

PROJECT PLANNING PRACTICES AND PERFORMANCE OF CIVIL ENGINEERING PROJECTS AT KENYA ELECTRICITY GENERATING COMPANY (KENGEN)

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ABSTRACT

Purpose: Project planning is widely recognized as a critical determinant of project success, particularly in large-scale infrastructure projects where effective coordination of project scope, objectives, schedules, and resources is essential for achieving organizational goals. Despite significant investments in project management practices, civil engineering projects at the Kenya Electricity Generating Company (KenGen) continue to experience schedule delays, budget overruns, scope changes, and challenges in achieving intended project outcomes. This study examined the influence of project planning practices on the performance of civil engineering projects at KenGen. Specifically, the study evaluated the effects of project scope definition and management, project objectives and goal clarity, schedule and timeline management, and budget planning and resource allocation on project performance. The study was anchored on Project Management Theory, Goal-Setting Theory, and the Resource-Based View Theory.

Methodology: A positivist research philosophy and descriptive cross-sectional survey design were adopted. The target population comprised 250 employees involved in civil engineering projects at KenGen, from which a sample of 154 respondents was selected using stratified random sampling. Primary data were collected using structured questionnaires, while qualitative insights were obtained through semi-structured interviews. Data

were analyzed using descriptive statistics, Pearson correlation analysis, and multiple regression analysis with the aid of SPSS Version 26.

Findings: Project planning practices had positive and statistically significant effects on project performance ($R=0.864$ and adjusted $R^2=0.739$) as their p-values were less than 0.05. Schedule and timeline management emerged as the strongest predictor of project performance with standardized beta coefficient ($\beta = 0.345$, $t = 5.707$, $p < 0.001$), followed by project objectives and goal clarity ($\beta = 0.274$, $t = 4.613$, $p < 0.001$), project scope definition and management ($\beta = 0.236$, $t = 4.085$, $p < 0.001$), and budget planning and resource allocation ($\beta = 0.209$, $t = 3.875$, $p < 0.001$). The study concluded that strengthening of project planning practices significantly enhances timely project completion, budget compliance, achievement of project objectives, and overall project success.

Recommendation: The study recommends institutionalizing comprehensive planning frameworks, strengthening stakeholder participation, enhancing schedule monitoring, and improving resource planning mechanisms to increase the performance of infrastructure projects.

Key words: Project planning practices, Project performance, project scope management, project objectives, schedule management, budget planning, civil engineering projects, KenGen.

INTRODUCTION

Background of the Study

Infrastructure development plays a fundamental role in promoting economic growth, industrialization, and sustainable development across the world. As governments and organizations continue to invest heavily in infrastructure projects, the ability to deliver projects within the planned scope, time, cost, and quality has become a major determinant of organizational success. Project planning therefore remains one of the most important phases of project management because it establishes the framework that guides project implementation, monitoring, and evaluation. Effective planning enables project teams to define project objectives, allocate resources efficiently, develop realistic schedules, anticipate risks, and establish mechanisms for monitoring project progress. Consequently, organizations that invest in comprehensive project planning are generally more likely to achieve successful project outcomes than those relying on reactive implementation approaches.

Globally, project planning has evolved into a strategic management function supported by internationally recognized frameworks such as the Project Management Body of Knowledge (PMBOK® Guide), PRINCE2, and Agile methodologies. These frameworks emphasize systematic planning through scope definition, schedule development, cost estimation, stakeholder engagement, and risk management to improve project success rates. Advances in digital technologies, including Building Information Modelling (BIM), artificial intelligence, predictive analytics, and cloud-based project management systems, have further enhanced planning accuracy and coordination among project stakeholders. However, despite these technological advancements, many organizations continue to experience project delays, cost overruns, scope changes, and quality deficiencies arising from inadequate planning practices.

Within Africa, infrastructure development has accelerated significantly over the past two decades due to increasing urbanization, industrial growth, and regional integration initiatives. Nevertheless, many public infrastructure projects continue to experience implementation challenges associated with inadequate feasibility studies, weak stakeholder engagement, poor schedule management, and ineffective resource allocation. Although initiatives such as the African Union Agenda 2063 and the Programme for Infrastructure Development in Africa (PIDA) have emphasized the importance of rigorous project planning, weaknesses in institutional capacity, bureaucratic procedures, and limited technical expertise continue to affect project performance across many African countries. These challenges demonstrate the importance of strengthening project planning practices to improve infrastructure delivery throughout the region.

In Kenya, project planning has gained increasing prominence following the implementation of Vision 2030 and other national development strategies that prioritize infrastructure expansion as a catalyst for economic transformation. Public sector organizations have adopted formal project

management frameworks to improve accountability and efficiency in implementing development projects. Despite these efforts, reports from oversight institutions continue to identify delays in project completion, budget overruns, inadequate stakeholder participation, unrealistic project schedules, and poor integration between planning and implementation. These shortcomings have reduced the effectiveness of many public infrastructure investments and highlight the continued need for evidence-based improvements in project planning practices.

The Kenya Electricity Generating Company (KenGen) is the leading electricity producer in Kenya and plays a strategic role in supporting national energy security and economic development. The organization develops and manages large-scale civil engineering projects involving geothermal, hydroelectric, thermal, and wind power infrastructure. These projects require substantial financial investments, multidisciplinary technical expertise, extensive stakeholder coordination, and strict compliance with regulatory requirements. Consequently, effective project planning is essential to ensure timely completion, cost control, quality assurance, and realization of intended project objectives.

