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# Project Control and Project Performance of Irrigation Projects in Embu County, Kenya

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**Abstract:** ***Project performance guarantee optimal utilization of resources, meeting project timelines, and achieving the desired outcomes, especially in irrigation sectors as global demand for food production increases to support a burgeoning population, optimizing water usage and irrigation systems becomes imperative. In various continents like Asia, and America, countries have focused more on maximizing the available resources to unlock the full potential of water resources, enhance crop yields, and mitigate environmental impacts which has realized over 90% project success rate unlike in Embu county, Kenya. As a result, the study thus aimed to determine the effect of project control on project performance within the context of irrigation projects in Embu County, Kenya. To be specific, the research focused to examine the extent to which comprehensive project planning, decision-making processes, risk management, and project monitoring influences the performance of irrigation projects in Embu County, Kenya. Additionally, the study explored existing theories and models such as waterfall model, prospect theory, and theory of constraints in relation predictors variable at hand. The researcher target population include 4 irrigations project namely, Nthawa, Masinga, Kanyuambora irrigation project, and Rupingazi-Weru irrigation water project in Embu County, where the unit of observation comprises of 153 respondents including project management officials, ministry of water and irrigation officials, and community representatives. A semi-structured questionnaire was utilized in this investigation to help in collection of real time data that is free from bias and errors. Once data is collected, a statistical package for social science software in readiness for analysis was included. Quantitative data was analyzed using descriptive statistics which include means, percentages, standard deviations and frequencies, while qualitative data utilized content analysis to identify themes and vital narratives emerging from the data. Further, the degree of impact and relationships between variables of project control (project planning, project monitoring, risk management, decision making) and project performance of irrigation projects in Embu County, Kenya was established using Pearson correlation and regression models after diagnostic tests such as normality and homoscedasticity. The researcher noted after a comprehensive descriptive, Pearson correlation and regression analysis, the result revealed a moderate practice of project planning, monitoring, risk management, and decision making, thus low performance of irrigation projects in Embu County, Kenya. As a result, the study recommends prioritization and investment in robust planning processes. Project team involved in irrigation projects to ensure that comprehensive planning activities are undertaken, including thorough needs assessment, stakeholder engagement, and resource allocation. Establish clear monitoring protocols and responsibilities, as well as leveraging technology where possible to streamline data collection and analysis processes. Regular and timely reporting of project progress and milestones to relevant stakeholders is essential to ensure transparency and accountability. The study also recommends adoption of project management software such as Asana, Trello, and Microsoft Project tools for tracking tasks, milestones, and deadlines. Teams to invest in comprehensive risk assessments at various stages of project implementation to identify potential threats and vulnerabilities. Subsequently, develop and implement a risk mitigation plan to address identified risks effectively. Regular reviews and updates of risk registers are essential to ensure that emerging risks are promptly addressed and managed. Furthermore, fostering a culture of risk awareness and accountability among project teams to enhance risk management practices and ensure resilience in project execution. Ensure that decision-making processes are transparent, participatory, and informed by reliable data and information. Finally, the study recommends project team to establishing clear decision-making frameworks and protocols to streamline decision-making processes and reduce ambiguity.***

**Keywords:** Project control, Project performance

## 1. Introduction

Completing irrigation projects gives hope and plays a pivotal role in addressing the growing global challenges of food insecurity and sustainable agricultural practices [7]. As global demand for food production increases to support a burgeoning population, optimizing water usage and irrigation systems becomes imperative. In various continents like Asia, and America, countries are focusing on maximizing the available resources to unlock the full potential of water resources, enhance crop yields, and mitigate environmental impacts. A good example is China, which is known for their extensive irrigation infrastructure, playing a crucial role in supporting their large agricultural sector.

China specifically has successfully implemented various irrigation projects, including the famous Yangtze Basin Water Resources Project, Vaico and Ningxia [5]. China's emphasis on large-scale irrigation has led to significant achievements in increasing agricultural productivity and water availability. According to statistics, China irrigates over 70% of its arable land, contributing to a substantial portion of its food production. The country has registered 90% irrigation project success rate, with the remaining 10% work in progress [15]. The achievement is due to strong regulatory framework allows for better planning, coordination, and implementation of irrigation projects from engineering structure to the areas water delivery. The government has invested in modern technologies for water management, such as remote sensing and real-time monitoring systems. The advanced technologies have enabled efficient water distribution to farmers as well as good monitoring system. Additionally, the strict enforcement of water-use regulations and penalties for unauthorized use

further contribute to the performance of irrigation projects in China.

In Sub-Saharan Africa (SSA) countries such as South Africa, Sierra Leon, Zimbabwe, Tanzania, Ghana and Kenya in Africa after a 30-years, large-scale irrigation projects have been witnessed according to [6]. The projects have been a subject of interest and debate in development and agricultural circles for decades. In Sub-Saharan Africa, the execution of irrigation projects has been motivated by the un-ending need to enhance food security due to the increasing population, and the need to promote economic development in the region with Ghana capital investments reaching as high as US$25,000 for irrigation projects.

