implementation of project plans, improving transparency, accountability and mechanisms. The results showed that project expenditure controls enhanced performance of the water projects setting limits, authorization process to access resources, monitoring costs and implementing cash flow management systems. The study concluded that project cost control techniques of cost estimation, budgeting, monitoring and evaluation and expenditure controls had positive and significant effects on performance of the water projects in Kericho County. The performance improved in terms of quality and sustainability of the project, keeping to the budget lines and completion on time. The study recommended project managers and team to implement cost control techniques for improvement in performance of projects. It also recommended that county governments to train contractors and project managers on budgeting, expenditure control, cost estimation and monitoring and evaluating project activities. It was recommended that the policy makers should formulate regulations and laws that support control of costs for delivery of quality projects.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Projects are planned pieces of work that can be small, medium or large and aim at attaining a specific goal and services delivery to specified group of people. There are many considerations and factors that come into play in an endeavor to deliver a successful project. Madu, Jimoh, Shittu and Tsado (2019) shared that highly performing and successful projects are the ones that are delivered on time, keep to the stated budget lines, offer quality to the beneficiaries and they are sustainable for a long period of time for enjoyment of its benefits. In projects, its key features are inherent in time, scope and quality of the finished works. Lu (2019) noted that successful projects are determined by elements of project management including aspects such as management of the scope, the time, the resources, procurement process and stakeholders. It also encompasses elements of communication, resources and cost management and cost control aspects. Any project incurs costs and demands for different resources as a way to deliver on the projected service or product and the issue of cost overruns is of great concern to project managers (Karunakaran, Abdullah, Nagapan, Sohu & Kasvar, 2018). In this case, the study

Chipulu, Mwanaumo, Mwiya, Haabazoka and Chisumbe (2019) shared that cost is an important consideration and indicator of project success. Due to the materiality of projects and the huge demand for different resources that increases the costs of project; it is therefore prudent to put in measures for effective management and control of project costs. Lukale (2018) noted that project managers of different projects are thusly bound to give serious consideration to the aspect of project costs. Inability to control and manage costs lead to increased overall project cost, decrease investors' confidence in project outcomes and negatively impact the performance of the overall project. Thus, it is important to install measures for effective cost control measures that include planning and proper budgeting, monitoring expenses, using modernize systems and tools in operations and tracking earned value (Joseph &

Caleb, 2021). It is also about properly managing time and keeping all project activities as per the schedule and actively addressing any variances between the projected estimates of the costs in the budget and actual incurred costs.

Dealing with costs only will not have great impact on the project unless it is roped in with project cost control, as the latter is linked to increased outcomes due to reduction of expenses. Akeem (2017) revealed that cost control measures are instigated immediately a project is initiated. The project cost control is important since no project can meet its budgetary requirements without it, and when exceeding the budget leads to clients with unmet expectations, inability to deliver projects on time and making compromises on raw material quality that negatively affects the finished product. When the project costs are not managed it results in loss of revenues, increased labor costs that is linked to delays in project and unsatisfied project owners and beneficiaries (Yismalet & Patel, 2018). Controlling costs in projects considers estimation of labor needed, the raw materials, tools and equipment and having measures to keep to the budget estimates and installing measures to reduce expenses. The result is improved project outcomes and benefits to the investors, project owners and beneficiaries.

Water is essential to human, animal and plant life and hence insufficiency in its supply affects the quality of life and decreases opportunities for growth and development. The threshold for fresh water source is set at a minimum level of $1000m^3$ and any nation that falls below that must make other arrangements to supply the resource to its people. Delmon (2021) shared that water projects impact the growth and development of economies as a source of living by directly selling and distributing it. It is also used in production of goods and services including agricultural produce through farming activities, manufacturing of different products and a travel way. Saad and Taleb (2018) revealed that 5% of European's GDP is based on water as its driver and investment of US$1Million in water supply infrastructure leads to generation of 20 more jobs for the people. There are approximately 1.2Billion jobs across the globe and sectors that depends on water supply such as recreation, manufacturing, agriculture and transportation. There is an

increase in returns to the economies that invest in water supply, infrastructure and sanitation projects (Bhorat & Kimani, 2018).

In the global scene, Karadimos and Anthopoulos (2021) shared that Greece contractors improved the performance of their projects by bring down the project costs. The prediction of actual project cost, estimating the entire project duration and costs helped the contractors keep to the budget and deliver the finished project on time. The budgeted cost and comparison with the estimates and actual costs led to high quality finished projects. In China, Wang, Mei, Kong and Xiao (2019) shared that success of the construction projects largely relied on cost control elements such as budgeting, cutting down expenditures and closely monitoring costs and progress of the projects. In Singapore, Hwang, Shan, Zhu and Lim (2020) noted that cost overrun was prevalent in mega projects, informed by deficiencies in cost control measures including forecasting, using of software and knowledge on cost control. These led to poor performance of the mega projects and demands for information sharing and strategies for controlling project costs. The systems and structures in developed nations are different to the scenes in developing nations and as such the differences created a need to cover project performance in a developing nation like Kenya.

Regionally, Joseph, Egwu, Agbo and Nnadi (2020) revealed that adopting project cost control increased the effectiveness of managing risks in construction industry and improved its performance. The cost control measures equaled reduced cases of abandoned projects while improving completion rates and keeping to the budget lines, however there is need to consider water projects. Madu, *et al.* (2019) noted that large projects in Nigeria suffer due to complexities and problems in planning, budgeting and controlling costs due to large number of activities, functional areas and people. The delivery of the projects can also be hampered by cost and time overruns and loss of materials through theft and obsoleteness. The ideal cost control techniques include cost estimation, forecasting, budgeting and control of expenditures. In Ethiopia, Gidey (2019) shared that cost management in projects with aspects like cost estimation, cost budgeting, cost planning and monitoring helped in attaining project goals. The involvement of project team members in cost management improved project

performance. Seliudi (2019) noted that cost and delay overruns in groundwater projects is dependent on project management, planning, execution and control.

In Kenya, Waithira and Onjure (2020) argue that cost of inputs, advancing technologies and challenges in the markets hampered the success of farming projects. Thus, to improve the projects' success rate and meeting of customer and market demands at the lowest costs, there is a need of adopting cost control measures. The project managers need to plan, estimate costs and returns, budgeting, monitoring and controlling costs. Mutya (2018) revealed that cost control aspects of budgeting, standard costing and cost control led to improved organizational performance. It was evident that cost control improved performance of the firms in the study. Oyolla (2019) shared that many projects in Kenya fail to be completed due to cost and time overruns. There is a big challenge in controlling costs during construction of road projects. There is need for adoption of financial control systems, management of labor, keeping to project schedule and project design to cut cost of road construction projects. Cost controlling had a positive effect to outcomes of the road construction projects. But it is important to consider performance water projects and thus the focus of the current study.

1.1.1 Performance of Water Projects

In consideration of the huge costs incurred during the implementation of projects and especially mega-projects, it is important to evaluate the project implementation progress to ascertain if it will lead to success of the overall project (Ali & Muathe, 2020). Projects are said to have performed well, if it keeps to the standards set, the final product or service is of high quality and the project is delivered on a timely and cost-effective manner. To attain high performing projects, Mbugua and Winja (2021) maintain that there is need to consider project management elements and get the right staff to handle different phases of the project. Other elements include having clear communication channels, involvement of all stakeholders, sufficient budget and well-knowledgeable and experienced staff. Performance of project as shared by Shani, Owino, Ogutu and Iraki (2021) adopts these metrics in its measurement, productivity, delivering value, customer and employee satisfaction, returns on the investment made and cost variance.

For the water projects, performance can be a measure of keeping to the specified budget through cost cutting measures, effective use of resources and returns made on the investment. It is also about aspects of higher service delivery, sustainability aspects of the water projects, cutting operational costs and high quality of the project to satisfy the beneficiaries (Tariq & Zhang, 2020). In this study, performance of the water will be measured basing it on timely delivery of the final project as it aligns with the project time scope. This will imply that all project phases are implemented as per the scheduled and planned timeline, such that eventually the final project can be handed-over to the users on time (Muema & Ngugi, 2021). The performance is also based on maintaining the project budget through installation of cost control measures, putting strategies to properly estimate expenditures and avoid wastage of financial resources. All measures must be applied to avoid cost overruns or else the risks of project failure will keep increasing and this is part of the responsibilities carried by the project managers (Waithira & Onjure, 2020).

The water project performance was also based on quality of the finished product, such that it aligns with the project specification. Quality water projects need highly skilled and experienced staffers to be used during the implementation phase. Feghaly, El Asmar and Ariaratnam (2021) the quality of the water projects is also an aspect of standards set by the construction boards and the demands of the stakeholders, project owners and beneficiaries. The final project must attain qualities and features that satisfy the project owners and users. Lastly, performance of the water projects is about the ability to satisfy the expectations of the stakeholders –financiers and developmental partners and the local residents as the users and beneficiaries of the project (Yismalet & Patel, 2018). In general performance of the water projects will be measured in terms of quality project, keeping to the set cost and budget lines, delivery on time and satisfaction of the stakeholders.

1.1.2 Project Cost Control Techniques

Cost control cover the practices of identification and reduction of expenses in an effort to increase returns and profit margins for the organization. The practice equally considers comparison of the actual costs versus the estimates and the budgeted costs and installation of measures to reduce costs at every phase of the project

implementation (Abdel-Hamid & Abdelhaleem, 2021). Cost control in projects involves finding economical ways of operating and prevention of wastes of resources using re-use and recycling measures. Kim (2019) noted that to address the problem of cost overruns, many project management experts advocate for use of cost control measures. According to the Project Management Institute (PMI, 2017), cost control is the adopted processes to monitor the project status through updating the budgets and the cost baselines. The monitoring will inform decisions on managing project costs and growing the profit margins and returns from the outcomes of the overall project. Similarly, Adjei, Aigbavboa and Thwala (2018) view cost control as comparisons made between the actual results, the deviations made and corrective measures undertaken to ensure proper cost management. Keen monitoring will allow the project managers to note the cost variances and make immediate changes to avert the issue of cost overrun and eventual failure of the project.

Cost control in this investigation is about cost estimation, budgeting, monitoring and evaluation and expenditure controls. On the first element cost estimation, Xue, Jia and Tang (2020) share that it is about determining the volume of materials and hours of labor needed to deliver the finished project. It is equally important to accurately estimate the costs and consider fluctuations in pricing of raw materials, hiring of tools, equipment and labor requirements. Cost estimation is also a measure of forecasts to gain insight on drivers of cost overruns and making comparisons of the actual and estimated project costs. Cost forecasting can be done using standard project forecasting method and regularly updating team members on project costs and taking corrective actions when cost variances are noticed. It is also about predicting the quantity of resources needed for delivering the finished project and includes breaking down the project scope to smaller parts and assigning materials and their costs (Love, Ahiaga-Dagbui, Smith, Sing & Tokede, 2018).

Project budgeting involves creating a budget for a new project including baseline that help to remove instances that can lead to budget overruns. The budget will enable the project management team to calculate an accurate cost of the whole project and understand where and when variations occurred and take corrective actions (Abdel-Hamid & Abdelhaleem, 2021). Project budgeting include looking at the variable and

fixed costs as well as the operational costs that will be incurred during the implementation of the project activities. Mutya (2018) noted that the most effective cost control goal is keeping the project within the limits of the budget. The budget helps in converting plans into action plans by allocating resources to each activity.

On cost monitoring and evaluation (M&E) covers aspects of identifying and mitigating issues that might negatively affect the scope, timelines, budget and quality of the project. Jones (2019) noted that M&E includes tracking all project activities and accompanying costs. It is also about assessing and appraising the project plans and continually checking for changes and then adjusting and re-adjusting the plans and costing to align the projections, expectations and the final outcome. Chege and Bowa (2020) noted that M&E will inform on project completion date, the budget and costing considerations, prioritization of activities, the working conditions and re-assessing resource and material requirements. All these elements affect the cost and expenses and if well managed ensure proper control of costs that improve project outcomes (Odhiambo, Wakibia & Sakwa, 2020). In mega-projects, the management invests in proper cost monitoring and control systems to report the cost estimations, the actuals and deliverables. Monitoring is a requisite element to cost controlling and evaluations informs decision makers whether everything is going to plan and what changes need to be made to attain the overall project goals.

On expenditure controls, Kim (2019) revealed that all projects incur expenses and their success is determined by control measures input by the managers such that the expenses do not spiral out-of control. This can be achieved through regularly monitoring the expenditures and comparison to the budget. Essential, it includes checking the actual costs against the cost estimates and ensuring corrective measures are taken. Expenditure controls is about not having cases of financial shortfalls. Expenditure controls is also about regular reviews, collecting accurate information on matters costs and taking cost cutting measures (Agarwal, Rainey, Steinberg, Rahman, Perrons & Brown, 2020). Controlling expenditures is difficult but must be done and project management team has to take the lead by putting limits on financial utilization. It might require authorization by managers before a certain project expense is assumed as a way to keep to the approved budget.

The study explored more on cost control techniques in projects by investigating deeper on aspects of cost estimation, budgeting, monitoring and evaluation and expenditure control and their influence on performance of the water projects.

1.1.3 Water Projects in Kericho County

Water scarcity is common feature in Kenya, such that the country has 647m^3 of fresh water against the recommended minimum level of 1000m^3, and hence efforts have been made to invest on water projects to supplement the demands. To achieve this, the national government has prioritized the provision of quality, clean, affordable and sustainable water and sanitation services. There have been reforms in the water sector and devolving the function to county governments is aimed at improve the provision and supply of water services to the locals (WASREB Impact Report, 2018). The Kericho County Government receives water and sanitation services from Kericho Water and Sanitation Company (KEWASCO) that aims at providing safe and clean water to the residents. The company has had challenges in service delivery based on high operational costs, poor revenue collection, water interruptions and irregular supply. These issues have led to construction of water projects at different locations that are managed by local water resources committee members. The limited natural water sources from rivers and rainfall, demands alternative manmade sources of water like water pans, dams and boreholes for the residents of Kericho County.