Despite adopting modern project management practices, KenGen continues to experience planning-related challenges that affect project performance. Previous evaluations have associated these challenges with deficiencies in project scope definition, unclear objectives, ineffective schedule management, inadequate budget planning, and weak stakeholder coordination. These shortcomings have contributed to project delays, cost escalation, reduced operational efficiency, and occasional failure to achieve intended project outcomes. Similar experiences have been reported in several infrastructure projects across East Africa, suggesting that project planning remains a significant determinant of infrastructure performance within the region.

Although considerable research has examined project management practices in different sectors, relatively few studies have specifically investigated how individual project planning practices influence the performance of civil engineering projects within Kenya's energy sector. Most previous studies have focused on general project management challenges or examined project performance across multiple industries without adequately considering the unique characteristics of large-scale energy infrastructure projects. This contextual gap limits the availability of evidence needed to strengthen planning frameworks within state-owned energy organizations.

This study therefore examined the influence of four key project planning practices—project scope definition and management, project objectives and goal clarity, schedule and timeline management, and budget planning and resource allocation—on the performance of civil engineering projects at KenGen. The study was guided by Project Management Theory, Goal-Setting Theory, and the Resource-Based View Theory, which collectively explain the procedural, behavioural, and strategic dimensions of project planning. The findings provide empirical evidence

to support improvements in project planning practices within KenGen and contribute to the broader body of knowledge on project management in public infrastructure projects.

Statement of the Problem

Kenya Electricity Generating Company PLC (KenGen) plays a pivotal role in the country's energy sector, producing approximately 75% of the national electricity supply through hydro, geothermal, thermal, and wind sources (National Treasury of Kenya, 2021). As the backbone of Kenya's power generation infrastructure, the efficiency and reliability of KenGen's civil engineering projects directly impact national development goals, industrial productivity, and public service delivery. Despite its strategic importance, KenGen continues to face persistent challenges in project performance, many of which are rooted in deficiencies in project planning processes.

Recent evaluations have shown that ineffective project planning particularly in scope definition, goal clarity, timeline setting, and resource allocation has led to cost overruns, schedule delays, quality shortfalls, and stakeholder dissatisfaction in several KenGen projects (Karanja & Gichure, 2019; Mwangi, 2022). These challenges have undermined the timely delivery and sustainability of infrastructure projects critical for national grid expansion, power reliability, and energy security.

A 2023 empirical study on project management dynamics at KenGen identified planning gaps in stakeholder engagement, risk anticipation, and budget control as major contributors to project underperformance (ResearchGate, 2023). Poor stakeholder alignment has led to miscommunication, resistance, and delayed approvals. Similarly, weak risk management frameworks have left projects vulnerable to regulatory setbacks, contractor disputes, and external shocks such as supply chain disruptions. Moreover, resource misallocation has resulted in procurement delays, labour shortages, and underutilized capital equipment compounding inefficiencies across the project lifecycle (Kamau & Wanyoike, 2019).

Although KenGen reported a 48% increase in profit after tax for the fiscal year ending June 2023, attributed to increased power generation capacity (KenGen, 2023), operational disruptions persist. A major nationwide blackout in September 2024 linked to infrastructure instability exposed systemic vulnerabilities in project planning, execution, and quality control (Reuters, 2024). This incident emphasized the urgent need to strengthen project planning frameworks to ensure not only the completion of infrastructure projects but also their resilience, safety, and long-term performance.

KenGen's challenges echo a broader regional pattern where infrastructure projects suffer from poor planning, unrealistic scheduling, and inadequate cost control. For instance, the Karuma Hydroelectric Power Project in Uganda and Tanzania's Julius Nyerere Hydropower Project both experienced cost escalations and delays due to inadequate project scope articulation and weak contractor management (Mugenyi, 2018; Makali, 2021). These regional parallels reinforce the

critical role that structured and data-driven project planning plays in ensuring timely, cost-effective, and high-quality infrastructure delivery.

KenGen's infrastructure projects are highly complex and capital-intensive, requiring seamless coordination across multidisciplinary teams, regulatory bodies, and funding partners. However, the organization continues to grapple with planning-related issues such as incomplete scoping, unrealistic timeframes, insufficient budget forecasting, and inadequate stakeholder consultation. These gaps have led to project creep, budget overruns, compromised quality, and delayed service delivery ultimately eroding organizational efficiency and public trust (Lock, 2020; Turner, 2016; Juran, 2016).

This study sought to critically examine the impact of project planning practices specifically scope definition, goal clarity, schedule management, and resource allocation on the performance of KenGen's civil engineering projects. The findings aim to inform the development of actionable planning frameworks that can enhance project success rates, reduce inefficiencies, and support sustainable energy infrastructure in Kenya.

RESEARCH OBJECTIVES

General Objective of the Study

The general objective of the study was to assess the influence of project planning practices on project performance at Kenya Electricity Generating Company (KenGen).