In Kenya, especially in Embu County, government has really invested a lot in irrigation projects still aiming to bring water to arid or semi-arid regions, enabling farmers to cultivate crops and potentially increase their income and living standards. Many of the projects including Rupingazi-Weru irrigation water project was financed by the county government and the World Bank where financial backing of Ksh. 298 million was allocated [11]. The projects are expected to enhance farming value chain in respect to National Agricultural and Rural Inclusive Growth (NARIG) project. Kanyuambora irrigation project was also allocated Ksh. 220 million by the National government which was expected to be completed by April 2020 but the project stalled at 17%. Other projects stalled were Masinga irrigation project as well as Nthawa which siphon billions of Kshs [2].

### 1.1 Statement of the problem

In the context of irrigation projects, the vital performance of a project is important for ensuring the optimal use of resources, adhering to project timelines, and attaining the desired goals. As revealed in the background of the study section, China among other countries has jumped into the investment to enhance food security due to the increasing population, and the need to promote economic development in the region. Many of the irrigation projects in various countries have recorded over 90% success rate, with the remaining percent work in progress unlike in Kenya. The achievements were as a result of strong regulatory framework which enhanced better planning, coordination, and implementation of irrigation projects from engineering structure to the areas water delivery. In Embu County, Kenya, however the results were striking, indicating that the projects have largely failed to deliver the promised benefits as well as achieve key performance indicators. All four irrigation projects under study have the occurrence of diminished economic returns often stems from cost overruns and late completion.

Besides, several studies globally have highlighted the significance of project control aspect such as project planning, project monitoring, conflict management, informed decision making and risk management in enhancing project performance. However, there are still unaddressed gaps such as consequences of over-planning [16] which requires a deeper understanding, failure to consider impact of other interventions that could improve project performance [1], and unclear whether the findings can be generalized to other industries and cities. Other gap include the complex nature of irrigation projects often involves multiple stakeholders, diverse environmental factors, and varying economic considerations. Explore the challenges and effectiveness of risk management tool in construction projects, which is an important consideration for project managers and stakeholders [12].

Given the important role that irrigation projects play in sustainable agriculture and water resource management, it is important to understand the correlation between project control and project performance. This study, therefore, sought to bridge existing gaps in the knowledge body by offering useful insights into the impact of management control on the overall performance of irrigation projects in Embu County, Kenya. This research draws on authoritative sources and relevant citations from previous studies to build a solid theoretical foundation for the investigation.

### 1.2 Specific Objectives of the Study

a) To examine the extent to which project planning influences the performance of irrigation projects in Embu County, Kenya.
b) To evaluate the effect of project monitoring on the performance of irrigation projects in Embu County, Kenya.
c) To evaluate the influence of risk management on the performance of irrigation projects in Embu County, Kenya.
d) To analyze the role that decision-making plays enhancing project performance for irrigation projects in Embu County, Kenya.

### 1.3 Significance of the Study

Locally, by comprehending the impact of effective project control on project performance, this study contributes directly to the development of sustainable irrigation initiatives, resulting in improved crop yields, food security, and economic conditions for local farmers. The examination on project planning, decision-making, project monitoring, and risk management offers insights to guide local authorities, project managers, and policymakers in making informed choices, thereby enhancing and bolstering the performance of irrigation projects. Moreover, the research's findings inform policy formulation, advance best practices, and enrich the academic discourse on project management, providing practical insights applicable not only in Embu County but also across diverse industries and contexts globally.

## 2. Theoretical Review

This section explored existing theories and models such as waterfall model, prospect theory, and theory of constraints related to project planning, project monitoring, risk management, decision making, and project performance.

**Waterfall Model**

This a classic approach to project planning and management develop by Winston in the year 1970 according to [8]. The model reveals a linear project sequence of phases, that is,

identifying project requirements, planning and design, implementation, testing, and maintenance. The model stresses the importance of thorough planning and documentation before moving to the next phase. The model contribution was instrumental in establishing a structured methodology that guided software projects through a step-by-step process, ensuring clarity and order in project execution.

Waterfall model was importance as it emphasized on detailed planning and sequential execution aligns with the planning phase of project management processes. In this study, it underscored the importance of a well-defined scope, clear objectives, and comprehensive documentation as integral components of effective project planning, thus, enhancing efficiency of irrigation projects in Embu County by ensuring sequential progression.

**Theory of Constraints (TOC)**

Eliyahu introduced the Theory of Constraints in 1984 to revolutionize both manufacturing and project management areas, although, it effectiveness for identifying bottlenecks in manufacturing are less suitable for addressing the intricate and evolving challenges of project management [3]. Additionally, TOC's focus on constraints that lead to neglecting other important factors that influence project performance.