The Kericho County Government has initiated and completed sixteen (16) water projects spread across all its six sub-counties to help in delivering clean and safe water. The water projects help the residents in accessing water from close quarters to their homes. Some of the water projects have been reported to have issues with misappropriation of funds, limited funds and wastage of resources and this has had negative impact on service delivery and performance of the projects (Siele & Tibbs, 2019). There have been cost, time and schedule overruns in the projects due to mismanagement of funds, political interferences, planning and budgeting inadequacies and insufficiency of financial resources. The water projects have helped in solving the issues of distance and access to water as a resource, but questions still linger on infrastructure and costing and budgeting elements of the projects. The delivery, performance and sustainability of the projects have been poor meaning that

the residents of the county still need to walk longer distances in search of clean water. In attempt to improve performances of the water projects, this study will look at project cost control. The study was carried out to empirically show the effect that cost control techniques will have on performance of these water projects.

1.2 Statement of the Problem

Projects as planned pieces of work are identified and implemented to attain specific goals like socio-economic development and provision of essential services. So, when they fail to be delivered on time, as per the cost estimates and quality, the goal remains unattainable. Attaining high performance in projects is a challenge in many developing nations as most fail to be completed in time, as per budget and stated standards and quality (Kosgei, 2021). In Kenya, there is a high number of projects that are abandoned, incomplete, incur cost and time overruns and poor quality. This has denied the general population a chance to enjoy the benefits and improve the quality of life. The issue is worsened when the project is meant to provide an essential product to life, as the case of water projects and especially in areas lacking sufficient natural sources. Therefore, Muema and Ngugi (2021) argue that cost control is an important aspect in eliminating unnecessary costs, avoiding wastage during implementation and increasing project success.

Water coverage in Kenya stands at 55% and sewerage services stand at 16% which is low compared to the projection of 80% (The Water Services Sector Report, 2017). The focus has shifted to water projects to supply the resource for livelihood of the people. Thus, the masses continue suffering and face worsening conditions linked to climate changes that causes low rainfall quantities and infrequent rainfall patterns. The Kericho County 2017-2022 CIPD report, shows that access to safe clean water is low, as there are only 2 large water projects and a projection to increase it to 12 at a cost of ksh.140Billion. The TILIBEI and KEWASCO report (2023) indicate that only 45% of water projects have been completed and fully functional and this accounts for low access to clean water. This is indicated as 31% of rural residents and 62% of urban residents have access to water.

Siele and Tibbs (2019) noted that disconnection of water supplies and incompletion of water projects has left the residents of the county in dire need of clean safe water. The Annual Development Plan (2019) report that there are stalled projects like the Chuboit water project that used up over ksh.3.8M and another water project in Momoniat location; leaving 100,000 residents of Kipkellion Sub-County with no water source. There are also delays in project delivery such as the case is of the Kimugu water project that was to serve 200,000 people and supply 13M liters of water. There was also poor workmanship and quality of the project was low as is the case of Chepcholiet water pan and spillway and which stands incomplete. The water committee report (2018) was such that some projects have been used as conduit for squandering public funds as is the case of Kapchumba, Tabule and Chemila water projects. Thus, need to seek means of improving performance of the water projects to serve the people of Kericho. This study will consider effect of project cost control to improve performances water projects.

Several studies have been done on cost control and performance, such as Waithira and Onjure (2020) on performance of fish farming projects as influenced cost control practices in Kiambu County. The improved performance of these projects was due to practices of financial training, standard costing and budgeting. The gaps created were based on context being fish-farming projects in Kiambu and conceptualization of cost control is different from the present study. Joseph, *et al.* (2020) investigation was on project cost control and managing risks in the Nigerian construction industry. The results showed effective project cost control improved the quality of risk management by reducing conflicts and project delivery. The study gap is in context as it was done in Nigeria and conceptually, there was no mention of performance of projects. Hussein (2020) study was on project performance at the water sector trust fund as influenced by monitoring practices. Findings revealed that monitoring plans, tools, techniques and practices significantly affected the performance of the projects. The study created gaps in concept by covering one element of cost control measures.

The challenges in performance of projects and issues faced by water projects in Kericho County and the identified gaps in the reviewed studies; created a need for further investigation in the area. The identified contextual, conceptual and knowledge

gaps in research were filled by investigating on project cost control techniques and performance of water projects within Kericho County, Kenya.

1.3 Study Objectives

1.3.1 General Objectives

The main objective of this study was to investigate the effect of project cost control techniques on performance of water projects in Kericho County, Kenya

1.3.2 Specific Objectives

The study was guided by these specific objectives:

i. To assess the effect of project cost estimation on performance of water projects in Kericho County, Kenya
ii. To determine the effect of project budgeting on performance of water projects in Kericho County, Kenya
iii. To find out the effect of project monitoring and evaluation on performance of water projects in Kericho County, Kenya
iv. To determine how project expenditure control affects the performance of water projects in Kericho County, Kenya

1.4 Research Questions

i. How does project cost estimation affect the performance of water projects in Kericho County, Kenya?
ii. What effect does project budgeting have on performance of water projects in Kericho County, Kenya?
iii. How does project monitoring and evaluation affect the performance of water projects in Kericho County, Kenya?
iv. What effect does project expenditure control have on the performance of water projects in Kericho County, Kenya?

1.5 Significance of the Study

The study findings is of value to the Kericho County Government and its ministry of water, energy and natural resources on identifying the challenges facing the water projects and in turn create measures to improve its performance. The county can learn how best to control costs and expenses of projects as ways to improve its performance and enable the residents enjoy the resources. It can also inform the handling of costs in other projects in the country such as educational, road construction and public building construction projects. Other counties stand to benefit from the current study, as they learn on how to control project costs and improve outcomes for the different types of projects.

The study value to the policy makers both at the national and county level in guiding the formulation of policies and strategies that aim at improving performance of projects. The developed policies and regulations will guide stakeholder's activities in a manner to deliver highly successful projects. The stakeholders will learn on what role they can play to manage project costs and deliver quality projects. The study is of significant to the academic fraternity including scholars, researchers and authors, who can get reference material from the study, also enrich their literature section and suggest areas to conduct future studies.

1.6 Scope of the Study

The study focused on project cost control techniques and its effect on performance in water projects. The project cost control elements that were considered include cost estimation, budgeting, monitoring and evaluation and expenditure control as they influence the performance of the water projects. The study location was Kericho County that has had a problem with supply and distribution of water and specifically focused on the 16 completed water projects. The study theoretical scope was anchored on organizational control theory and supported by the transaction cost theory and theory of project management. The research considered the water projects' performance within the one-year time frame –January to December of 2021. The data was collected from the project managers, project contractors, water committee chairperson and officials at the ministry of water, energy and natural resources at the

county. The study data was collected using semi-structured questionnaires from the respondents and the exercise took two-weeks.

1.7 Limitations of the Study

The study anticipated facing some challenges, such as difficulties in accessing respondents from all the water projects in the county to fill and return the questionnaires. The researcher booked appointments and scheduled meetings with the respondents in a specific area to avoid wasting time and resources. Some respondents were unwilling to share information deemed sensitive and personal, but having the research authorization letter from the university and research permit, helped in gaining their cooperation. The researcher also explained that the information was to be used for academic purposes only.

1.8 Organizations of the Study

The project is in five parts, with the first section discussing the study's background, the problem of the study, the objectives, significance and scope of the study. The second section presents the theoretical, empirical and conceptual framework for the present study. The third section is the research methodology and shares the design to be adopted, the population and sampling techniques that will get the sample size. It also presents the data collection instrument, the procedures to be followed and analysis of the data and its presentation format. The chapter concludes with the ethical considerations that the researcher will abide by. The fourth chapter provided study findings from the conducted analysis in table, figures and discussions. The last chapter presented the summary of findings, drawn conclusions, recommendations and suggested areas to conduct further researches.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter presented a discussion by looking at previous literature on the study topic. The chapter is arranged in sections that present theoretical framework of the study and the review of past empirical literature. There is a section on summaries and research gaps that necessitate the conduction of the present study. The chapter concludes with conceptual framework that gives a pictorial element of the linkage between the independent variables and the dependent one and the indicators.

2.2 Theoretical Framework

The study is anchored on the organizational control theory by Cheney and Tompkins (1987); and supported by the transaction cost theory founded by Williamson (1979) and the theory of project management postulated by Koskela and Howell (2002)

2.2.1 Organizational Control Theory

The theory was formulated by Cheney and Tompkins (1987) and its main concept is sustaining high performance outcomes by developing systems between the organization and its system. The systems and control measures must be able to align the activities and actions of the organization with its overall goal. Snell (1992) noted that is on the basis of developing control mechanisms across all functional and operational units of an organization. Its basis is on the systems and mechanisms used in an organization to influence the sub-units to behave in a certain manner for achieved of a specified goal. According to Liu, Borman and Gao (2014) the main aim of the theory is setting a schedule for implementing action plans and monitoring and evaluating different key and elemental operations that dictate the behavior of staff and deliver on the organizational goals. Its focus is equally on shaping and swaying the behaviors and the driving force in each adopted technique.

The organizations' set different control forms that once adopted can help in delivering the goals. Most managers use the organizational structure, performance measurement and control systems based on behavior, input and outputs (Parker & Manley, 2017). On behavior control, firms formulate policies, norms, practices and standards and the management regularly monitors and evaluates the actions of staff to attain the set goals. In the same manner, project managers can check on project team members to ensure they abide by set standards of behavior to attain project goals. The second aspect is on input controls by improving the competencies of staffs through trainings and growth and development programs. The quality of raw materials and parts and tools need to be checked to positively affect the quality of the finished product. On output controls is based on checking performance of employees, machine output and functional and operational units and rewarding those who perform well (Liu, *et al.* 2014).

The theory is criticized for focusing on syncing the behavior of staff with the goals and objectives and concentration is on attaining them. Therefore, Murata, Tezel, Koskela and Tzortzopoulos (2017 shared that once the firm objective is achieved then it can be demotivating for some staff who have nothing else to look forward. It is also assumed that the employees look for feedback and there is ignorance of employee needs that reduce productivity and output as the motivation levels of the employees' decreases. The managers have to set a course of action to keep their staff motivated for attaining organizational goals and high productivity levels, which might be a daunting task. Parker and Manley (2017) shared that the control theory is too mechanical and fails to consider that human beings and their behaviors and motives is not mechanical. The theory can only work in strict and bureaucratic organizations and the current workplace is dynamic, competitive and accommodative to the different genres of staffers.

The theory is applicable in the study, by informing the project managers of the control measures and systems to be adopted and focusing on behavior, input and output controls. The installed project control measures can help in improving project productivity and outcomes, through monitoring and evaluation and installing control system to cut expenses. The project managers can do regular supervision and

inspection by comparing project progress against the project plans and incurred costs. The theory is then linked to the third and fourth variables of the study – M&E and expenditure controls in projects as a way to improve project performance.

2.2.2 Transaction Cost Theory

It was founded by Williamson (1979) and its main concept is complete use of the structure of the organization for economic efficiency and for minimization of costs of exchange. The theory informs that all transactions that occur in market exchanges for products and cash there is a corresponding cost attached. Parties to the transaction make agreements in a contract that govern the nature of the interaction and in that biding contract the costs are indicated on which party will carter for that. The signing of the contract agreements serves as protection against any opportunist behavior that one of the parties may assume to exploit. Alaghehband, Rivard, Wu and Goyette (2011) shared that the basis of the theory is finding measures to reduce the transaction costs through adoption several methods such as partnerships, monitoring and evaluating transaction process, use of digital systems and technology.

In project management, the theory seeks means of reducing high operational costs especially in megaprojects. The large projects incurred huge costs in acquiring raw materials, tools and equipment and labor and the transactions costs can be huge, hence calling for measures to reduce the costs. The project managers can form a specific team to monitor costs and design systems to cut-down operational costs. The tendering process should be efficient to get quality products from suppliers with the lowest bid quotes or apply supply chain elements such as bulk purchasing to enjoy economies of scale. Rindfleisch (2020) shared the project profitability can be reduced if the transaction costs are very high and the margins can be high for small projects whose profit margins are equally low. If transaction costs are high, the project managers might compromise on quality of materials and the ultimate final project quality and its service. Effective management of transaction costs, needs managers to estimate the costs, budget for them, closely monitor it and set measures to control it for successful projects.

The theory is criticized for its ambiguity in defining what consists of transaction costs and inability to assess the micro-level unit of analysis for each transaction incurred (Rindfleisch, 2020). However, the theory explains what organizations can do to reduce operational costs including transactional cost. The theory is relevant in the present study by considering the amount of transaction costs that water project managers incur in the process of purchasing different raw materials, hiring labor, tools and equipment. The managers need to set systems to reduce the transaction costs for higher profitability. The theory thus, anchors the aspect of estimating the costs, budgeting for the costs, monitoring and evaluating the costs and setting control measures for the expenses for successful water projects. Thus, the theory is relevant in expounding on the elements of project cost control inclusive of cost estimation, budgeting, M&E and expenditure control as a way to positively influence the performance of the water projects.

2.2.3 Theory of Project Management

The theory was founded by Koskela and Howell (2002) and its key concept is on aspects of project management including project initiation, planning, execution, monitoring and controlling and closure of the overall project. The project management is undertaken by the management paradigm and uses planning to attain its overall goals and objectives. In essence, the theory adopts the concepts as stipulated in the PM-BOK (Project Management Body of Knowledge) and PMI (Project Management Institute), such that the theory is divided into two –the theory of project and the theory of management (Morris, 2002).