Specific Objectives of the Study

The study was guided by the following specific objectives:

- i. To determine the influence of project scope definition and management on the operational and strategic performance of projects implemented by Kenya Electricity Generating Company (KenGen).
- ii. To examine the effect of project objectives and goal clarity on the performance outcomes of projects undertaken by Kenya Electricity Generating Company (KenGen).
- iii. To assess the influence of schedule and timeline management on the timely completion and efficiency of project execution at Kenya Electricity Generating Company (KenGen).
- iv. To evaluate the effect of budget planning and resource utilization on the cost efficiency and overall success of projects implemented by Kenya Electricity Generating Company (KenGen).

Research Hypotheses

The study tested the following null hypotheses:

- i. **H01:** Project Scope Definition and Management has no statistically significant influence on Project Performance at Kenya Electricity Generating Company (KenGen).
- ii. **H02:** Project Objectives and Goal Clarity have no statistically significant influence on Project Performance at Kenya Electricity Generating Company (KenGen).

- iii. **H03:** Schedule and Timeline Management has no statistically significant influence on Project Performance at Kenya Electricity Generating Company (KenGen).
- iv. **H04:** Budget Planning and Resource Allocation have no statistically significant influence on Project Performance at Kenya Electricity Generating Company (KenGen).

LITERATURE REVIEW

Theoretical Review

This study is anchored on three complementary theories that collectively explain the relationship between project planning practices and project performance: Project Management Theory, Goal-Setting Theory, and Resource-Based View Theory. These theories provide procedural, behavioural, and strategic perspectives for understanding how planning influences successful implementation of civil engineering projects.

Project Management Theory

Project Management Theory provides the principal theoretical foundation for this study. The theory, largely operationalized through the PMBOK® Guide developed by the Project Management Institute, emphasizes systematic planning throughout the project life cycle. It proposes that successful projects depend upon effective integration of scope management, schedule development, cost estimation, quality planning, stakeholder management, communication, procurement, and risk management.

The theory argues that planning establishes the roadmap guiding project execution, monitoring, and control. Comprehensive planning enables organizations to define project deliverables, estimate activity durations, allocate resources efficiently, anticipate implementation risks, and establish measurable performance indicators. Consequently, projects founded on structured planning processes are more likely to achieve completion within approved scope, schedule, budget, and quality standards.

Despite criticism that traditional project management assumes relatively stable implementation environments, the theory remains highly applicable to capital-intensive infrastructure projects because of its emphasis on systematic planning, documentation, and performance monitoring. The theory therefore provides the primary foundation for examining project scope definition, schedule management, and overall project planning practices within KenGen.

Goal-Setting Theory

Goal-Setting Theory, developed by Locke and later refined with Latham, explains how clearly defined objectives influence individual and organizational performance. The theory argues that specific, measurable, and challenging goals motivate employees by directing attention, increasing effort, enhancing persistence, and encouraging effective implementation strategies.

Within project management, clearly defined project objectives establish common expectations among project stakeholders and facilitate coordination throughout implementation. Goal clarity enhances communication, accountability, performance measurement, and decision-making while

reducing uncertainty and conflicting priorities. The theory therefore provides a behavioural explanation for the relationship between project objectives and project performance.

Although Goal-Setting Theory acknowledges that external environmental conditions may affect achievement of established goals, it remains highly relevant to infrastructure projects requiring coordination among engineers, contractors, consultants, financiers, regulators, and local communities. Its emphasis on SMART objectives directly supports examination of project objective clarity within this study.

Resource-Based View Theory

Resource-Based View (RBV) Theory, advanced principally by Barney, argues that sustainable organizational performance depends upon the strategic acquisition, development, deployment, and utilization of valuable organizational resources. These resources include financial capital, human expertise, technology, organizational knowledge, equipment, and institutional capabilities.

Within project management, RBV emphasizes that project success depends not merely upon resource availability but upon efficient planning and allocation of financial, technological, human, and physical resources throughout implementation. Comprehensive budgeting, effective procurement, efficient staffing, and optimal equipment utilization collectively improve implementation efficiency while minimizing resource wastage.

Although the theory primarily emphasizes internal organizational capabilities, it provides valuable strategic insights into budget planning and resource allocation within capital-intensive infrastructure projects. It therefore provides the theoretical foundation for examining how effective resource planning contributes to project performance at KenGen.