Every system has a bottleneck that restricts its capacity [13]. By identifying and addressing project constraints, project team can significantly improve project performance and throughput. This translates to identifying critical paths or bottlenecks that may impact project timelines and outcomes.

Authors like Goldratt as well as Jeff Cox, have continued to refine and expand upon the TOC framework [10]. Goldratt, and Jeff Cox have introduced additional concepts such as the five focusing steps which provide a systematic process for identifying and addressing constraints. In regard to this study, TOC's concept was relevant to project monitoring, identifying and addressing bottlenecks of irrigation projects in Embu County, thus, ensuring that projects remain on track and are completed within the budget.

### 2.2 Conceptual Framework

This is a theoretical structure aimed at providing a systematically organized way to analyze, understand, and interpret complicated concepts. It served as a foundation for researchers, practitioners, or individuals to conceptualize relationships between variables, develop research objectives, and guide the study design.

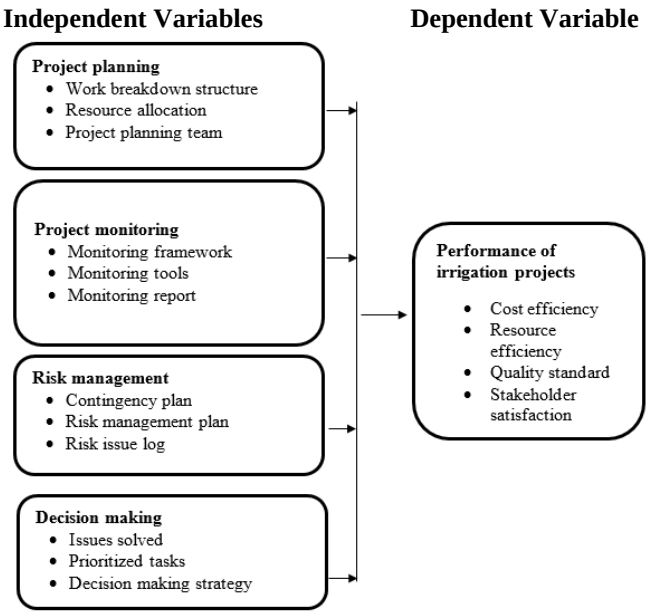


**Figure 1:** Conceptual Framework
Source: Researcher (2023)

## 3. Research Methodology

In regard to this study, the research employed descriptive to gain a comprehensive understanding of relationships between predictor variables (project planning, monitoring, risk management, decision making) and dependent variable (project performance). The researcher targeted 4 irrigations project namely, Nthawa, Masinga, Kanyuambora irrigation project, and Rupingazi-Weru irrigation water project in Embu County which are key iconic national projects aimed to benefit community at large. On the other hand, the unit of observation comprised of 156 respondents including project management officials, ministry of water and irrigation officials, and community representatives.

The researcher employed the Yamane formula to calculate sample size because of its usefulness when one is dealing with a large population and the desired precision level is known. Additionally, the researcher employs simple random technique to select participants from the population randomly.
The Yamane formula is as follows:

$$n = N / [1 + N(e^2)]$$

Where:
n is the required sample size.
N is the total population size.
e is the desired level of precision (0.05).
Working;
n = 246/ [1+ 246*0.05^2]
n = 153

### 3.1 Data Collection Instrument

A semi-structured questionnaire was utilized in this investigation to help in collection of real time data that is free from bias and errors. This tool has an upper hand as it gives the respondents total freedom when expressing their views. It was designed to have six (6) sections comprising of

demographic information of the respondents, and the key variables of the study.

### 3.2 Diagnostic Test

Diagnostic tests such as normality and multi-collinearity was conducted before inferential analysis (Pearson correlation and multi-regression analysis) to provide insights in the regression model's performance, assumptions and predictable issues. Normality test usually presumes a normal distribution of the residuals. In this case, the researcher utilized normal probability plot to check the normality distribution of data. On the other hand, multi-collinearity presumes a high degree of correlation among the predictor variables in a regression analysis, tested via VIF value. The VIF measures how much the variance of the estimated regression coefficients is inflated due to multi-collinearity. VIF values above 10 are often considered indicative of multi-collinearity.

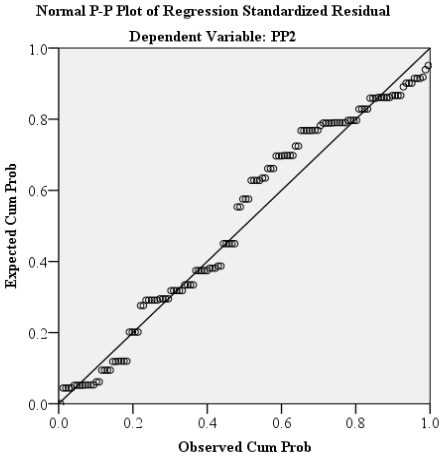


**Figure 1:** Normal P-P Plot
Source: Data analysis (2024)

The analysis finding as demonstrated in figure 2, indicates that data points fall approximately along a diagonal line suggesting that the data is normally distributed.