The theory of project is based on the concept of transformation of project operations. In that the project is divided into functional areas that transform the inputs to outputs. The overall project tasks is transformed and regrouped to smaller tasks and assigned to teams to deliver them independently. For the theory of management is based on three elements, management as a planning tool and works to develop and implement plans for success of the overall project. The link is on causal connections that deliver expected project outcomes. The second aspect is on dispatching model that is conceptualized through dispatch of project tasks to different work stations and project team members. The last is based on the thermostat model that follows the principles

of possibility of variances between the standard and value and taking corrective actions to control the project outcomes (Hanisch & Wald, 2012).

The theory is criticized for neglecting the concepts of power and politics in project management. The omission lends to the credence that the theory is not needed in managing successful projects. Pollack (2007) noted that the theory measures project performance using the typical triangle of time, cost and quality, hence the need to broaden the spectrum to cover modern project dynamics, integration and communication aspects. Richardson (2010) also criticizes the theory for being narrow and implicit and hence the need to broaden the scope to fill the missing gaps. Project management can only be enhanced by expanding the body of knowledge through training the project managers and influencing their decision making. Knowledgeable management team can make decisions on project plans and implementation for success of the project.

The theory is relevant in the present study by considering ways of planning and implementing projects in a manner to improve the performance. Adoption of project cost control techniques such as cost estimation, budgeting and expenditure controls aimed at improving performance of the projects. The theory exposes how the water projects can plan and implement the plans to improve its performance in terms of quality, time and cost and satisfaction of the beneficiaries.

2.3 Empirical Literature

2.3.1 Project Cost Estimation and Performance of Water Projects

Ahn, Ji, Ahn, Park, Lee, Kwon and Kim (2020) study was on improving construction cost estimation through the CBR models and evaluating its performance. The study noted that use of case-based reasoning model is effective in achieving reliable and accurate estimation of costs for projects and more so during the initial project stages. Case-based reasoning (CBR) is best used in the project identification, scope and design phase since it relies on historical data from similar projects and their recorded information. The data is then compared to the present project and lends credence to cost estimation for all project activities and operational areas. The researchers

concentrated on multi-family housing complexes as the case studies and the CBR model was based on absolute error rate, standard deviation of findings and means for accuracy of cost estimation. Results found that use of CBR model in cost estimation enhanced accuracy and stability and supported making of decisions during the initial stages of the projects. The study recommended that CBR model can also be used in estimation of project scheduling, time allocation and allocation of resources. The study focus was on CBR model and did not assess the linkage of cost estimation and resulting performance of the projects, thus creating conceptual gaps.

Fazil, Lee and Tamyez (2021) investigation was on cost estimation and its performance within the construction projects in Malaysia. It was noted that estimating of costs in construction projects is a critical element and valuable in avoiding cases of cost overrun. Through the use of cost estimation aspects, the article provided a way of measuring performance of cost estimation in construction sector. The researchers collected secondary data by reviewing 23 journals, 238 construction cost estimation papers in the past 31 years, revealing that only 33 papers concentrated on performance and outcomes of cost estimation. The results identified the factors linked to performance of cost estimation as based on elements of organizational control theory, contingency theory and task-technology fit theory. The framework for cost estimation was based on control themes such as control practices, overall project cost and assessing costs incurred by previous projects and applying it to the current study. The study created methodological gaps since it used secondary data by reviewing journals.

Romanovich and Adel (2018) study on cost estimation and the analysis of its performance in construction industry in Saudi Arabia. The building information modeling (BIM) system has been used by project managers to integrate different functions and systems of the project into a singular unit such as the architectural, mechanical and structural aspects. Use of BIM was found to be beneficial to the projects and improving its success rate by cutting off cases of re-working, double scheduling and work conflicts. However, despite the benefits enjoyed by BIM model, it is not commonly used die to lack of information and difficulties in accessing accurate information in estimating costs and applying in projects. The researchers engaged local Saudi contractors who use BIM in the construction project

implementation phase in an effort to quicken the project delivery. The results showed that contractors who used BIM model during implementation phase of construction phase were able to accurate estimate costs and deliver high quality projects that keep to time and costs. The contextual gaps created are based on the study background being in the construction projects in Saudi Arabia.

Kermanshachi, Anderson, Molenaar and Schexnayder (2018) research investigation was on transportation cost estimation and its effectiveness as a cost management element. The assessment of cost estimation is based on workforce educational training in implementing complex projects. The study noted that project cost estimation was a big challenge to state transport agencies in the USA and hence significantly affected the success and performance of projects. Accurate cost estimates is based the capacity of the estimator in converting project scope into costs and estimating the costs for each project phase. Thus, the need for specialized training on staffs for improving cost estimation and cost management skills in transport projects. The estimators mostly use history, available info and resources and experiences to estimate project costs. The training module covered aspects of cost estimation, cost management and pilot exercises done in the states of Texas and Maryland and their department of transport. Findings showed that training estimators led to improve cost estimation for projects and better cost management that led to improved knowledge on it and success of projects. The research created methodological gaps due to unclear sources of data for the current study.

2.3.2 Project Budgeting and Performance of Water Projects

Mwaguni, Mbugua and Rambo (2020) researched on budgets and the performance of research projects in public universities in the Kenyan coastal region. Study participants included staff working at the universities of Technical and Pwani in Mombasa and using random sampling the list composed of 285 participants. The researchers collected primary data using interviews and open-ended questionnaire and data was later analyzed. The study concentrated on budget elements of reviewing budgets, compliance of budgets, stakeholder involvement budget guidelines and budgeting controls and research projects performances. The findings revealed that budgets improved the performance of the research projects and the relationship

between the variables was positive and significant. Conclusions showed that budget guidelines had the biggest influence on research projects' performance, this was followed by complying with the budget, budget reviews, stakeholder involvement and lastly budget controls. The study created contextual gaps as its focus was on the research projects, in coast-based universities.

Eyibio and Daniel (2020) conducted a study on how effective is resource budgeting as a tool for managing of projects. Due to globalization of markets, all organizations seek to maximize funds and resources use to deliver highly performing projects that improve the profitability of projects. The issue of budgeting is important in relating resource budgeting and project management and performance. The focus was determining the significance of the relations existing between effective resource budgeting and project management and review of past papers to collect data and quantitatively analyze it. The findings revealed that resource budget is an effective tool in managing projects and has a significant effect in project success. The study concluded that review of past articles realized that resource budgeting led to success of projects in Nigeria. The study conceptual gaps as resource budgeting was linked to project management while the present study will link budgeting to project performance.

Adafin, Rotimi and Wilkinson (2020) conducted a study on development of project budgets by assessing the impact of risks. The focus was in developing of the project budgeting that relies on early estimates during the initial phases of project designing and initialization. Getting accurate estimates positively affects the budgeting process and informs the decisions of owners and financiers of projects. The budgeting process works best after proper risk analysis and help in reducing variances between the cost plans and actual incurred costs in construction projects. The data was collected using online questionnaires from 62 practicing surveyors in New Zealand and analyzed descript and spearman correlation formats. The findings showed that risks in construction projects led to inaccuracies in the budget and inability to correctly forecast on cost implication of the entire project. Proper budgeting is ideal for the surveyors and result in better management of client's funds and delivering projects on time, as per budget and quality. Information on risk factors and its consideration in the

budgeting process could also help in reliably estimating project costs at the design stage and putting measures to control costs at the implementation phase for its success. Conceptual gaps were created since project budgets was associated with risks with no mention of project performance outcomes.

Kwon and Kang (2019) research investigation was on project budget and how to improve and accurate estimate its elements through analyzing risks. The study focus was on project risks both the identified and unidentified are critical factors in estimating the budgets for projects. Project managers are unable to deliver projects on time and as per cost baselines if unidentified risks are excluded as well as lacking relevant tools. The study revealed that use of three-point estimation techniques to determine costs of risks that covers the identified and unidentified resulted in improved accurate and precise project budgets. Further results showed that construction managers that used accurate and précised budgets delivered successful projects. Budgeting allowed project managers to reduce project costs and limit their expenses leading to successful projects. The research gaps are in context as its background is building projects in South Korea, the conceptual gaps are based on focusing on risks and not performance and methodological gaps are based on the data sources and study participations are not revealed

2.3.3 Project Monitoring and Evaluation and Performance of Water Projects

Sinigi and Kaburu (2020) investigation was on monitoring and evaluation and performance of youth employment projects within the Narok County Government in Kenya. Focus was on the 32 projects that were active in 2014 to 2018 and from which questionnaires were filled from 195 respondents who included project managers, government representatives and youths and then later analyzed using descriptive, inferential statistics. The research revealed that M&E had noteworthy effect to performance of the youth employment projects. Monitoring and evaluation was effective because the staffs were well-trained, knowledgeable, skilled and experienced; there was also involved of all stakeholders in awareness creation, oversight role, collecting information, assessing and reporting findings. The study concluded that M&E process works where staffs are trained, feedback is freely given, embraced and acted upon, continuous improvement and regular activities for

monitoring and reporting findings. Successful projects are the ones where there is stakeholder involvement, continuous improvement and feedback is seamless and information sharing. The study created conceptual gaps by not assessing the effect of M&E on performance of the youth projects and its contextual background is in Narok County.

Kissi, Agyekum, Baiden, Tannor, Asamoah and Andam (2019) assessed the project monitoring and evaluation practices and its impact on success of construction projects in Ghana. Focus was on monitoring and evaluation practices as an important aspect of project implementation, execution and its management. Some of the monitoring and evaluation (M&E) practices include learning culture, data and information collection, assessment and application, participatory approach and feedback mechanism. These practices were included in the research tool used to collected data from project professionals in the construction industry of Ghana. Through use of PLS and SEM, the findings showed that M&E practices had significant effects and led to success of construction projects. Further findings also revealed that M&E practices were affected by the project scope, and health and safety practices in the construction projects. The study concluded that M&E practices are significant and critical to the success of projects and once applied increase the success rate of project delivery. The study created contextual gaps since its background was in the construction projects in Ghana.

Chebet (2021) study was monitoring and evaluation role in school infrastructure development projects in Marakwet West Sub-County, Kenya. The focus of the study was on monitoring and evaluation aspects that included components of M&E, the policies of M&E that ensure transparency and accountability, challenges of M&E and how to improve M&E in infrastructure projects. The data was collected from teachers in both primary and secondary schools in the sub-county, education officials, CDF officials, parents and NGO's funding some of the projects. Analysis revealed positive relations between M&E and infrastructure projects. M&E plans, costs, routines, programs, capacity of staffs, supervision of the exercise, data access, sharing and usage improved project outcomes and its success. The conclusion was such that M&E influenced the implementation of infrastructure projects in schools. Effective M&E

demands stakeholder participation, systematic use of resources, project costing, budgeting, mobilization and allocation of resources and proper records keeping for successful project delivery. Conceptual gaps are based on M&E not linked to performance of projects and its context is in infrastructure projects and education sector.

Mokua and Kimutai (2019) study researched on M&E systems and performance of PPP –Public Private Partnership projects within Nairobi City County. The focus was on M&E adoption in involvement of government and private entities in financing and implementing projects. Specific attention was placed on M&E aspects such as availability of M&E systems, staff competence in M&E, use of logical framework matrix and frequency of use of M&E reports. The data was collected from 26 PPP projects and 161 respondents with the information revealing that most M&E staff lacked formal training but gained competence from staying longer in their position. The results also showed that most of the projects had a functional M&E system, but rarely used M&E reports in decision making hence having negative impact to performances of the projects. The logframe matrix as a planning tool was not used and hence had no effect on project performance. The study recommends training of M&E staff, use of M&E reports and application of the matrix as a planning tool for successful delivery of projects. The conceptualization of M&E and its focus was on the system hence creating conceptual research gaps.

Wambua (2019) investigation was on monitoring and evaluation practices and performance education projects in Makueni as funded by the county. M&E activities are left to stakeholders to improve implementation and performance of projects. The study focus was on M&E staffing and planning, stakeholder's involvement and use of baseline survey and performance of projects as measured in terms of timely completion of projects, keeping to project budget, attaining product specification and meeting needs of customers and management. The researcher collected data from 31 county funded education projects and analysis revealed that M&E staffs were well-trained and competent, they were aware of M&E plans and applied them, the county used baseline surveys to collect data that led to positive effects on project

performance. The contextual gaps created were due to study focusing on county funded education projects in Makueni County.

2.3.4 Project Expenditure Control and Performance of Water Projects

Omotayo, Bankole and Olubunmi Olanipekun (2020) assessed on prediction of the most applicable post-contract cost controlling techniques within the construction industry and its projects. The study concentrated on use of artificial neural network approach to predict the ideal cost control technique since the post-contract phase is critical for project implementation and its success. The researchers noted that in some instances, the deployed cost control technique has not yielded the expected results of reducing cases of cost overruns. The study focused on cost control techniques such as cost forecasting, cash flow, having a working budget, taking corrective actions, monitoring overhead, material, labor and equipment costs, identifying indicators of cost overruns and managing variations. The 135 project managers and quantity surveyors that took part in the study shared that use of artificial neural network approach to predict the ideal cost controlling technique led to better management and control of project expenditures. Further results revealed that project managers and quantity surveyors influenced the decision on the choice and implementation of the post-contract cost and expenditure control approach. The choice of cost control technique was done by the quantity surveyors but the responsibility of its implementation was mostly done by project managers. The study concluded that cost control techniques, cost management practices and cost monitoring approaches led to reducing project costs and expenses and improved the overall performance of construction projects. Conceptually, the focus of this study was in predicting the ideal post-contract cost controlling techniques using artificial neural network approach. The present study will link cost and expenditure control to performance of projects.