Synthesis of the Theoretical Framework

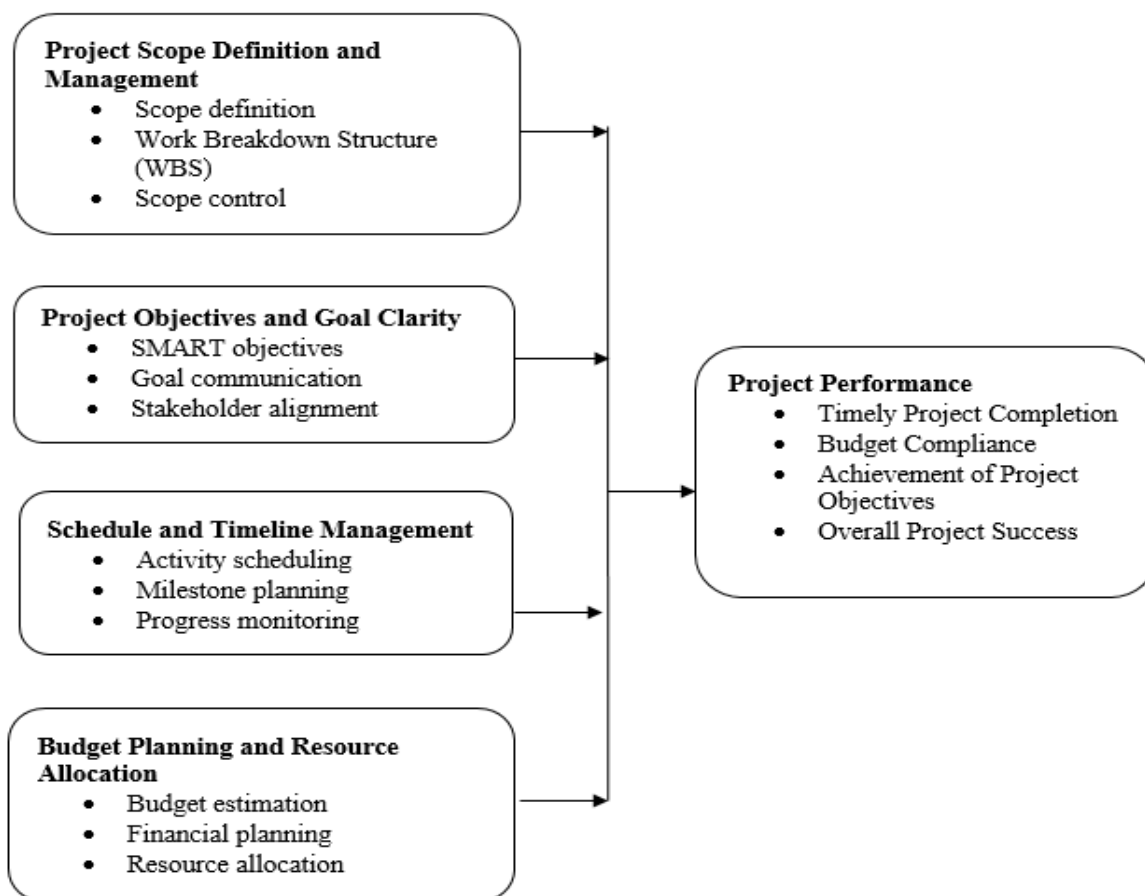
The three theories complement one another in explaining the multidimensional nature of project planning. Project Management Theory explains the structured planning processes necessary for successful project implementation. Goal-Setting Theory provides the behavioural perspective by demonstrating how clearly defined objectives improve motivation, coordination, and organizational performance. Resource-Based View Theory contributes the strategic resource perspective by explaining how effective planning and utilization of organizational resources enhance project success.

Together, these theories provide a comprehensive framework for understanding how project scope definition and management, project objectives and goal clarity, schedule and timeline management, and budget planning and resource allocation collectively influence the performance of civil engineering projects at Kenya Electricity Generating Company (KenGen). The integrated theoretical framework therefore supports the study's proposition that effective project planning practices significantly enhance project performance through improved coordination, efficient resource utilization, stronger stakeholder alignment, and better implementation control.

Conceptual Framework

The conceptual framework for this study is anchored on Project Management Theory, Goal-Setting Theory, and the Resource-Based View (RBV) Theory. These theories collectively explain that effective project planning enhances project performance by ensuring that project activities are properly defined, objectives are clearly communicated, schedules are realistic, and organizational resources are efficiently allocated and utilized.

In this study, Project Scope Definition and Management, Project Objectives and Goal Clarity, Schedule and Timeline Management, and Budget Planning and Resource Allocation constitute the independent variables. These planning practices were found to be influencing Project Performance, which is measured in terms of timely project completion, budget compliance, achievement of project objectives, and overall project success. The framework assumes that improvements in project planning practices enhance coordination, resource utilization, communication, and decision-making, thereby leading to improved project performance at Kenya Electricity Generating Company (KenGen).



Independent Variables

Dependent Variable

Figure 4.1: Conceptual Framework
Source: Author (2026)

Project Scope Definition and Management

Project scope definition and management refers to the process of identifying, documenting, controlling, and monitoring all the work required to successfully complete a project while ensuring that only the agreed activities are undertaken. According to the Project Management Institute (PMI, 2021), project scope management encompasses the processes required to ensure that a project includes all the work needed and only the work needed to complete the project successfully. Effective scope management establishes clear project boundaries, defines deliverables, identifies stakeholder requirements, and provides a framework for controlling changes throughout the project life cycle. It is one of the most critical knowledge areas in project management because it forms the basis upon which schedules, budgets, quality standards, and resource requirements are developed.

Several empirical studies have demonstrated the importance of project scope management in improving project performance. Harold Kerzner (2022) observed that projects with clearly defined scopes experience significantly fewer cost overruns and schedule delays than projects characterized by poorly specified requirements. Similarly, Rodney Turner (2020) reported that comprehensive scope planning enhances project coordination, improves stakeholder satisfaction, and increases the likelihood of achieving project objectives. In another study, Bent Flyvbjerg (2021) found that inadequate scope definition was among the primary contributors to cost escalation and implementation delays in major public infrastructure projects worldwide.

Project scope management is particularly important for Kenya Electricity Generating Company (KenGen), which undertakes large-scale geothermal, hydropower, wind energy, and thermal power generation projects characterized by high technical complexity and substantial financial investment. These projects involve multiple stakeholders, including government agencies, financiers, engineering consultants, contractors, suppliers, environmental regulators, and local communities. Clearly defining project scope at the planning stage ensures that stakeholder expectations are harmonized and project deliverables are well understood before implementation commences.