**Table 1:** Multi-collinearity statistics

| Model | | Collinearity Statistics | |
|---|---|---|---|
| | | Tolerance | VIF |
| 1 | (Constant) | | |
| | Project planning | .176 | 5.675 |
| | Project monitoring | .134 | 7.437 |
| | Risk management | .145 | 6.909 |
| | Decision making | .230 | 4.356 |

a. Dependent Variable: Project Performance
Source: Data analysis (2024)

As per the analysis result presented in table 1, the VIF values for project planning (5.675), project monitoring (7.437), risk management (6.909), and decision making (4.356) are within the recommended scale of 1-10. This indicates that there is no multi-collinearity among the variables.

### 3.3 Data Analysis

The collected data was both qualitative and quantitative in nature. Once it was collected, data entry and cleaning process was initiated using statistical package for social science (SPSS) software in readiness for analysis. Quantitative data was descriptively analyzed (means, percentages, standard deviations and frequencies were generated), while qualitative data utilized content analysis to identify themes and vital narratives emerging from the data. The degree of impact and relationships between variables of management control (project planning, project monitoring, risk management, decision making) and project performance of irrigation projects in Embu County, was established through Pearson correlation and regression model analysis. This was the multiple regression model that was used;

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

Where: -
**Y** = Project performance of irrigation projects
$\mathbf{X_1}$ = Project planning
$\mathbf{X_2}$=Project Monitoring
$\mathbf{X_3}$=Risk management
$\mathbf{X_4}$= Decision making
$\boldsymbol{\beta_0}$ = Intercept
$\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4}$ = Regression coefficients
$\varepsilon$ = error term.

### 3.4 Ethical Consideration

The ethical considerations in research provides a code a conduct that researcher should uphold. Initially, the researcher obtained an approval from the graduate school as well as an authorization from the National commission for Science, Technology and Innovation (NACOSTI) to ensure adherence to the set ethical guidelines and regulations. Following, the researcher shared an informed consent to all the participating individuals. Prior to data collection, the participant was provided with clear information about the study and a voluntary consent sought through handwritten signature. Only those who agreed to participate were involved in the study. The researcher also ensured confidentiality of the shared data and reassure the participants that the information sought was going to be used strictly in academic purpose.

## 4. Research Findings

### 4.1. Response Rate

The researcher recorded a response rate of 87.6% (134/153) which indicated a substantial level of engagement and cooperation between the targeted respondents and the researcher. High response rate enhance the validity and reliability of the research outcomes, thus recommending effectiveness of data collection method employed in eliciting participation from the intended sample, reflecting a robust research design and implementation strategy.

### 4.2 Test for reliability

**Table 2:** Reliability Statistics

| Variable | Cronbach's Alpha | N of Items |
|---|---|---|
| Project planning | .869 | 8 |
| Project monitoring | .886 | 11 |
| Risk management | .858 | 10 |
| Decision making | .764 | 10 |
| Project performance | .873 | 9 |

Source: Data analysis (2024)

As presented in table 2, project monitoring and the performance exhibit high internal consistency with Cronbach's alpha coefficients values of .886 and 873 respectively, suggesting that the items within the variables are highly correlated and measure the intended constructs reliably. Project planning and risk management also demonstrate acceptable internal consistency with Cronbach's alpha values of .867 and .858, respectively. Lastly, decision making variable shows a slightly lower value of .764 but still acceptable. Overall, the coefficient values indicate that the measurement instruments used in the research are reliable, and thus, contribute to the validity of the study's findings.

### 4.3 Descriptive Analysis

The section provides descriptive statistics analysis which include measures of central tendency, such as the mean, offering insights into the typical value of a dataset. Additionally, measures of dispersion such as the variance, and standard deviation, provides information about the variability of the data points around the central tendency.

**Table 3:** Project planning

| | | Statistic |
|---|---|---|
| During project planning all the requirements and needs of the stakeholders were identified. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 4.16 |
| | Std. Deviation | .591 |
| The project planning process effectively allocated tasks to appropriate team members with necessary skill sets. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.91 |
| | Std. Deviation | .654 |
| The project has a clearly defined Work Breakdown Structure (WBS) that outlines all project tasks and subtasks. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.92 |
| | Std. Deviation | .589 |
| Resource allocation is regularly reviewed and adjusted as necessary to meet project goals. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.92 |
| | Std. Deviation | .589 |
| The project planning team includes members with diverse skills and expertise. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.90 |
| | Std. Deviation | .734 |
| Communication within the project planning team is effective, promoting collaboration and knowledge sharing. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.91 |
| | Std. Deviation | .654 |
| Valid N (listwise) | N | 134 |