Khodeir and El Ghandour (2019) in the study that was examining the role played by value management in controlling cost overruns for the residential construction projects in Egypt. The study noted that in practice, the actual costs incurred in any project differs from the planned and estimated project costs and reaches values that range between 21% - 55%. In mega-construction projects, cost overrun is a key element and is likely to hinder the success of projects. Cost overruns are due to

inaccurate cost estimates, delays in implementation and conclusion, changes in project design and scope, weak planning processes, and increased cost of materials. Thus, use of value management is based on value analysis, value engineering and value methodology to assess changes in design and execution of projects and the accompanying cost variations. The researchers reviewed past literature on cost implementation. The findings showed that use of value management led to improved controls for cost overruns and improved outcomes of the residential projects in Egypt. The study concluded that adoption of value management helped the residential projects to achieve 15% - 40% savings in the total costs of the project. The contextual gaps created linked to assessing residential projects in Egypt, and methodologically, the study used secondary date by reviewing past literature. Conceptual gap is such that performance of the project was not assessed

Yismalet and Patel (2018) critically reviewed aspects for improvement of cost management practices in a manner leading to profitability to domestic contractors. The study shared that the aspect of cost performance and management in construction projects is common and affects many projects globally resulting in cost overruns and delays and failure of projects. Therefore, managing cost is an important function and leads to success and high performance measured in terms of cost and budget variances. Controlling and managing project costs and expenses, the study looked to functions including estimations, tendering, budgeting and controlling practices for project costs. The study revealed that adopting these functions by construction contractors led to increased profits and success rate of projects by as much as 43%. Low pricing and inadequacies in managing costs and expenses led to 52% reduction in contractors' profits from projects. This means that contractors gained by more than half of the profits from the completed projects through adoption of cost control and management measures. The findings also noted that poor financial planning, ineffective cost management systems and inefficient expenditure control techniques led to low profits for the contractors. Gap was conceptual since cost management was linked to profits for contractors without considering its effects to project performance. Methodologically, the gap is based on unclear sources of data and analysis methods from which the findings and conclusions were drawn from.

Abobakr (2018) study was on necessity for cost control in construction projects at both the pre and post contractual stages. The researcher noted that budgeting and cost estimation were the commonly adopted cost management measures during the pre-contractual phase, while stakeholder engagement, monitoring, evaluation and control, budgeting and cost cutting measures were applied during the implementation phase of construction projects. In questionnaire survey with project staffs including contractors, sub-contractors and consultants, it was revealed that the overall cost management plan, cost estimations and cost control guidelines helped to reduce cost overruns. The study concluded that proper management of cost issues improved construction project outcomes. The study recommended use of BIM technologies in accurate estimation of costs, the budgeting should consider risks, use of earned value management for controlling costs and expenses and proactive cost control process. The conceptual gap is created since focus is on assessing the necessity for cost control in the pre and post contractual phases and the context is construction projects and not linked to project performance.

2.4 Summary of Literature and Research Gaps

Table 2. 1: Summary of Literature and Research Gaps

Author & Year	Study Topic	Findings	Research Gaps	Focus of the current study
Ahn, *et al.* (2020)	Construction cost estimation through the CBR models and evaluating its performance	CBR model in cost estimation enhanced accuracy and stability and supported the decision-making process during the initial stages of the projects	The conceptual gaps were created since cost estimation was not linked to performance	Assessing cost estimation effects on project performance
Fazil, *et al.* (2021)	Cost estimation and its performance in the construction projects in Malaysia	The framework for cost estimation was based control practices, overall project cost and assessing costs incurred by previous projects	The study created methodological gaps since it used secondary data Contextual gaps were based on	Assess cost estimation and project performance in the Kenyan context

			the study focusing on Malaysia construction projects	
Kermanshachi, *et al.* (2018)	Transportation cost estimation and its effectiveness as a cost management element	Training estimators led to improve cost estimation for projects and better cost management that led to improved knowledge on it and success of projects	The study created contextual gaps as the study was done in the USA. Methodological gaps are due to unclear data sources	Determined cost estimation and project performance in the Kenyan context
Mwaguni, *et al.* (2020)	The budgets and the performance of research projects within public universities in the Kenyan coastal region	Findings showed significant link of budgets to performance	The gap was in context as focus was on research projects in universities in the coastal region	Assessed how project budgeting affects performance of water projects
Kwon and Kang (2019)	On the project budget and how to improve and accurate estimate its elements through analyzing risks	Budgeting allowed project managers to reduce project costs and limit their expenses leading to successful residential building projects in South Korea	Contextual gaps were created as the study background is building projects in South Korea Methodological gaps are such that data sources and respondents are unclear	Determined the effect of project budgeting affects performance of water projects in Kericho County, Kenya
Sinigi and Kaburu (2020)	On monitoring and evaluation and performance of youth employment projects within the Narok County Government in Kenya	M&E process works where staffs are trained, feedback is freely given, embraced and acted upon, continuous improvement and regular activities for monitoring and reporting findings	Contextual gaps were created since it was done in Narok County	Assessed how monitoring and evaluation affects the project performances

Kissi, *et al.* (2019)	Project monitoring and evaluation practices and its impact on success of construction projects in Ghana	The M&E practices had significant effects and led to success of construction projects	The study created gaps in context as its background was done in the construction projects and in Ghana	Investigated how monitoring and evaluation affect the project performances in Kenyan background
Chebet (2021)	Monitoring and evaluation role in school infrastructure development projects in Marakwet West Sub-County, Kenya	M&E plans, costs, routines, programs, capacity of staffs, supervision of the exercise, data access, sharing and usage improved project outcomes and its success.	The study created conceptual gaps based on M&E not linked to performance of projects. The context was based on infrastructure projects in education sector.	Assessed how monitoring and evaluation affects the project performances of water projects in Kericho County
Omotayo, *et al.* (2020)	Prediction of the most applicable post-contract cost controlling techniques within the construction industry and its projects	The use of artificial neural network approach to predict the ideal cost controlling technique led to better management of project expenditures	Conceptual gaps was based on predicting then ideal cost controlling technique	This study linked cost and expenditure control to performance of projects.
Abobakr (2018)	The necessity for cost control in construction projects at both the pre and post contractual stages of construction projects	The overall cost management plan, cost estimations and cost control guidelines helped to reduce cost overruns	Conceptual gap as focus was on assessing the necessity of cost control in the pre and post contractual phases The contextual gap as focus was on construction project	Assessing expenditure controls on project performance of water projects in Kericho County, Kenya

2.5 Conceptual Framework

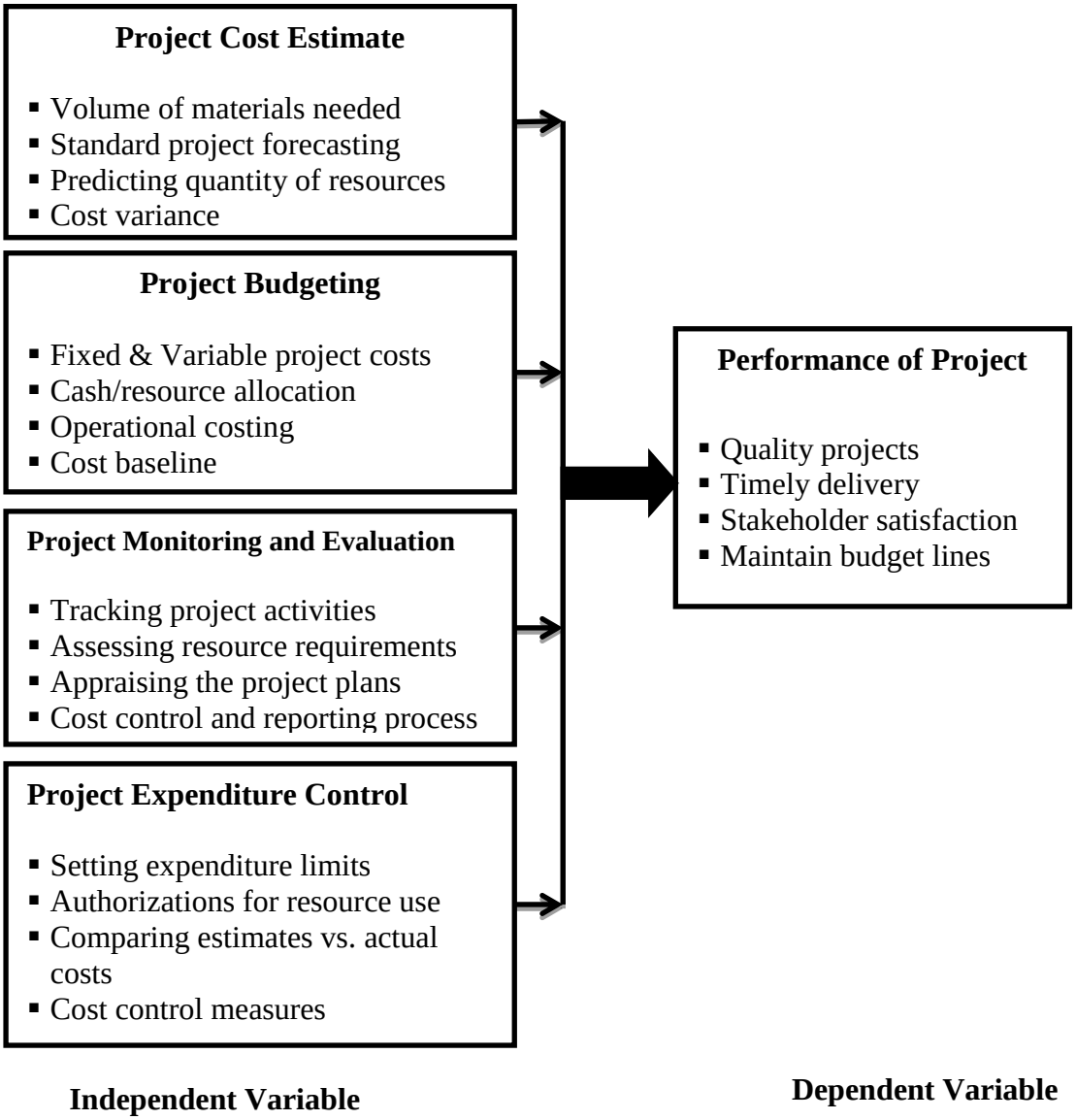

Figure 2. 1: Conceptual Framework

Source: Researcher (2022)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Chapter three presents information on the procedures and techniques that were adopted by the researcher in searching for answers on the research questions. The chapter highlighted the research design, the population and sampling used to get the respondents. It also had sections on data collection instrument, procedures and analysis of the data as well as ethical considerations.

3.2 Research Design

The design for any research shows the blueprint that the researcher follows in collecting data from different sources in a manner to respond to the research query (McKenney & Reeves, 2018). In this case, the study employed the use of descriptive research design, that Doyle, McCabe, Keogh, Brady and McCann (2020) defined as an approach that represents the elements without any manipulation. The design answers questions on what, why and how of elements and thus ideal in explaining how water projects employed cost control measures to improve its outcomes. The respondents of the study described the cost control techniques used and their effect on performance of the water projects in Kericho County.

3.3 Target Population

This include elements from which information will be sourced from and respond in the research questions. These elements have features that interest the researcher and can answer the research query. The study targeted 16 completed water projects in Kericho County as the unit of analysis. These water projects gave a clear picture on performance outcomes and the adopted cost control measures and association between the two elements. The respondents included persons associated with project planning and implementation and included 67 people. The targeted population was the unit of observation and covered the project managers, the project contractors, the chairperson

of the water committees and officials from the county government; this is as shown in the Table 3.1

Table 3. 1: Sample Population

No.	Description	Target Population
1.	Project Managers	16
2.	Project Contractors	16
3.	Water Committee Chair	16
4.	County Government Officials (Min. of Water	19
	Total	**67**

Source: Kericho County Government Website (2021).

3.4 Sampling Technique and Sample Size

Sampling in research is a way of getting a small group of elements from the total study population using different techniques (Sharma, 2017). This study employed stratified sampling method where the respondents were grouped as per the role, they handle in the water projects including project manager or water committee chairperson. A census was done of all the 16 water projects and simple random sampling adopted when selecting the respondents including one project manager, contractors and water committee chair who took part in the research. All the county officials in charge of water projects and residing from the ministry of water, energy and natural resources from the Kericho County were also included in the study. Thus, the sample size of the study participants was 67 respondents who participated in the study.

3.5 Data Collection Instrument

A semi-structured questionnaire was employed as the research instrument to collect primary data from both open and closed-ended questions. The data type was quantitative and qualitative. The open questions allowed the respondents space to express themselves and use their own words to describe the phenomenon and thus enrich the study. The questionnaire as a research tool is ideal as it can collect large volumes of data at a considerably cheaper cost (Johnston, 2014). The questionnaire development covered all the study variables, such that it was divided into sections

covering demographic information of participants, independent variables on cost estimation, budgeting, monitoring and evaluation and expenditure controls and the last part was on dependent objective on water projects performance. A five-point Likert scale was applied in assessing the respondents' agreement or disagreement level with each statement.

3.6 Pilot Study

The instrument –questionnaire –was pilot tested using 8 respondents from 2 water projects in Bomet County –the Labotiet and Kaptebeswet water projects that were funded and operationalized by the county. The respondents included project managers, contractors, water committee chairpersons or members and county officials from the water department. The pilot study checked that the instrument was fit for use in the present study and alterations and errors were corrected to deliver a fit research instrument.

3.6.1 Validity of the Instrument

Validity of research tool is defined as the capacity to measure the contents and what an instrument was developed and expected to measure (Chan & Idris, 2017). This study in checking for questionnaire validity were employed content validity technique that will use the opinion and help of experts in data collection tools, the researchers and classmates who will go through the questionnaire. Validity testing was done by the university supervisor, who checked on the content, the structure, the formulation of questions –length, leading, format and spacing. The supervisor's suggestions helped in revising the instrument and later produced a good instrument for the final research study.

3.6.2 Reliability of the Instrument

Reliability is the degree to which a research tool is able to produce similar results each and every time that it is used. Thus, it measures the degree of consistency and capacity to reproduce similar results (Lindlof & Taylor, 2017). The researcher applied the internal consistency technique in checking for reliability of the instrument by comparing the study contents with the elements in the questionnaire. The test results

were then checked against the Cronbach's alpha coefficient and if tests scores yielded are 0.7 and above the instrument is deemed fit and adequate for use and if the scores are below 0.7 then adjustments were made on the instrument until is it fit. Taber (2018) set the ideal Cronbach's alpha coefficient at 0.7 as fitness for research instrument. The reliability results showed all alpha scores were above 0.7, an indication that the questionnaire was fit for use in this study.