Project Objectives and Goal Clarity

Project objectives and goal clarity refer to the process of establishing clear, specific, measurable, achievable, relevant, and time-bound (SMART) objectives that guide project implementation and provide a basis for evaluating project success. Project objectives define what a project seeks to accomplish, while goal clarity ensures that all project stakeholders have a common understanding of the expected outcomes, responsibilities, priorities, and performance expectations. According to the Project Management Institute (PMI, 2021), clearly defined project objectives provide direction for planning, execution, monitoring, and control by aligning project activities with organizational strategic goals. They serve as reference points against which project performance is measured throughout the project life cycle.

Several empirical studies have demonstrated the positive relationship between project objectives, goal clarity, and project performance. Edwin A. Locke and Gary P. Latham (2002) found that organizations characterized by specific and challenging goals consistently outperform those operating under vague or generalized objectives. Similarly, Kerzner (2022) reported that clearly established project objectives improve project coordination, increase employee commitment, strengthen accountability, and significantly reduce implementation delays. Research by Jeffrey Pinto (2020) further established that project success is strongly associated with effective goal formulation, stakeholder communication, and continuous performance monitoring.

Project objectives and goal clarity are particularly important to Kenya Electricity Generating Company (KenGen), whose mandate involves developing sustainable electricity generation infrastructure to support Kenya's economic growth and energy security. KenGen undertakes highly complex geothermal, hydropower, wind energy, and thermal power projects requiring substantial financial investments, advanced engineering expertise, long implementation periods, and extensive stakeholder collaboration. These projects can only succeed when project objectives are clearly defined, communicated, and consistently understood by all participants.

Schedule and Timeline Management

Schedule and timeline management refers to the systematic process of planning, sequencing, estimating, developing, monitoring, and controlling the time required to complete project activities within the approved schedule. According to the Project Management Institute (PMI, 2021), project schedule management comprises the processes necessary to ensure the timely completion of a project by establishing realistic timelines, allocating activity durations, identifying task dependencies, monitoring progress, and implementing corrective actions whenever deviations occur. Effective schedule management enables project managers to coordinate project activities efficiently, optimize resource utilization, and minimize delays that may negatively affect project performance.

Numerous empirical studies have demonstrated a positive relationship between schedule management and project performance. Kerzner (2022) observed that organizations implementing comprehensive scheduling practices consistently achieve higher project success rates than organizations characterized by weak schedule planning and monitoring systems. Similarly, Jeffrey Pinto (2020) reported that realistic scheduling, continuous monitoring, and timely corrective action significantly improve project delivery performance by reducing implementation delays and enhancing coordination among project stakeholders. Furthermore, Bent Flyvbjerg (2021) found that inadequate schedule planning is one of the primary contributors to delays in large-scale infrastructure projects worldwide, particularly those involving multiple contractors, complex engineering activities, and extensive stakeholder engagement.

Schedule and timeline management are particularly critical for Kenya Electricity Generating Company (KenGen), whose operations involve implementing large-scale geothermal, hydropower, wind energy, and thermal power generation projects characterized by long implementation periods and significant technical complexity. These projects require careful coordination of exploration activities, engineering design, procurement, equipment installation, environmental compliance, testing, commissioning, and stakeholder engagement. Delays in any one of these activities may affect subsequent tasks and ultimately postpone project completion.

Budget Planning and Resource Allocation

Budget planning and resource allocation refer to the systematic process of estimating project costs, allocating financial resources, assigning human resources, scheduling equipment, and organizing materials required to achieve project objectives efficiently and effectively. Budget planning establishes the financial framework for project implementation, while resource allocation ensures that the appropriate resources are available at the right time and in the right quantities to support project activities. According to the Project Management Institute (PMI, 2021), project cost management includes planning, estimating, budgeting, financing, funding, managing, and controlling project costs so that projects are completed within the approved budget. Effective budget planning and resource allocation enable organizations to maximize value while minimizing waste and operational inefficiencies.

Several empirical studies have demonstrated that effective budget planning and resource allocation positively influence project performance. Bent Flyvbjerg (2021) observed that inaccurate budgeting and poor resource planning are among the leading causes of cost overruns in large infrastructure projects worldwide. Similarly, Kerzner (2022) found that organizations characterized by comprehensive budgeting systems, disciplined financial control, and effective resource allocation consistently achieve better project performance than organizations with weak financial planning practices. Research by Jeffrey Pinto (2020) also established that efficient allocation of financial and human resources significantly improves project productivity, schedule compliance, quality performance, and stakeholder satisfaction.

Budget planning and resource allocation are particularly critical for Kenya Electricity Generating Company (KenGen), whose projects involve substantial financial investments, sophisticated engineering technologies, specialized human resources, and long implementation periods. Geothermal development projects, hydropower stations, wind farms, and thermal power plants require billions of shillings in capital investment and involve numerous contractors, consultants, suppliers, regulatory agencies, and financing institutions. Effective financial planning is therefore essential to ensure uninterrupted project implementation and efficient utilization of organizational resources.