Data analysis (2024)

Firstly, as per the analysis, respondents agree that during project planning, all requirements and needs of stakeholders were identified with a mean of 4.16, suggesting a high level of effectiveness in this area. However, neither agree nor disagree with the statement that the appropriate team members with necessary skill sets are allocated tasks as indicated with a mean of 3.91. More so, respondents are not sure whether Work Breakdown Structure (WBS) that outlines all project tasks and subtasks is clearly defined (mean of 3.92). It's worth noting that while resource allocation is moderately reviewed and adjusted as necessary (mean of 3.92). Similarly, the mean for the diversity of skills and expertise within the project planning team is 3.90, suggesting a moderate satisfactory. Communication within the project planning team is moderately effective with a mean of 3.91. Overall, the findings indicate that the project planning process is moderately structured and practiced, resulting to unclear scope and objectives definition, minimal resource allocation and risks mitigation.

**Table 4:** Project monitoring

| | | Statistic |
|---|---|---|
| The project monitoring process is well-defined and understood by the project team. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.80 |
| | Std. Deviation | .802 |
| Communication among project team members regarding project progress is clear and effective. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.92 |
| | Std. Deviation | .589 |
| Project status reports are generated and shared with stakeholders in a timely manner. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 4.18 |
| | Std. Deviation | .957 |
| Issues and risks are promptly identified, documented, and made available to the team. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.92 |
| | Std. Deviation | .918 |
| Data collected in project monitoring is used to make informed decisions and adapt the project plan as needed. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 4.00 |
| | Std. Deviation | .683 |
| Project monitoring fosters a culture of accountability and responsibility within the project team. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.90 |
| | Std. Deviation | .734 |
| Lessons learned from project monitoring are used to enhance future projects. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.91 |
| | Std. Deviation | .654 |
| Valid N (listwise) | N | 134 |

Source: Data analysis (2024)

The findings on project monitoring highlight several key aspects of the monitoring process within the project as presented in table 4. Respondents are not sure of clear understanding of the monitoring procedures among team members with a mean 3.80. Additionally, the communication

among project team members regarding project progress is moderately clear and effective with a mean of 3.92. Moreover, respondents agree that the project status reports are generated and shared with stakeholders in a timely manner (mean of 4.18), indicating proactive communication with project stakeholders. Furthermore, issues and risks are moderately identified, documented, and made available to the team (mean of 3.92). Respondents agree that the data collected in project monitoring is utilized to make informed decisions and adapt the project plan as needed (mean of 4.00).

Additionally, it's noted that there is room for improvement in fostering a culture of accountability and responsibility within the project team as indicated by a mean of 3.90. Finally, respondents are not sure if the lessons learned from project monitoring are used to enhance future projects (mean of 3.91). With the overall mean of 3.88, the findings revealed that the project monitoring is moderately practiced, with few proactive measures in place for risk management and communication leading to low accountability.

**Table 5:** Risk management

| | | Statistic |
|---|---|---|
| Risk mitigation strategies are well-defined and executed effectively to address identified risks. | N | 130 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.85 |
| | Std. Deviation | .599 |
| The project's risk management plan is comprehensive and aligns with the project's objectives. | N | 130 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 4.21 |
| | Std. Deviation | .580 |
| There is a clear and established process for escalating and addressing high-impact or critical risks. | N | 130 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 4.25 |
| | Std. Deviation | .660 |
| Risk management activities are integrated into the overall project planning and execution. | N | 130 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.65 |
| | Std. Deviation | .555 |
| Stakeholders are engaged in the risk identification and assessment process, providing valuable insights. | N | 130 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.91 |
| | Std. Deviation | .664 |
| Risk management activities contribute to increased project resilience and the ability to adapt to changing circumstances. | N | 130 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.91 |
| | Std. Deviation | .664 |
| The project's risk management process effectively balances the cost of risk mitigation with potential project impacts. | N | 130 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.77 |
| | Std. Deviation | .721 |
| Valid N (listwise) | N | 130 |

Source: Data analysis (2024)

The findings presented in table 5 revealed that risk mitigation strategies are moderately-defined and effectively executed to address identified risks (mean of 3.85). Additionally, the project's risk management plan is viewed as comprehensive and aligned with the project's objectives (mean of 4.21). This implies that there is a clear understanding of the project's risk landscape and that risk management efforts are closely tied to achieving project goals. Furthermore, there is a clear and established process for escalating and addressing high-impact or critical risks, with a mean score of 4.25, suggesting a robust approach to handling significant project risks.

However, respondents nor agree neither disagree that risk management activities are integrated into the overall project planning and execution (mean of 3.65). Similarly, stakeholders are moderately engaged in the risk identification and assessment process (mean of 3.91). Furthermore, respondents are not sure whether risk management activities contribute to increased project resilience and the ability to adapt to changing circumstances (mean of 3.91). Finally, the project's risk management process moderately balances the cost of risk mitigation with potential project impacts (mean of 3.77).