Table 3. 2: Reliability Test Results

Variables	Number of Items	Cronbach Alpha	Comment
Project Cost Estimation	7	.802	Reliable
Project Budgeting	7	.731	Reliable
Project Monitoring and Evaluation	7	.789	Reliable
Project Expenditure Control	8	.766	Reliable
Project Performance	6	.714	Reliable
Aggregate Scores	**35**	**.761**	**Reliable**

Source: Pilot Test Data (2023)

3.7 Data Collection Procedure

An introduction letter was obtained from the university and research permit from NACOSTI before proceeding to collect data. The researcher will seek permission from the county government of Kericho and the associated water projects and inform the respondents on the purpose of the research exercise. Contact information was sourced for booking appointments and making follow-ups. They were self-administered the questionnaires and then waited for them to be filled before collecting and going to the next person. Waiting for the tool to be filled ensured that no questionnaires are lost, or there is comparison of information and also increases the response rate. There is also high accuracy of the information as the respondents were present when the questionnaire is filled and can answer any queries.

3.8 Data Analysis and Presentation

All the collected data was checked, coded and entered into SPSS version 25.0 for analysis. Younas, Shahzad and Inayat (2021) noted that analysis is a systematic process of arranging and extracting valuable information from data and from which

conclusions and recommendations can be made. For the collected data that was quantitative in nature, the researcher conducted descriptive analysis to obtain means, frequencies and standard deviations. Inferential statistics was done to assess the association and strength of the relationship between the variables. This was done using Pearson's correlation analysis and multiple regression analysis.

The multiple regression model followed this format

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Y = Project Performance

β_0 = Constant value

β_1 to β_4 = Coefficients of determination for Project Cost Control Techniques

X_1 = Project Cost Estimation

X_2 = Project Budgeting

X_3 = Project Monitoring and Evaluation

X_4 = Project Expenditure Controls

ε = Error term

The qualitative data obtained from the open-ended questions and was analyzed using content analysis. The information was extracted and arranged into themes as per the study variables and thereafter presented in prose form for its discussions. The quantitative and qualitative data findings were presented in tables, charts and prose for the discussions.

The researcher also conducted diagnostics tests to ensure that the assumption made by the regression model is not violated. The specific tests that were conducted include multicollinearity that obtained the VIF values; Normality test through using the

Shapiro-Wilk test and obtained p-values and Autocorrelation that was done to check for serial correlation in the data series using Durbin Watson statistic.

The operationalization and measurement of variables is as presented in Table 3.3

Table 3. 3: Operationalization of Variables

Indicator	Variable	Category	Measurement/Analysis
Performance of water projects	Dependent	Categorical	Mean, standard deviation, correlation, multiple regression, content analysis
Project cost estimation	Independent	Categorical	Mean, standard deviation, correlation, multiple regression, content analysis
Project budgeting	Independent	Categorical	Mean, standard deviation, correlation, multiple regression, content analysis
Project monitoring and evaluation	Independent	Categorical	Mean, standard deviation, correlation, multiple regression, content analysis
Project expenditure control	Independent	Categorical	Mean, standard deviation, correlation, multiple regression, content analysis

Source: Researcher (2023)

3.9 Ethical Consideration

The researcher made an effort to adhere to the stipulated research ethics, including obtaining a research permit and seeking permission from the county and the water projects before commencing research. The participation in the study was on willing basis and there was no forcing or coercion. All the participants were informed of the purpose of the study and their consent sought to take part in the study. All information sources were acknowledged to avoid plagiarism cases and information will be used for academic purposes only.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

The chapter presents the study findings after conducting different analysis including descriptive, correlation and multiple regression analysis. For the open-ended questions, content analysis was carried and information on demographic data of the respondents is also provided. These findings are presented in tables, figures and prose form for discussions.

4.2 Response Rate

Out of the 67 distributed questionnaires, 53 were duly filled and returned, making the study's response rate be 79.1%. The study adopted the Hardigan, Popovici and Carvajal (2016) stipulation on response rate by indicating that response rates that are 70% and above are ideal for generalization of findings across the entire population. Thus, the study's response rate of 79.1% fits in the range showing that findings, conclusions and recommendations can reflect the position of water projects in the counties. The results are as indicated in Table 4.1

Table 4. 1: Response Rate

Description	Frequency	Percent
Response	53	79.1%
Non-Response	14	20.9%
Total	**67**	**100%**

4.3 Demographic Information

The study sought information on the features of the respondents in terms of gender distribution, the education status, position they are holding and length they have been holding the same position. The results are shared in the subsequent sections:

4.3.1 Gender

The respondents were requested to indicate their gender. Figure 4.1 shows the obtained responses.

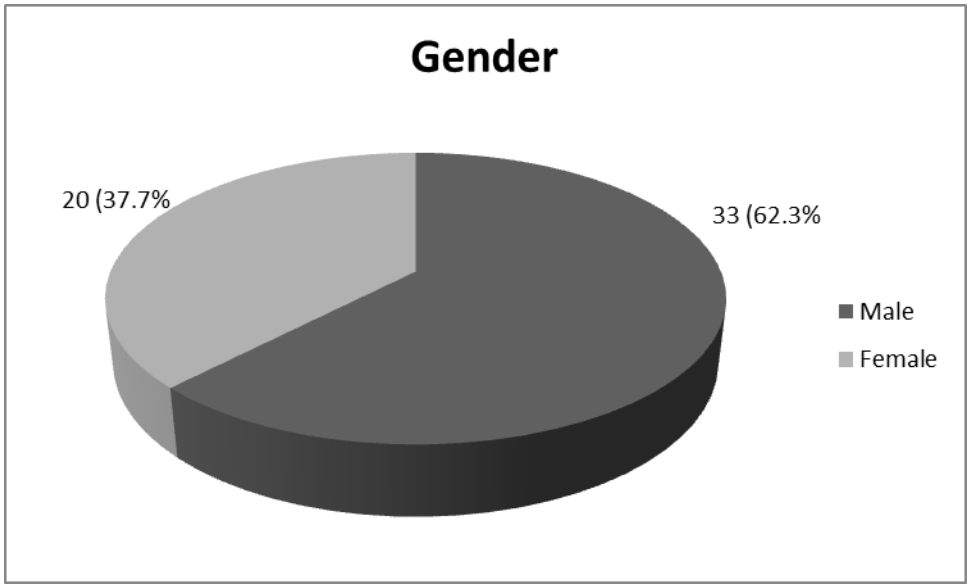

Figure 4. 1: Gender

The findings in Figure 4.1 show that male respondents were more than their female counterparts. The males were the majority at 62.3% while the females were the minority at 37.7% of the respondent group. The males were the majority of the respondents due to nature of the projects that are largely manual and demand more energy, hence accounting for more male respondents. Traditionally, manual jobs in projects were handled by men and this could account for the higher male respondents for the study. The gender information is a confirmation that there was no gender bias and drawn findings and conclusions are obtained from opinion of both genders.

4.3.2 Highest Education Qualifications

The respondents were also asked to state their education level and findings are as shown in Figure 4.2

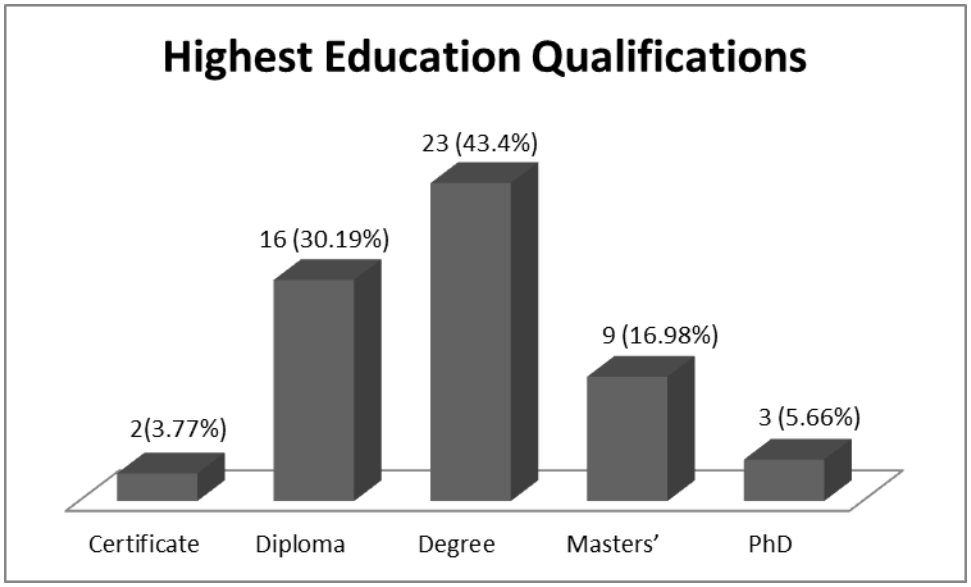

Figure 4. 2: Highest Education Qualifications

The findings show that many of the respondents at 43.4% were degree holders, while 30.19% of the respondents were diploma holders. Some 16.98% of the respondents had a Master's degree, 5.66% had PhD and 3.77% respondents were certificate holders. These results imply that all respondents had tertiary education and hence they had sufficient education qualifications to be able to read and comprehend the research questions and provide the necessary answer. Educated respondents improved on the quality of the data and its validity to the present study.

4.3.3 Position Held

The respondents were asked to indicate the position that they were holding in the water projects in Kericho County. The results are as shown in Figure 4.3

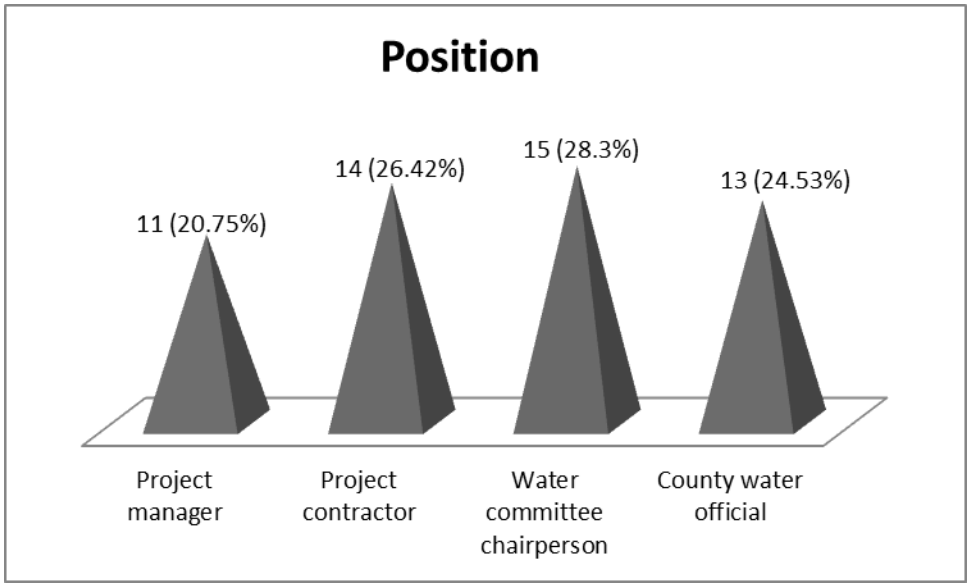

Figure 4. 3: Position Held

The findings in Figure 4.3 show the different positions held by the respondents of this study. Some 28.3% of the respondents were chairpersons of the water committees, another 26.42% of the respondents were project contractors, 24.53% of the respondents were working as county water officials in Kericho and 20.75% respondents indicated they handle project management roles. The findings indicate that the respondent list comprised of people handling different tasks in implementing the water projects, based on their work experiences, then enriched the current study by providing variety in the responses given in the present study.

4.3.4 Length holding that position

The respondents were asked to indicate the length they were in their current position in terms of years. The findings are as shown in Figure 4.4

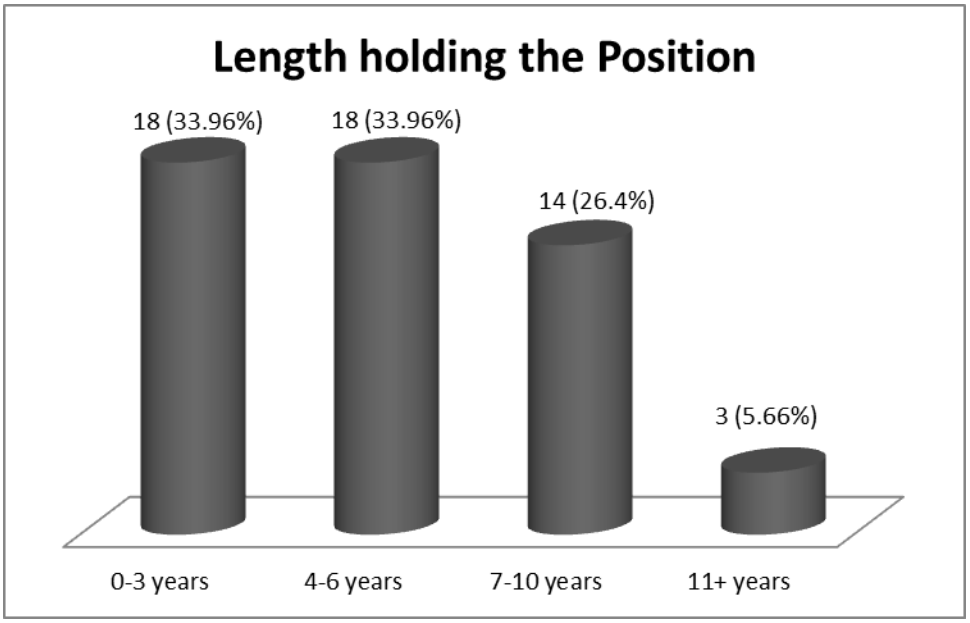

Figure 4. 4: Length Holding the Position

The results show that many of the respondents had worked in the stated position for less than six years. There were 33.96% respondents who had held the position for 0-3 years and for 4-6 years, while 26.4% respondents had held the same position for a period of between 7 years and 10 years. Only 5.66% had held the position for more than 11 years since counties were formed 10 years ago and few people transitioned from municipal councils to the county government, which accounted for the low percentage rate. The findings show that majority of the respondents had held the position for less than six years, but that is sufficient time to learn about the water project performance and adopted cost control measures. Coppock and McClellan (2019) confirmed that it takes an employee at least two years to have complete information about the operations of the organization. Thus, the findings imply that the respondents had sufficient time to understand the key aspects of the water projects and answer the research questions in this study.