Project Performance

Project performance refers to the extent to which a project achieves its intended objectives within the approved time and budget while delivering the expected outcomes. It represents the ultimate measure of whether project planning and implementation activities have been successfully executed. According to the Project Management Institute (PMI, 2021), project performance is evaluated by assessing how effectively project objectives have been achieved throughout the project life cycle while maintaining control over project schedule, cost, and scope. Effective project performance demonstrates that project resources have been utilized efficiently and that the anticipated project benefits have been realized.

Project performance has traditionally been evaluated using the project management "triple constraint," which emphasizes the successful management of time, cost, and scope. However, contemporary project management literature recognizes that project success should also consider whether projects achieve their intended objectives and deliver the expected organizational value (Kerzner, 2022). For this reason, this study measures project performance using four key indicators: timely project completion, budget compliance, achievement of project objectives, and overall project success. These indicators collectively provide a comprehensive assessment of project outcomes at Kenya Electricity Generating Company (KenGen).

Overall project success represents the combined achievement of timely project completion, budget compliance, and the successful realization of project objectives. It reflects the overall effectiveness of project planning, coordination, execution, monitoring, and control throughout the project life cycle. According to Turner (2022), project success should be evaluated holistically by considering whether projects achieve their intended purpose while utilizing organizational resources efficiently.

Within the conceptual framework of this study, Project Performance serves as the dependent variable and is measured using four indicators: timely project completion, budget compliance, achievement of project objectives, and overall project success. These indicators are used to determine the extent to which project planning practices influence the performance of projects implemented by Kenya Electricity Generating Company (KenGen). It is hypothesized that improvements in project scope definition and management, project objectives and goal clarity, schedule and timeline management, and budget planning and resource allocation positively influence project performance by enhancing timely completion, improving budget compliance, facilitating achievement of project objectives, and increasing overall project success.

RESEARCH METHODOLOGY

Research Design

This study adopted a positivist research philosophy and employed a descriptive cross-sectional survey design to examine the influence of project planning practices on the performance of civil

engineering projects at the Kenya Electricity Generating Company (KenGen). The positivist paradigm was considered appropriate because it facilitates objective measurement of relationships among variables using quantitative techniques. The descriptive survey design enabled the collection of standardized data from respondents involved in project planning and implementation, thereby providing an empirical basis for evaluating the effects of project planning practices on project performance.

Study Area and Target Population

The study was conducted at KenGen's corporate offices and selected project sites in Nairobi and Olkaria, where major civil engineering projects are planned and implemented. KenGen was selected because it is Kenya's leading electricity generation company and undertakes large-scale infrastructure projects involving geothermal, hydroelectric, thermal, and renewable energy developments.

The target population comprised 250 employees directly involved in planning, coordinating, and implementing civil engineering projects. These included project managers, civil and structural engineers, planners, quantity surveyors, procurement officers, finance officers, contract managers, and project coordinators. These professionals were considered appropriate respondents because of their direct involvement in project planning and execution.

Sample Size and Sampling Procedure

A sample size of 154 respondents was determined using Yamane's sample size determination formula at a 95% confidence level. Stratified random sampling was employed to ensure adequate representation of the various professional categories involved in project implementation. Each department constituted a sampling stratum, after which respondents were selected randomly within each stratum. This approach enhanced representativeness while minimizing sampling bias.

Data Collection

Primary data were collected using a structured questionnaire comprising closed-ended questions measured on a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The questionnaire was organized into sections covering respondent demographics, project scope definition and management, project objectives and goal clarity, schedule and timeline management, budget planning and resource allocation, and project performance.

To complement the quantitative findings, semi-structured interviews were conducted with selected senior managers and project coordinators. The interviews provided contextual insights into planning practices, implementation challenges, and organizational experiences that could not be adequately captured through structured questionnaires alone.

Validity and Reliability of Research Instruments

Content and construct validity of the questionnaire were established through expert review by supervisors and experienced researchers in project management. Their recommendations were incorporated to improve clarity, relevance, and consistency of the research instrument.

Reliability was assessed through a pilot study conducted among respondents with characteristics similar to those of the study population but who were excluded from the final survey. Internal consistency was evaluated using Cronbach's Alpha coefficient. All study variables attained reliability coefficients exceeding the recommended threshold of 0.70, confirming that the questionnaire was sufficiently reliable for data collection.

Data Analysis

Completed questionnaires were coded and entered into the Statistical Package for the Social Sciences (SPSS) Version 26 for analysis. Data cleaning procedures were undertaken to identify missing values, inconsistencies, and outliers before statistical analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondent characteristics and describe the study variables. Inferential statistics were subsequently employed to test the study hypotheses. Pearson's correlation analysis was performed to determine the strength and direction of relationships between project planning practices and project performance.

Multiple linear regression analysis was used to evaluate the combined influence of project scope definition and management, project objectives and goal clarity, schedule and timeline management, and budget planning and resource allocation on project performance. Statistical significance was evaluated at the 5% level ($p < 0.05$).

The regression model adopted was expressed as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where:

- Y = Project Performance
- X_1 = Project Scope Definition and Management
- X_2 = Project Objectives and Goal Clarity
- X_3 = Schedule and Timeline Management
- X_4 = Budget Planning and Resource Allocation
- β_0 = Constant
- β_1 – β_4 = Regression coefficients
- ε = Error term

Ethical Considerations

Ethical approval was obtained before commencement of the study, and all respondents participated voluntarily. Participants were informed about the purpose of the research and assured that the

information collected would be used solely for academic purposes. Confidentiality and anonymity were maintained throughout the study by ensuring that respondents' identities were not disclosed in the analysis or reporting of findings. Informed consent was obtained from all participants prior to data collection, and the study adhered to accepted principles of research integrity, privacy, and professional ethics.