**Table 6:** Decision making

| | | Statistic |
|---|---|---|
| The project team employs a systematic and structured approach to decision-making. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.88 |
| | Std. Deviation | .786 |
| Decisions are made with consideration of their potential impact on project timelines, budgets, and objectives. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.86 |
| | Std. Deviation | .684 |
| The project team evaluates multiple alternatives before making important decisions. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.78 |
| | Std. Deviation | .543 |
| The decision-making process is transparent, and the rationale behind decisions is communicated to relevant stakeholders. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.86 |
| | Std. Deviation | .477 |
| Lessons learned from past projects are used to inform decision-making strategies and avoid similar pitfalls. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 4.30 |
| | Std. Deviation | .694 |
| The project team adapts its decision-making approach in line with specific requirements and complexities of each project. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 4.31 |
| | Std. Deviation | .738 |
| The project planning team demonstrates a clear understanding of project objectives and constraints. | N | 134 |
| | Minimum | 3 |
| | Maximum | 5 |
| | Mean | 3.88 |
| | Std. Deviation | .601 |
| The project monitoring process is well-defined and understood by the project team. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.80 |
| | Std. Deviation | .802 |
| Project milestones are effectively monitored and reported on. | N | 134 |
| | Minimum | 2 |

| | | |
|---|---|---|
| | Maximum | 5 |
| | Mean | 3.54 |
| | Std. Deviation | .742 |
| The project team demonstrates a proactive approach to resolving issues as they arise. | N | 134 |
| | Minimum | 2 |
| | Maximum | 5 |
| | Mean | 3.78 |
| | Std. Deviation | .711 |
| Valid N (listwise) | N | 134 |

Source: Data analysis (2024)

The analysis result presented in table 6 shows majority of the respondents neither disagreeing nor agreeing with several decision making statements, specifically on how decisions are made and managed within the project team with a mean of 3.00 to 3.99. Project team employs a systematic and structured approach to decision-making with a mean of 3.88. Additionally, decisions are made with consideration of their potential impact on project timelines, budgets, and objectives with a mean of 3.86. Furthermore, the project team evaluates multiple alternatives before making important decisions with a mean score of 3.78. Moreover, the decision-making process is transparent, and the rationale behind decisions is communicated to relevant stakeholders (mean of 3.86). Additionally, the project team also adapts its decision-making approach in line with specific requirements and complexities of each project (mean of 4.31). Lessons learned from past projects are used to inform decision-making strategies and avoid similar pitfalls (mean of 4.30).

Moreover, the project planning team moderately demonstrates a clear understanding of project objectives and constraints (mean of 3.88). Additionally, it's noted that project milestones are slightly lower (mean of 3.54). Lastly, the project team demonstrates a moderate proactive approach to resolving issues as they arise (mean of 3.78). In conclusion, the findings revealed that decision-making within the project is moderately characterized by a systematic, transparent, and adaptive approach that is informed by lessons learned and guided by a clear understanding of project objectives and constraints.

### 4.4 Inferential statistics

In this study, inferential statistics such as person correlation, ANOVA and multi-regression were conducted.

**Table 6:** Pearson correlation matrix

| | | PP | PM | RM | DM | PP2 |
|---|---|---|---|---|---|---|
| PP | Pearson Correlation | 1 | .844** | .858** | .612** | .912** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 |
| | N | | 134 | 134 | 134 | 134 |
| PM | Pearson Correlation | | 1 | .874** | .825** | .875** |
| | Sig. (2-tailed) | | | .000 | .000 | .000 |
| | N | | | 134 | 134 | 134 |
| RM | Pearson Correlation | | | 1 | .796** | .940** |
| | Sig. (2-tailed) | | | | .000 | .000 |
| | N | | | | 134 | 134 |
| DM | Pearson Correlation | | | | 1 | .732** |
| | Sig. (2-tailed) | | | | | .000 |
| | N | | | | | 134 |
| PP2 | Pearson Correlation | | | | | 1 |
| | Sig. (2-tailed) | | | | | |
| | N | | | | | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | |

Project Planning (PP), Project Monitoring (PM), Risk Management (RM), Decision Making (DM), Project Performance (PP2)
Source: Data analysis (2024)

Table 6 present insightful findings on the relationships between different aspects of project management, namely project planning, project monitoring, risk management, decision making, and project performance. Firstly, the strong positive correlations observed between project planning and project performance ($r = .912$, $p < .01$) suggest that effective project planning is closely associated with the project achievement. This indicates that a well-structured and comprehensive project planning process tends to lead to better project performance. Similarly, strong positive correlations are observed between project monitoring and project performance ($r = .875$, $p < .01$), highlighting the interconnectedness of these elements within the project management framework. The findings suggest that robust project monitoring practices are associated with improved project performance.