4.4 Descriptive Analysis

The descriptive analysis was done and the study findings are presented as per the objectives in these subsequent tables and discussions. There was use of a five-point likert scale ranging from 1-5 where 1 = strongly disagree, 2 = disagree, 3 = not disagree or agree, 4 = agree, and 5 = strongly agree. This analysis generated means

(M) as the average score for each statement and standard deviation (SD) that show variation of the responses from the median. The findings interpretation is such that mean scores of 0-1 indicate strong disagreement, 1.1 -2 indicate disagreement with the statement, 2.1-3 imply moderate agreement levels, 3.1 -4 indicate that respondents agreed with the statement and scores of 4.1 – 5 imply that the study respondents strongly agreed with the statements. The interpretation of the standard deviation results is such that 0-2 scores imply that respondents agree with the statement while deviations of 2 or more indicate that the respondents disagree with the statement. Table 4.2 to 4.6 presents the findings from the conducted descriptive analysis accompanied by discussions of its interpretations.

4.4.1 Project Cost Estimation

Table 4. 2: Project Cost Estimation

Statement	N	Mean	Std. Dev.
Use of different models helps in accurately estimating overall project costs	53	4.05	.820
Experts are involved in estimating the volume of materials needed for completion of the water projects	53	3.79	.755
The project forecasts inform decision making done by the project managers	53	3.96	1.006
Resource estimates work to avoid instances of cost overruns	53	3.72	1.054
Calculating project cost estimate factors in pricing variation to avoid deficits	53	4.01	1.228
Estimating volume of work helps in scheduling tasks while reducing conflicts due to double scheduling	53	3.77	.708
Cost estimates is done as per project phase that is compiled into the overall report	53	3.66	1.005
Aggregate Score		**3.85**	**.939**

The results in Table 4.2 show that the aggregate score was high at (M=3.85, SD =.939) noting that respondents agreed that adoption of project cost estimation led to improved performance of the water projects in Kericho County. The respondents also strongly agreed that there was use of different models for accurate estimating project costs (M=4.05, SD =.82) and the respondents agreed with the statement since the standard deviation was within the 0-2 range. The respondents also shared that to avoid deficits in calculating cost of the project, it is through doing the cost estimates with

price variations (M =4.01, SD =1.228). These findings are echoed by Romanovich and Adel (2018) who used the building information modeling (BIM) and Ahn, *et al.* (2020) adopted the Case-based reasoning (CBR) model to estimate costs in projects. Kermanshachi, *et al.* (2018) found that project cost estimation enhance knowledge on cost management that lead to successful projects.

The respondents also showed that respondents agreed that the project forecasts were instrumental in decision making (M =3.96, SD=1.006), the estimation of volumes of materials needed in the water projects is done by experts, was agreed with scores of (M=3.79, SD =.755) and the respondents also agreed that estimations made on volume of work helps in scheduling and avoiding work conflicts (M=377, SD =.708). The variation of the responses is near the median, based on the standard deviation scores an indication that respondents agreed with these statements. Similarly, Ahn, *et al.* (2020) noted that cost estimation that was accurate supported the decision-making process in projects. In addition, Romanovich and Adel (2018) in their study revealing that estimation of work in projects helps in avoiding instances of double scheduling, conflicts and disagreements at the workplace and re-doing the same work.

The findings also show that avoidance of cost overruns was possible through estimating resource (M=3.72, SD=1.054) and the respondents also agreed that cost estimates were done according the specific project phase and a report was made, (M=3.66, SD =1.005). The standard deviation score indicate that respondents agreed with the statement as a true position of the analyzed water projects. Defining cost estimates per project phase enable clear outlining and control of project resources that impact positively on performance outcomes. Findings confirm what the researchers Fazil, *et al.* (2021) revealed that estimating cost of project is critical and helps in avoiding cost overruns. The cost estimates can be drawn from past projects by assessing the costs incurred and estimated project costs. The Project Management Institute (PMI, 2017) noted that cost estimations, improve decision making and avoid cost overruns, resulting in high performance of the overall project.

The respondents were also asked to share on benefits of accurately estimating cost of the projects, and responses indicated that cost estimation is done to ensure success of projects through access to information on resource mobilization, allocation and

utilization. The respondents also noted that cost estimates bring in the aspect of risk management by accurately planning of the work, the resources and outcomes. Another respondent shared that cost estimation allows for information sharing with all stakeholders and hence they would know what they are investing their time, resources, efforts and funds and expected outcomes. The estimations bring clarity in the work space by avoiding conflicts and confusions, resulting in better performance outcomes. The respondents also revealed that cost estimation is an essential phase in projects that align needs, expectations and outcomes.

4.4.2 Project Budgeting

Table 4. 3: Project Budgeting

Statement	N	Mean	Std. Dev.
The budget includes both fixed and variable costs of the water project	53	3.7	1.309
The formulated budget gives an indication of how funds or other resources are allocated	53	3.34	1.208
The budget covers all operational costing for all functional areas of the water project	53	3.49	.992
The budget guidelines indicate sources plus utilization of project resources	53	3.89	.847
The project budget helps in maximizing usage of funds or other resources	53	4.22	.993
Budgeting informs the project decision making process done by managers	53	4.09	.882
The project budget includes possible risks as it sets the costing baseline	53	3.81	1.001
Aggregate Score		**3.79**	**1.033**

The results on Table 4.3 indicate that there was a high aggregate score at (M=3.79, SD=1.033) as the respondents agreed on project budgeting influencing the performance of the water projects in Kericho County. With the standard deviation scores of SD =1.033, as a confirmation that the respondents agreed that budgeting influenced project performance, as the scores were within the 0-2 range. Study respondents strongly agreed that through utilization of project budget, there was maximization in utilization of project funds and other resources, with scores of (M= 4.22, SD =.993) and the budgeting process also informed the decision-making exercise undertaken by project managers, was agreed at score of (M =4.09, SD

=.882). These results were also echoed by Mwaguni, *et al.* (2020) noting that budgets improve performance of projects through setting guidelines and compliance with the budget estimates and reviews. Kwon and Kang (2019) mentioned that budgeting allows managers to reduce project costs and improve utilization of the resources for delivery of successful projects.

The respondents also agreed with this statement on project budget showing the source of resources and indicate the utilization point (M =3.89, SD =.847) and the respondents indicate that the project budget set cost baselines to avoid risks on excessive use with high scores of (M =3.81, SD = 1,001) and the budget was made up of both fixed and variable costs for the water projects (M =3.7, SD = 1.309). These findings are also shared by Eyibio and Daniel (2020) that an effective resource budget shows sources of resources, its utilization across the different implementation units and outcomes yielded. The budgeting is a good tool for management of projects and enhances chances of success of the projects. According to Abdel-Hamid and Abdelhaleem (2021) budgeting enables the managers to accurate calculate project costs and in instances of variations, corrective measures are taken.

Moderate extent was agreed on the statement that the budget covered all the operational costs covering all the functional areas of the project with low scores of (M =3.49, SD = .992 and low score ratings were found for how budget was formulated to indicate the allocation of funds and other resources (M =3.34, SD = 1.208). On the contrary, Adafin, *et al.* (2020) shared that a project budget that fails to consider risks that impact the project is likely to cause inefficiencies that result in poorly completed projects. An effective project budget must consider the risks, the plan and expected incurred costs in the project, thus the budget will be able to accurately forecast on cost estimates for the project. Kwon and Kang (2019) shared that project managers face a challenge in completing projects on time, keeping to the costs and quality, hence the need for assessing cost of risks and incorporate in the budget.

When asked about other ways in which the project budgeting affected the water projects, respondents indicated there was better planning and implementation of the water project activities. All the stakeholders could easily access information on the sources, allocation and utilization of funds and other project resources. The

respondents also indicated that the budgeting helped in reducing wastage as dispatch of resources was accompanied by a request form and there were records. Budgeting improved project outcomes and led to successfully completion of the water projects. In addition, the budgeting process draws insight from various stakeholders improving the engagement and participation by all project stakeholders.

4.4.3 Project Monitoring and Evaluation

Table 4. 4: Project Monitoring and Evaluation

Statement	N	Mean	Std. Dev.
Monitoring and evaluation is done through tracking all project activities in all phase	53	3.4	1.276
M&E aides in assessing the resource demands needed for completion of the project	53	3.49	1.265
Project M&E takes a participatory approach by incorporate all project stakeholders	53	3.53	.952
Monitoring costs informs the decision makers in the water projects on resource consumption	53	3.81	1.057
M&E is done to check on implementation of the project plans	53	3.96	.999
The project has a feedback mechanism for collecting information on project progress	53	3.88	.953
The M&E policies ensure transparent and accountable water projects	53	3.92	1.071
Aggregate Score		**3.71**	**1.082**

Source: Field Data (2023)

The findings shown in Table 4.4 show that the study respondents agreed that project monitoring and evaluation influenced the performance of the water projects, as the scores were high at (M= 3.71, SD = 1.082). The aggregate score of standard deviation of 1.082, aligns with the ranging of 0-2 that indicate agreement with the statement. This implies that respondents agreed that project monitoring and evaluation led to improved project performance in the water projects in Kericho County. The findings also revealed that respondents agreed that M&E is done by checking on implementation of the project plans (M=3.96, SD =.999) and the project monitoring and evaluation exercise enhances transparency and accountability in the water projects (M =3.92, SD =1.071). Similarly, Kissi, *et al.* (2019) noted that adoption and utilization of M&E practices led to success of the construction projects. The M&E is based on learning culture and assessment that improve performance of the projects. In

addition, Chebet (2021) found that monitoring enhances transparency and accountability in the implementation of project plans and activities. Wambua (2019) stated that competent M&E staff and plans that are well-executed lead to better performing of the projects.

It was also agreed to great extent that the presence of a feedback mechanisms for the water projects at scores of (M = 3.88, SD =.953) and the respondents agreed that the project monitoring and evaluation works to inform decision makers on costs and consumption of the resources (M =3.81, SD =1.057). The respondents also shared that the project monitoring and evaluation was done through participation by all project stakeholders (M =3.53, SD =.952). Basing on the standard deviations of the responses, it shows that the respondents agreed with these statements as the score were within the 0 to 2 range. The researchers' Sinigi and Kaburu (2020) also noted that success of their youth employment projects was influenced by involvement of all stakeholders. The stakeholders helped in creating awareness, information collection and sharing and oversight role which improved project performance outcomes.

Findings also showed that study respondents agreed moderately that the monitoring and evaluation helps in assessing resource demands that are needed towards the completion of the project (M =3.49, SD =1.265) and that monitoring and evaluation exercise works by tracking all project activities across all project phases, was agreed moderately by the respondents (M =3.4, SD =1.276). Chebet (2021) noted that monitoring and evaluation focuses on costs management routines, supervision and capacity of project staffs and had less concerns on assessing and tracking resource demands. Mokua and Kimutai (2019) noted that the M&E system was present but it was not implemented and the M&E report was rarely utilized creating negative impacts on performance of the projects.

The respondents were asked to share how monitoring and evaluation affected the performance of water projects in Kericho County. The responses included that use of monitoring and evaluation report in decision making process, tracking and assessing competencies of project staffs, the effectiveness of the implementation process and outcomes. Conducting monitoring and evaluation exercise enabled the project contractors to take corrective measures whenever they were informed of an error in

the project implementation activities. The monitoring and evaluation highlighted the project measurement indicator and stated the M&E framework that guided the project activities leading to its success.

4.4.4 Project Expenditure Control

Table 4. 5: Project Expenditure Control

Statement	N	Mean	Std. Dev.
The project managers have set limits to consumption of project funds	53	3.92	1.298
Authorization must be sought before using project resources from project managers	53	3.75	1.207
Regular reviews help in comparing estimates vs. actual costs to avoid unnecessary expenses	53	3.58	1.081
Project managers implement cash flow management to cut project expenses	53	3.88	1.187
The managers actively monitor overhead/operational costs	53	3.86	1.144
Assessments done identify indicators of cost overruns where corrective measures are undertaken	53	3.9	1.147
Delays in implementation at different stages is discouraged to bring expenditures down	53	3.54	1.148
Expenditure control measures like tendering and budgeting is taken to keep to project costing	53	3.72	.885
Aggregate Score		**3.76**	**1.137**

The results shown in Table 4.5 indicate that the respondents agreed to a great extent that project expenditure control influenced performance of the water projects in Kericho County, as based on aggregate scores of (M =3.76, SD =.1.137). And with the standard deviation scores within the stipulated range of 0-2, implying that the respondents agreed with the statements. There were high scores on the statements about project managers setting limits on consumption of project funds (M =3.92, SD =1.298) and there are assessments that are taken to identify areas where cost overruns can occur and corrective measures taken (M =3.9, SD =1.147). These findings echo the sentiments of Omotayo, *et al.* (2020) who shared that monitoring overhead costs, labor and material costs, forecasting, budgetary and corrective actions are part of the cost control techniques adopted in projects for improved performance outcomes. Cost control techniques involving cost management and monitoring practices improved overall project performance.