Pilot Study

A pilot study was conducted before the main survey to determine the suitability, clarity, validity, and reliability of the research instruments. It involved approximately 10% of the study sample, as recommended by Mugenda and Mugenda (2003). Since the study sample consisted of 154 respondents, a pilot sample of 16 respondents was selected. The respondents were purposively selected from departments within KenGen that possessed similar characteristics to those included in the main study but were excluded from the final sample. This approach ensured that participation in the pilot study did not influence the responses obtained during the main survey. The pilot respondents included project managers, engineers, planners, finance officers, procurement officers, and monitoring and evaluation personnel who possessed adequate knowledge of project planning and implementation processes within the organization.

Reliability Test

The reliability of the structured questionnaire was assessed using Cronbach's Alpha coefficient, which measures the internal consistency among items measuring the same construct. According to Nunnally (1978), a Cronbach's Alpha coefficient of 0.70 or above indicates acceptable reliability for social science research. The pilot data were coded and analyzed using the Statistical Package for Social Sciences (SPSS) Version 26, and Cronbach's Alpha coefficients were computed for each study variable.

Table 3.4: Reliability Test Results

Variable	No. of Items	Cronbach's Alpha (α)	Mean	Std. Deviation
Project Scope Definition and Management	6	0.842	4.12	0.55
Project Objectives and Goal Clarity	6	0.879	4.25	0.49
Schedule and Timeline Management	6	0.863	4.08	0.58
Budget planning and Resource Allocation	6	0.887	4.15	0.53
Project Performance	6	0.901	4.21	0.51

Source: Author (2026)

Variables that achieved Cronbach's Alpha coefficients of 0.70 or higher were considered sufficiently reliable for inclusion in the main study. Questionnaire items that reduced the reliability coefficient were reviewed and revised before the final administration of the instrument.

Validity Test

Validity refers to the degree to which a research instrument measures what it is intended to measure (Kothari, 2019). An instrument is considered valid when it accurately captures the concepts under investigation and adequately represents the research variables. This study established both content validity and construct validity. Content validity was established through an extensive review of relevant literature on project planning and project performance and by aligning the questionnaire items with the study objectives, research questions, conceptual framework, and theoretical foundations. The questionnaire was subsequently reviewed by the research supervisors at Jomo Kenyatta University of Agriculture and Technology together with experienced professionals in project management at KenGen. Their recommendations were incorporated to improve the relevance, clarity, and completeness of the research instrument.

Construct validity was established by ensuring that questionnaire items measuring each construct were developed from established project management literature. During the pilot study, exploratory factor analysis was conducted to determine whether the questionnaire items loaded appropriately under their respective constructs. Items exhibiting weak factor loadings or cross-loadings were revised or removed to improve construct validity (Hair et al., 2019).

The combination of expert review and statistical validation enhanced the validity of the research instruments and increased confidence in the quality of the data collected during the main study.

RESEARCH RESULTS

Response Rate and Respondent Characteristics

A total of 154 questionnaires were distributed to employees involved in civil engineering projects at Kenya Electricity Generating Company (KenGen). Of these, 138 were correctly completed and returned, representing a response rate of 89.6%, which was considered adequate for statistical analysis and generalization of the study findings.

The respondents represented diverse professional groups involved in project planning and implementation, including project managers, civil engineers, planning officers, procurement officers, finance officers, monitoring and evaluation officers, project coordinators, and quantity surveyors. Most respondents possessed at least a bachelor's degree, indicating that the information was obtained from technically competent professionals with substantial knowledge of project planning and implementation.

Descriptive Analysis

Project Scope Definition and Management

Project scope definition and management constituted the first independent variable of this study. Respondents were requested to indicate the extent to which they agreed with statements relating to scope definition, scope documentation, development of work breakdown structures (WBS), and scope change management practices within KenGen projects. Their responses were rated on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

The results are presented in Table 6.1.

Table 6.1: Descriptive Statistics for Project Scope Definition and Management (n = 138)

Statement	Mean	Std. Dev.	Rank
Project scope was clearly defined before project implementation commenced.	4.34	0.63	1
Comprehensive scope documentation guided project implementation.	4.22	0.69	2
Work Breakdown Structures (WBS) were developed and effectively used during project planning.	4.11	0.74	3
Scope changes were properly evaluated, approved, and controlled during project implementation.	3.96	0.81	4
Overall Mean	4.16	0.72	

Source: Author (2026)

The findings in Table 6.1 indicate that respondents generally agreed that project scope definition and management practices were effectively implemented at KenGen, as reflected by an overall mean score of 4.16 and a relatively low standard deviation of 0.72. The low standard deviations suggest that respondents held fairly consistent opinions regarding the scope management practices adopted by the organization.

Among the indicators, project scope being clearly defined before project implementation commenced recorded the highest mean score ($M = 4.34$; $SD = 0.63$), indicating that respondents strongly agreed that projects generally began with clearly established boundaries and deliverables. Comprehensive scope documentation ranked second ($M = 4.22$; $SD = 0.69$), implying that formal documentation was widely used to guide project implementation.