Moreover, the strong positive correlation between risk management and project performance ($r = .940$, $p < .01$) underscores the critical role of risk management in achieving successful project outcomes. This suggests that projects with well-implemented risk management strategies are more likely to demonstrate higher levels of performance. Furthermore, the positive correlation between decision making and project performance ($r = .732$, $p < .01$) indicates that effective decision-making processes contribute to better project outcomes. In general, the findings highlight the interconnected nature and integrated approaches among variables such as project planning, monitoring, risk management, and decision making in achieving successful project outcomes. The findings agree with [14], who revealed that a strong positive relationship between study variables enhances predictability, effectiveness, efficiency, and success of a project.

**Table 7:** Model Summary[b]

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .963[a] | .927 | .925 | .12172 |

a. Predictors: (Constant), Decision making, Project planning, Risk management, Project monitoring
b. Dependent Variable: Project performance
Source: Data analysis (2024)

The analysis result in table 7 reveals that the coefficient of determination (R-squared) value of .927 suggests that approximately 92.7% of the variability in project performance can be explained by the combination of the predictor variables. This indicates a high degree of predictive power in the model, suggesting that the selected predictors collectively have a significant impact on project performance.

**Table 8:** ANOVA[a]

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 24.405 | 4 | 6.101 | 411.835 | .000[b] |
| | Residual | 1.911 | 129 | .015 | | |
| | Total | 26.316 | 133 | | | |

a. Dependent Variable: Project performance
b. Predictors: (Constant), Decision making, Project planning, Risk management, Project monitoring
Source: Data analysis (2024)

From the analysis result presented in table 8, the F value of 411.835 indicates that the regression model, which includes the predictors (decision making, project planning, risk management, project monitoring), collectively has a significant effect on predicting project performance. This suggests that at least one of the predictor variables significantly contributes to explaining the variability in project performance.

**Table 9:** Multi-Regression coefficients

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .063 | .126 | | .505 | .614 |
| | Project planning | .353 | .054 | .370 | 6.551 | .000 |
| | Project monitoring | .068 | .056 | .078 | 1.212 | .228 |
| | Risk management | .578 | .065 | .555 | 8.905 | .000 |
| | Decision making | .002 | .057 | .001 | .028 | .978 |

a. Dependent Variable: Project performance
Source: Data analysis (2024)

The presented regression analysis in table 9, the coefficients provide insights into the relationship between various predictor variables and the dependent variable. Notably, project planning and risk management emerge as significant predictors of project performance, as evidenced by statistically significant coefficients ($p < .001$ and $p < .001$, respectively). For every one-unit increase in project planning and risk management, there is an estimated increase of 0.353 and 0.578 units in project performance, respectively. [4]; [16] agree with the findings that a proper project planning and risk management impact project performance greatly. Proper planning is essential in order to identify potential risks and develop strategies to mitigate them. Proactively addressing risks helps project managers to minimize the likelihood of negative impacts on project schedule, budget, and quality, ultimately leading to successful project delivery and improved stakeholder satisfaction.

Conversely, while project monitoring and decision making also play crucial roles in project management, their coefficients are not statistically significant ($p = .228$ and $p = .978$, respectively), although an additional unit of project monitoring and decision increases project performance by 0.68 and 0.02 respectively. According to [9], the effectiveness of project monitoring and decision making processes vary depending on the complexity and nature of the project. According to [9], project managers may not have access to enough relevant and reliable data to make informed decisions, leading to monitoring activities that have little impact on project outcomes. Additionally, if decision-making processes are not well-defined or if stakeholders do not have clear roles and responsibilities, ineffective decisions are usually being made and do not positively impact project performance.

### 4.5 Thematic Content Analysis

As per thematic analysis, to improve the planning process for future projects, 71% of the respondents revealed that, it is important for the project team to clearly define the goals and objectives of the project from the start. Additionally, regular communication and collaboration among team members is essential to identify potential challenges and address them early on in the planning process as respondent (63%) revealed.

Additionally, on the project planning, 47% of the respondents revealed that utilizing tools such as Gantt charts and Kanban boards help to visually map out the project timeline and identify potential bottlenecks. More so, conducting risk assessments and contingency planning early on in the project planning process help to mitigate potential risks and uncertainties that may arise during project execution as 54% of the respondents depicted.

As per respondents' opinion, the most critical aspects of project monitoring that contribute to project performance include tracking progress against the project plan (as 42% indicated), monitoring key performance indicators (KPIs) to assess project health (as 58% revealed), identifying and addressing any issues or deviations from the plan in a timely manner (as 63% revealed), and 79% of the respondents recommends effective communication among team members.