The respondents agreed that project managers oversee the management of cash flows as a means of cutting project costs, at scores of (M =3.88, SD =1.187) and it was agreed on the fact that water project managers actively monitored the overhead and operational costs, where the scores are (M =3.86, SD =1.144). These findings are similar to Khodeir and El Ghandour (2019) who noted cost overruns are a challenge for the mega projects which is largely informed by inaccurate cost estimates, delays and changes in design and scope. Through the value management that had cash management aspects, resulted in improved project performance. Similarly, Abobakr (2018) found that adoption of project expenditure controls helps in reducing cost overruns resulting in successful projects.

Results showed that there was authorization that was needed before project resources can be released for use, at score of (M =3.75, SD =1.207) and to maintain the project costs, expenditure control measures such as tendering and budgeting were undertaken (M = 3.72, SD = .885). The variation in responses imply that respondents agreed with the statements and their influence on performance outcomes of the objectives. Authorization, tendering and budgeting are important costs control measures that ensure prudent financial resource utilization that improves project performance outcomes. These findings are an echo of what Yismalet and Patel (2018) noted that control and management of project costs and expenses is possible using techniques such as tendering, estimations, budgeting and control practices.

The respondents also agreed to the fact that frequent reviews were carried out by comparing estimated and actual project costs as a means of avoid unnecessary project expenses. The agreement had scores of (M =3.58, SD =1.081) and there was discouragement of delays in the implementation to reduce project expenditure (M =3.54, SD = 1.148). According to Omotayo, *et al.* (2020) there is some instances where the adopted control techniques do not yield the anticipated results of reduced cost overruns. The completed project had exceeded its budget estimates and allocated funds or resources. Yismalet and Patel (2018) mentioned that contractors can get low revenues and profits in instances of poor financial management and planning, ineffective expenditure controls and cost management systems.

The respondents were asked to share on other measures that can be adopted in the water projects to control expenses; some of the responses included outsourcing of non-core project activities, implementing cost accounting, budgeting and budgetary controls and cost reduction measures. This can also be achieved through estimating and planning for all project costs and tracking allocation, distribution and utilization of resources to increase gains and value gained from the project.

When asked about the implication of huge expenses of water projects, the respondents revealed that huge expenses can result in compromised quality of acquired raw materials and finished product. It can also cause delays, stalling of projects and abandonment of some projects. There is also no value for money and gaps can lead to wastage of resources, theft, corruption and misappropriation of funds, which leads to poor project performance.

4.4.5 Project Performance

Table 4. 6: Project Performance

Statement	N	Mean	Std. Dev.
The quality of water projects is high	53	3.98	1.028
The water projects are completed as per the scheduled timeline	53	4.13	.899
Beneficiaries are satisfied with the water projects	53	3.77	.993
The water projects maintain the set budget lines	53	4.06	.769
The water projects is sustainable for long	53	3.94	.818
The projects used quality raw materials	53	4	.808
Aggregate Score		**3.98**	**.886**

Source: Field Data (2023)

The findings in Table 4.6 indicate that respondents agreed on the fact that there was improvement in performance of the water projects in Kericho County, as the score was at a high of (M =3.98, SD =.886). The agreement scores of 0.886 for the standard deviation imply that respondents confirmed on improvement of the project performance outcomes in the analyzed water projects. The respondents noted an increase in water projects completed on time (M =4.13, SD = .899), the water projects kept to the budget line (M =4.06, SD =.769) and the project had used quality raw

materials (M = 4, SD = .808). The findings also indicated the water projects were of high quality at (M =3.98, SD =1.028), they were also sustainable for lengthy periods with scores of (M = 3.94, SD =.818) and the locals and beneficiaries were satisfied with the water projects at scores of (M =3.77, SD = .993).

These findings are also echoed by Joseph and Caleb (2021) who noted that successful projects are those who are properly managed and keep to their scheduled timeline, cost and quality. Karadimos and Anthopoulos (2021) noted that reducing project costs improved performance of the projects and Joseph *et al.* (2020) found that proper cost control increase completion of projects and reduces cases of abandoned projects. Shani, *et al.* (2021) noted some of the project performance metrics included productivity, delivering value, customer and employee satisfaction, returns on the investment made and cost variance. The performance of water projects, according to Muema and Ngugi (2021) is measured by quality, sustainability of the project and satisfaction with quality and accessibility of water as a product.

4.5 Diagnostic Tests

Diagnostic tests of multicollinearity, normality test and autocorrelation were conducted and results presented in the following table.

Table 4. 7: Diagnostic Tests

	Collinearity Statistics		**Shapiro-Wilk**			
	Tolerance	**VIF**	**Statistics**	**df**	**Sig.**	
Project Cost Estimation	.223	1.490	.863	53	.246	
Project Budgeting	.198	2.089	.961	53	.209	
Project Monitoring and Evaluation	.667	1.453	.828	53	.163	
Project Expenditure control	.472	2.114	.948	53	.799	
Performance of water projects	.588	1.993	.841	53	.195	
Durbin Watson						1.856

Source: Field Data (2023)

Results in Table 4.7 reveal that there is no multicollinearity in the data set based on (VIF <10 and Tolerance > 1) implying the data set is suitable for conducting regression analysis. The Shapiro-Wilk test for normality test and the obtained p-

values were higher than set standard of 0.05 (P-values > 0.05) an indication of normal distribution for the data. The regression model was diagnosed using Durbin Watson for autocorrelation with results of (d = 1.856) an indication of lack of serial correlation and the model is independent.

4.6 Correlation Analysis

To establish the effect of project cost control on project performance, correlation analysis was conducted and the results are as shown in Table 4.8

Table 4. 8: Correlation Analysis

		Project Performance	Project Cost Estimation	Project Budgeting	Project Monitoring & Evaluation	Project Expenditure
Project Performance	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	53				
Project Cost Estimation	Pearson Correlation	.71	1			
	Sig. (2-tailed)	.000				
	N	53	53			
Project Budgeting	Pearson Correlation	.539	.283	1		
	Sig. (2-tailed)	.000	.000			
	N	53	53	53		
Project Monitoring & Evaluation	Pearson Correlation	.606	.543	.692	1	
	Sig. (2-tailed)	.000	.170	.000		
	N	53	53	53	53	
Project Expenditure	Pearson Correlation	.516	.162	.196	.009	1
	Sig. (2-tailed)	.007	.000	.000	.159	
	N	53	53	53	53	53

Source: Field Data (2023)

The findings shown in Table 4.8 show that all the project cost control measures adopted in this study were positively correlated to performance of water projects in Kericho County. The results further show that project cost estimation had positive and significant relationship with water project performance based on r =.71. Similarly, project budgeting was strongly and positively linked to water project performance in Kericho County, since it had high score values where r =.539. The results also showed that project monitoring and evaluation with r =.606 had strong and positive relation to water project performance. Lastly, project expenditure at r =.516 was positively and significantly linked to water projects performance in Kericho County. These findings show that the relationship between all the independent variables and the dependent variable was positive. This is based on all the r values being greater than zero as an indication of positive association.

On the strength of the relationship between the variables and basing on the interpretation of the r values where 0 to 0.2 implies very weak correlation, 0.2 to 0.4 implies the relationship is weak; 0.4 to 0.6 indicate moderate strong correlation; 0.6 to 0.8 imply that the correlation is strong and 0.8 to 1.0 imply the correlation is very strong. Based on this categorization, then project cost estimation at (r =.71) and project monitoring and evaluation at (r =.606) have a strong association with water project performance and project budgeting at (r =.539) and project expenditure (r =.516) have moderate but strong correlation with water project performance in Kericho County.

These findings imply that the reported improved performance of the water projects in Kericho County was as a resulted of the adopted project cost control measures. The findings are echoed by Mutya (2018) sharing that effective cost control, keeping the costs limited to the budget result in improved project performance. Odhiambo, *et al.* (2020) noted that management of costs and expenses improve project outcomes. In addition, Mwaguni, *et al.* (2020) mentioned that budgets had a positive and significant influence on performance of the research projects. Gidey (2019) found that cost management in projects with aspects like cost estimation, cost budgeting, cost planning and monitoring helped in attaining project goals and improve project performance

4.7 Multiple Regression Analysis

Multiple regression analysis was conducted to evaluate the association between project cost control and performance of water projects in Kericho County, Kenya. The analysis included model summary, ANOVA and beta coefficient and results are indicated in these subsequent sections.

Table 4. 9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.789[a]	.623	.599	.355286

a. Predictors: (Constant), Project cost estimation, Project budgeting, Project Monitoring & Evaluation, Project Expenditure Control

Source: Field Data (2023)

The results shown in Table 4.9 indicate that project cost estimation, project budgeting, project monitoring and evaluation and project expenditure control are predictors of performance of water projects in Kericho County. The adjusted R square of .599 imply that the four adopted project cost control measures account for 59.9% of the change in performance of the water projects. Thus, 59.9% of changes in performance of the water projects were influenced by project cost estimation, project budgeting, project monitoring and evaluation and project expenditure control. Hence, project cost control improved performance of water projects in Kericho County, Kenya and the remaining 40.1% change in performance of the water projects is explained by other factors outside the scope of the current study.

Table 4. 10: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	22.165	4	5.541	4.0625	.000[b]
	Residual	62.504	48	1.364		
	Total	74.669	52			

a. Dependent Variable: Project Performance
b. Predictors: (Constant), Project cost estimation, Project budgeting, Project Monitoring & Evaluation, Project Expenditure Control

Source: Field Data (2023)

Table 4.10 indicate that ANOVA analysis was performed at 0.05 significance level and findings showed that F calculated was 4.0625 while F critical was 2.565. The results indicate that the model for analysis is fit, ideal and acceptable for use. This is based on the obtained F calculated

is greater that the F critical, such that $F_{calculated}$ (4.0625) > $F_{critical}$ value (2.565). The overall significance level of the regression model (sig =.000) implying that at least one of the study variables affects the dependent variable on performance of the water projects. The changes of the performance of the water projects can be explained by the adopted project cost control measures.

Table 4. 11: Regression Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	5.567	3.087		1.803	.000
Project Cost Estimation	.993	.618	1.209	1.606	.000
Project Budgeting	1.979	.847	.423	2.336	.032
Project Monitoring & Evaluation	.804	.715	.626	1.124	.000
Project Expenditure Control	2.057	1.476	1.439	1.393	.001

a. Dependent Variable: Project Performance

The adopted model was:

$$\mathbf{Y = 5.567 + .993\ X_1 + 1.979\ X_2 + .804\ X_3 + 2.057\ X_4}$$

The findings indicate that when all the four variables of project cost control are valued at zero, then performance of the water projects in Kericho County is valued at 5.567. The findings show that project expenditure control had the highest effect on performance of the water projects, as based on high beta value of (β =2.057, p-value 0.001 < 0.05). These results are echoed by Omotayo, *et al.* (2020) who noted that cost

control techniques such as forecasts, cash flow management, presence of a working budget, monitoring the costs of overheads, material, tools, equipment and labor and taking corrective actions whenever variations and signs of cost overruns are identified; these lead to project success. As such, cost control techniques, cost management practices and cost monitoring approaches improve overall project performance. Similarly, Yismalet and Patel (2018) found that control and management of project costs and expenses improve performance outcomes and revenues generated from the project. Abobakr (2018) also shared that estimation, control and management of costs improved the performance of construction projects by reducing cost overruns.

The study findings revealed that aspects of project budgeting had the second largest effect on water projects performance. These findings are based on reported beta values of (β =1.979, p-value 0.032 < 0.05). The results were supported by the researchers Mwaguni, *et al.* (2020) who revealed that budget review, compliance with the budget, involvement of all stakeholders in budget making and budget controls resulted in highly performing research projects. At the same time, Eyibio and Daniel (2020) noted that resource budgeting has a significant effect on success of projects and Kwon and Kang (2019) found that use of accurate and precise budgets led to high performance for the residential projects in the South Korean construction industry.

The study also revealed that project cost estimation had significant effects on water project performance as shared by beta results where (β =.993, p-value 0.000 < 0.05). This finding is echoed by Ahn, *et al.* (2020) noted that accurate cost estimation informs the decision making resulting in successfully completed projects. While Fazil, *et al.* (2021) shared that cost control measures of cost estimation, control practices and assessing incurred project costs helped reduce cost overruns. Kermanshachi *et al.* (2018) found positive effects of cost estimation as an aspect of cost management leading to success of the projects. Cost estimation of materials needed for each project phase, forecasting and predicting overall project costs, the estimates made with variations and accuracy, help in scheduling project tasks that improve performance of the project.

The study findings also share that project monitoring and evaluation had the least effect on performance of water projects in Kericho County. This is based on beta results reported at (β =.804, p-value 0.000 < 0.05). Just as Sinigi and Kaburu (2020) found that M&E significantly affect performance of the youth employment projects. Alternatively, Chebet (2021) found positive and significant relationship between M&E and infrastructure projects. The improvement in performance of the projects was informed by the adopted monitoring and evaluation plans, costs, programs, competency of the staffs, assessment and supervision and access, sharing and utilization of data. Mokua and Kimutai (2019) argues that effective use of M&E reports and having trained and experienced monitoring and evaluation staffs is needed for successful delivery of projects.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter summarizes the findings of this study on project cost control aspects of project cost estimation, budgeting, monitoring and evaluation and expenditure control and performance of water project. The summaries helped in drawing the conclusions and recommendations and the chapter concludes with suggestion for further studies as linked to gaps in the study.

5.2 Summary of Findings

The main focus of this study was to establish the effect of project cost control techniques on performance of water projects in Kericho County, Kenya. The study's aim was achieved through these specific objectives on project cost estimation, project budgeting, project monitoring and evaluation and project expenditure. Through use of descriptive research design and targeting 16 completed water projects in Kericho County where project managers, contractors, water committee chairpersons and county officials in the water department formed the respondent list. Semi-structured questionnaires were used in collecting data that was analyzed using descriptive, correlation, regression and content analysis methods. The results obtained are summarized as follows:

The results on project cost estimation showed that accurate cost and material estimates were done by adopting different models in an effort to reduce cost overruns for the entire water projects. The managers used the cost and material forecasts to inform their decisions on project resource needs for completion of the water projects. The cost estimates were grouped as per project phase and later compiled to inform work volume and utilization of resources. Therefore, project cost estimation significantly improved project performance.