Consequently, majority of the respondents (66%) suggested that project management software such as Asana, Trello, and Microsoft Project allows teams to track tasks, milestones, and deadlines, assign responsibilities, and collaborate in real-time. The tools provide features like Gantt charts, Kanban boards, and dashboards to visualize project progress and identify any areas that need attention. Additionally, 61% of the respondents recommended communication tools such as Slack and Microsoft Teams in facilitating communication and collaboration among team members, especially in remote or distributed project teams.

To communicate risk information to project stakeholders, 56% of participants develop a comprehensive risk register that contains information on identified risks, their potential impact and likelihood, proposed responses, responsible parties, and status updates, which helps to have visibility into the risks affecting the project. Sixty-four incorporate risk information into project status reports, progress meetings, and stakeholder presentations, which provides regular updates on the status of key risks, any changes to their impact or likelihood, and the effectiveness of risk response strategies being implemented.

Effective communication plays a crucial role in ensuring that task prioritization is clearly understood by all team members as respondent agrees. One way to communicate task

prioritization effectively is by setting clear and specific goals and objectives as 86% indicated. Sixty-one indicated that regular team meetings can be utilized to discuss and prioritize tasks, providing a platform for team members to voice their opinions and concerns. Another important aspect is assigning clear deadlines and responsibilities for each task, ensuring that team members are aware of their roles and the timelines within which tasks need to be completed as championed by 72% of the respondents. Lastly, 63% recommended using tools for task management to help in organizing and prioritizing tasks, making it easier for team members to understand the order of importance.

## 5. Recommendations

Despite the moderate influence of project planning on the performance of irrigation projects in Embu County, Kenya, the study recommends prioritization and investment in robust planning processes. Project team involved in irrigation projects to ensure that comprehensive planning activities are undertaken, including thorough needs assessment, stakeholder engagement, and resource allocation. Furthermore, the integration of modern planning tools and techniques, such as Gantt charts and critical path analysis to enhance the efficacy of planning efforts. Regular reviews and updates of project plans to adapt to changing circumstances and mitigate potential risks. Project team should establish a regular communication and collaboration among team members to be able to identify potential challenges and threats within the projects. Last, study recommends allocation of sufficient time and resources for thorough research and analysis before finalizing the project plan.

To improve the effect of project monitoring on the performance of irrigation projects in Embu County, Kenya, project team should prioritize the implementation of effective monitoring mechanisms. Establish clear monitoring protocols and responsibilities, as well as leveraging technology where possible to streamline data collection and analysis processes. Regular and timely reporting of project progress and milestones to relevant stakeholders is essential to ensure transparency and accountability. The study also recommends adoption of project management software such as Asana, Trello, and Microsoft Project tools for tracking tasks, milestones, and deadlines.

In light of the significant influence of risk management on the performance of irrigation projects in Embu County, Kenya, the study recommends teams involved to prioritize the adoption of robust risk management strategies. Teams to invest in comprehensive risk assessments at various stages of project implementation to identify potential threats and vulnerabilities. Subsequently, develop and implement a risk mitigation plan to address identified risks effectively. Regular reviews and updates of risk registers are essential to ensure that emerging risks are promptly addressed and managed. Furthermore, fostering a culture of risk awareness and accountability among project teams to enhance risk management practices and ensure resilience in project execution. Actively engage stakeholders in risk assessment workshops, brainstorming sessions, and risk analysis activities to gather input and perspectives on potential risks and mitigation strategies.

Finally, to enhance the role of decision-making in enhancing project performance for irrigation projects in Embu County, project team should focus on refining decision-making processes and fostering a culture of evidence-based decision-making. Ensure that decision-making processes are transparent, participatory, and informed by reliable data and information. Additionally, the study recommends project team to establishing clear decision-making frameworks and protocols to streamline decision-making processes and reduce ambiguity.

## 6. Areas for Further Studies

For further research, it would be valuable to conduct a longitudinal study to assess the long-term impact of improved project planning, monitoring, risk management, and decision-making practices on the performance of irrigation projects in Embu County, Kenya. The longitudinal study will track the implementation of recommended strategies over an extended period, allowing for the measurement of outcomes and performance indicators over time. Additionally, exploring the role of external factors such as government policies, environmental changes, and socio-economic factors on project performance will provide a more comprehensive understanding of the dynamics at play.

Moreover, future researchers to explore the potential integration of emerging technologies such as artificial intelligence, machine learning, and Internet of Things (IoT) devices in project management practices for irrigation projects. Investigating how these technologies enhance data collection, analysis, decision-making, and overall project performance will provide valuable insights into the future of irrigation project management.

Lastly, future researchers to investigate the role of capacity-building initiatives, training programs, and knowledge-sharing platforms in enhancing project management capabilities among stakeholders. Assessing the effectiveness of educational interventions in improving project planning, monitoring, risk management, and decision-making skills will help inform future capacity-building efforts aimed at improving irrigation project outcomes in Embu County and beyond.

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