Project budgeting findings revealed that budget as a tool helped in maximizing the utilization of project funds, materials and resources. The budget also informed the

decision-making process such as identifying, assessing and management of project risks and indication of the sources and utilization of resources. An effective budget entailed costs for all functional areas and included fixed and variable costs. The study also found that project budgeting was related to other cost control measures of expenditure control, monitoring and evaluation and estimation of costs. Project budgeting positively and significantly improved performance of the water projects in Kericho County.

The findings showed that project monitoring and evaluation was done to check on execution of the plans, enhance transparency and accountability and share feedback from all project team members. The monitoring and evaluation function took a participatory approach by collating views from stakeholders in guiding the decision-making process on execution of project plans. The function also involved tracking project activities across all the phases for delivery of successful and completed project. The project monitoring and evaluation function was found to improve implementation of project activities resulting in successfully completed water projects in Kericho County.

Project expenditure control is an important aspect in reduction of cost overruns and leading to successfully completed projects. The results revealed that managing project costs entailed setting limits and authorization methods for consumption of project funds and resources, having a cash flow management system and monitoring all the operational project costs. The management adoption of tendering and budgeting measures helped in implementing project plans. The regular reviews and assessments helped in identifying early warning signs of cost overruns and delays and corrective measures were undertaken. The managers also did comparisons of the estimates and actual costs to guide decisions on project costs. The expenditure controls led to improved water project performance in Kericho County.

5.3 Conclusions

The study concluded that project cost control positively and significantly improved performance of water projects. The project cost control measures assessed in this study resulted in completion of water projects on time and keeping to the budget lines

for costs. The quality of the water was good making the beneficiaries including local residents getting satisfaction with the water projects. Adopting the project cost control improved the quality of raw materials used making these water projects sustainable for long.

It was also concluded that the project cost estimation significantly improved performance of the water projects in Kericho County. This was based on accurately estimation of costs, raw materials needed and volume of materials for completion of the water projects. In addition, the estimates included price variation that ensured there were no deficits in funds and resource for smooth implementation of all project activities and plans. Forecasting for all costs and funds enabling work scheduling that improved on timeliness in delivery of the overall water projects.

The study also concluded that project budgeting had a positive and significant effect on performance of the water projects in Kericho County. This was attributed to presence of comprehensive budget that included fixed and variable costs, sources of funds, allocation and utilization of the funds and resources by the various operational units. The budgeting also set guidelines on use of resources and risks to the costing baseline resulting in maximum utilization of funds and other resources in the water projects.

The study conclusions were such that project M&E positively and significantly improved performance of the water projects in Kericho County. The results indicated that monitoring and evaluation function worked by checking execution of plans and getting feedback. There was improved transparency and accountability in resource utilization that enabled the project to keep to budget lines. All stakeholders were involving in monitoring project activities, resource utilization and made decisions concerning key project aspects. However, little was done in tracking project activities from start to end and assessing resource needs across the entire project. For improved performance outcomes, the managers mist track and assess resource needs.

The study further concludes that project expenditure control led to high performance of the water projects in Kericho County. The manager set limits and authorized the allocation and utilization of resources as a way to keep the project within the budget

baseline. Cutting down unnecessary and excessive costs was done by implementing the cash flow management, identifying likely areas for cost overruns and avoiding delays. The expenditure control measures resulted in keeping the water projects to budget, acquiring quality raw materials and taking corrective actions to reduce cost overruns leading to quality and sustainable water projects.

5.4 Recommendations

The study recommends to the county government of Kericho, other counties, management teams in the water department to adopt project cost control techniques as a means of improving project performance. This will help reduce cost overruns, delays and issues of quality of the finished project and result in improved performance. Management teams of other projects such as construction and building, road and development projects are advised to read and gain insights from this study to implement project cost control techniques.

The study also recommends that the project management and teams improve cost estimation measures that are incurred during the different project phases, and effectively budgeting for material needs for the various functional units of the project. The project managers should also set monitoring and evaluation teams to check on the progress of the project and set expenditure controls for improvement in performance of the projects.

The study also recommends to policy makers at the national and county government level to set guidelines that will reduce the challenges in project performance such as cost overruns, stalling and abandonment of projects. The policies should also endorse and support training programs for contractors, engineers and project managers on management of costs for delivery of quality and timely projects that keep to the stipulated budget.

5.5 Suggestions for Further Research

Further research can be done on cost control and performance of other project types such as road or construction projects. This study was done in Kericho County and a similar study can be done in other counties for comparison purposes. There was a

residual effect of 40.1% of factors outside the scope of the current study, which future researchers can assess in determining all factors influencing performance of water projects in Kericho County.

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APPENDICES

Appendix I: Questionnaire

Kindly answer all the questions by marking (√) in the provided spaces.

PART I: DEMOGRAPHIC INFORMATION

1. Gender

   Male [ ] Female [ ]

2. What is your highest education qualification?

   Certificate [ ] Diploma [ ] Degree [ ] Masters [ ] PhD [ ]

3. What position do you hold?

   Project manager [ ] Project contractor [ ] Water committee chairperson [ ] County water official [ ]

4. How long have you held this position?

   0-3 years [ ] 4-6 years 7-10 years [ ] more than 11 years [ ]

PART II: PROJECT COST CONTROL

For Q5 to Q15 with closed-ended questions use this 5-point likert scale stated as 1 = strongly disagree, 2 = disagree, 3 = not disagree or agree, 4 = agree, and 5 = strongly agree; to rate the extent that you agree with each of the statements.

5. Project Cost Estimation

Statement	**1**	**2**	**3**	**4**	**5**
Use of different models helps in accurately estimating overall project costs					
Experts are involved in estimating the volume of materials needed for completion of the water projects					
The project forecasts inform decision making done by the project managers					
Resource estimates work to avoid instances of cost overruns					
Calculating project cost estimate factors in pricing variation to avoid deficits					
Estimating volume of work helps in scheduling tasks while reducing conflicts due to double scheduling					
Cost estimates is done as per project phase that is compiled into the overall report					

6. What other benefits accrue from accurate cost estimates of projects?

   ……

   ……..

7. Project Budgeting

Statement	**1**	**2**	**3**	**4**	**5**
The budget includes both fixed and variable costs of the water project					
The formulated budget gives an indication of how funds or other resources are allocated					
The budget covers all operational costing for all functional areas of the water project					
The budget guidelines indicate sources plus utilization of project resources					
The project budget helps in maximizing usage of funds or other resources					
Budgeting informs the project decision making process done by managers					
The project budget includes possible risks as it sets the costing baseline					

8. In what other ways does project budgeting affect the overall outcome of the water project performance?

   ……

   ……..

9. Project Monitoring and Evaluation

Statement	**1**	**2**	**3**	**4**	**5**
Monitoring and evaluation is done through tracking all project activities in all phase					
M&E aides in assessing the resource demands needed for completion of the project					
Project M&E takes a participatory approach by incorporate all project stakeholders					
Monitoring costs informs the decision makers in the water projects on resource consumption					
M&E is done to check on implementation of the project plans					
The project has a feedback mechanism for collecting information on project progress					
The M&E policies works to ensure transparency and accountability in implementing water projects					

10. What impact does monitoring and evaluation have on performance of water projects in Kericho County?

    ……

    ……..

11. How best can the monitoring and evaluation exercise be carried out in the water projects?

    ……

    ……..

12. Project Expenditure Control

Statement	**1**	**2**	**3**	**4**	**5**
The project managers have set limits to consumption of project funds					
Authorization must be sought before using project resources from project managers					
Regular reviews help in comparing estimates vs. actual costs to avoid unnecessary expenses					
Project managers implement cash flow management to cut project expenses					
The managers actively monitor overhead/operational costs					
Assessments done identify indicators of cost overruns where corrective measures are undertaken					
Delays in implementation at different stages is discouraged to bring expenditures down					
Expenditure control measures like tendering and budgeting is taken to keep to project costing					

13. What other measures can be implemented to control expenses in the water projects?

    ……

    ……

14. What is the implication of huge expenses in the water projects?

    ……

    ……

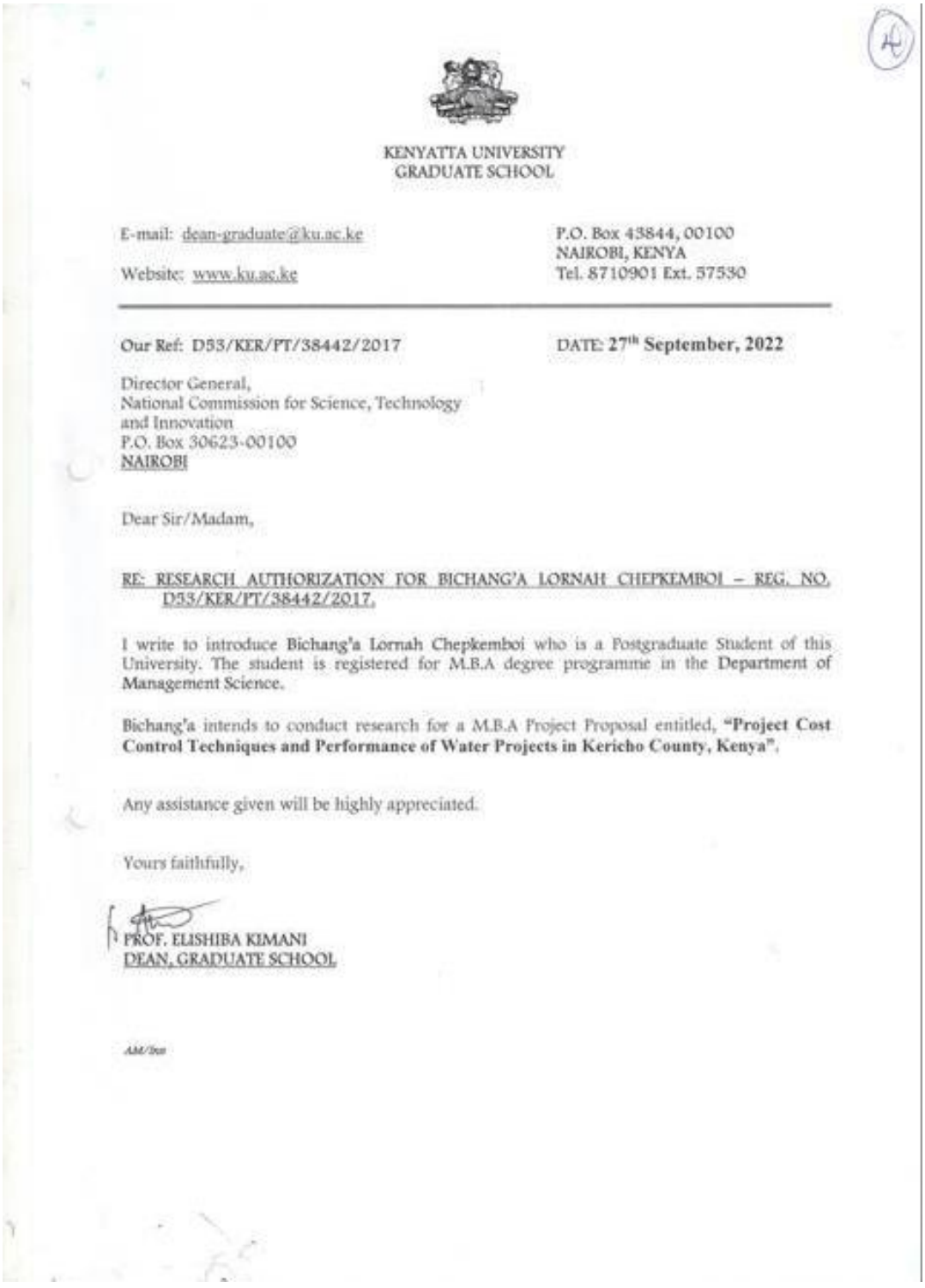
PART III: PROJECT PERFORMANCE

15. Use the Likert Scale to indicate the extent you agree with these statements on performance measures of water projects in Kericho County.

Statement	**1**	**2**	**3**	**4**	**5**
The quality of water projects is high					
The water projects are completed as per the scheduled timeline					
Beneficiaries are satisfied with the water projects					
The water projects maintain the set budget lines					
The water projects is sustainable for long					
The projects used quality raw materials					

THE END!

Appendix II: Research Authorization



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Our Ref: D53/KER/PT/38442/2017

DATE: 27th September, 2022

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR BICHANG'A LORNAH CHEPKEMBOI – REG. NO. D53/KER/PT/38442/2017.

I write to introduce **Bichang'a Lornah Chepkemboi** who is a Postgraduate Student of this University. The student is registered for M.B.A degree programme in the **Department of Management Science.**

Bichang'a intends to conduct research for a M.B.A Project Proposal entitled, **"Project Cost Control Techniques and Performance of Water Projects in Kericho County, Kenya".**

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

AM/bm

Appendix III: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **534908**

Date of Issue: **25/July/2023**

RESEARCH LICENSE

This is to Certify that Ms.. LORNAH CHEPKEMBOI BICHANG'A of Kenyatta University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kericho on the topic: PROJECT COST CONTROL TECHNIQUES AND PERFORMANCE OF WATER PROJECTS IN KERICHO COUNTY, KENYA for the period ending : 25/July/2024.

License No: **NACOSTI/P/23/27992**

534908

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions

Appendix IV: List of Water Projects in Kericho County

1. Kimugu
2. Kipkobob
3. Kimaut
4. Kusumek
5. Sigowet
6. Chesonoi
7. Benditai
8. Londiani
9. Kipkelion
10. Ainamoi
11. Sosiot
12. Fortenan health center water project
13. Kipsitet
14. Chepkoinin/Kirukto water supply
15. Kapbokyek
16. Roret pineapple processing plant water project