The use of Work Breakdown Structures (WBS) obtained a mean score of 4.11 ($SD = 0.74$), suggesting that respondents agreed that WBS was commonly applied in planning project activities. Scope change management recorded the lowest mean score ($M = 3.96$; $SD = 0.81$), although respondents still generally agreed that changes in project scope were adequately managed. The

comparatively lower mean and higher variability may indicate occasional challenges in controlling scope changes during project execution.

The findings suggest that KenGen places considerable emphasis on defining project scope during the planning stage. Clearly defined project scope enables project teams to understand project boundaries, expected deliverables, and stakeholder requirements, thereby minimizing ambiguity during implementation. Effective scope definition also reduces the likelihood of scope creep, which is one of the major causes of cost overruns and project delays.

The relatively high rating for scope documentation demonstrates that formal planning documents provide an important reference throughout project implementation. Similarly, the widespread use of Work Breakdown Structures indicates that project activities are systematically decomposed into manageable work packages, facilitating resource planning, scheduling, and monitoring.

However, the relatively lower rating for scope change management suggests that although formal procedures exist, managing changes during project implementation remains an area requiring continuous improvement. This finding supports the Project Management Institute (PMI, 2021), which emphasizes that effective scope control is essential for maintaining project objectives, preventing unnecessary changes, and ensuring successful project delivery. The findings are also consistent with Kerzner (2022), who argues that well-defined scope and structured scope management practices significantly improve project performance by reducing uncertainty and enhancing project control.

Project Objectives and Goal Clarity

The second objective of the study sought to examine the influence of project objectives and goal clarity on project performance at Kenya Electricity Generating Company (KenGen). Respondents were requested to indicate their level of agreement with statements relating to the formulation of SMART objectives, communication of project goals, stakeholder understanding of project objectives, and alignment of project goals with organizational strategy. The results are presented in Table 6.2.

Table 6.2: Descriptive Statistics for Project Objectives and Goal Clarity (n = 138)

Statement	Mean	Std. Dev.	Rank
Project objectives were Specific, Measurable, Achievable, Relevant, and Time-bound (SMART).	4.28	0.66	1
Project goals were effectively communicated to all project stakeholders.	4.18	0.71	2
Stakeholders clearly understood the project objectives throughout implementation.	4.09	0.75	3
Project objectives were aligned with KenGen's strategic goals.	4.01	0.77	4
Overall Mean	4.14	0.72	

Source: Author (2026)

The results presented in Table 6.2 indicate that respondents generally agreed that project objectives and goal clarity were effectively implemented at KenGen, as demonstrated by an overall mean score of 4.14 and a standard deviation of 0.72. This suggests that respondents consistently perceived project objectives as being clearly formulated and communicated during project planning and implementation.

The highest-rated statement was that project objectives were formulated as SMART objectives (M = 4.28, SD = 0.66), indicating that projects were generally planned using clearly defined and measurable goals. Effective communication of project goals ranked second (M = 4.18), while stakeholder understanding of project objectives ranked third (M = 4.09). Alignment of project objectives with KenGen's strategic goals recorded the lowest mean (4.01), although respondents still agreed that strategic alignment was achieved.

The findings indicate that KenGen emphasizes establishing clear project objectives during the planning phase. Clearly defined objectives provide project teams with direction, facilitate performance measurement, and improve accountability throughout project implementation. The strong emphasis on SMART objectives supports Goal-Setting Theory, which argues that specific and challenging goals enhance employee motivation and project performance.

Effective communication of project goals ensures that all project participants understand their responsibilities and expected outcomes, thereby improving coordination and minimizing conflicts during implementation. The positive findings regarding stakeholder understanding also suggest that project planning processes encourage stakeholder participation and consensus-building.

The slightly lower rating for strategic alignment may indicate that while project objectives generally support organizational priorities, there remains room for strengthening the integration of

project goals with broader corporate strategies. Overall, the findings support Locke and Latham (2002), who argue that clearly defined goals improve organizational performance through enhanced commitment, coordination, and performance monitoring. They also agree with PMI (2021), which identifies objective definition as a fundamental component of effective project planning.

Schedule and Timeline Management

The third objective of the study sought to determine the influence of schedule and timeline management on project performance at Kenya Electricity Generating Company (KenGen). Respondents were requested to indicate their level of agreement with statements relating to project scheduling, activity sequencing, milestone monitoring, and timely completion of project activities. Their responses were measured using a five-point Likert scale, where 1 = Strongly Disagree and 5 = Strongly Agree.

The descriptive statistics are presented in Table 6.3.

Table 6.3: Descriptive Statistics for Schedule and Timeline Management (n = 138)

Statement	Mean	Std. Dev.	Rank
Comprehensive project schedules were developed before project implementation commenced.	4.31	0.65	1
Project activities were properly sequenced according to the implementation plan.	4.20	0.70	2
Project milestones were regularly monitored and reviewed throughout project implementation.	4.09	0.74	3
Corrective measures were taken promptly whenever project schedule deviations occurred.	3.97	0.82	4
Overall Mean	4.14	0.73	

Source: Author (2026)

The findings presented in Table 6.3 indicate that respondents generally agreed that effective schedule and timeline management practices were implemented in KenGen projects, as demonstrated by an overall mean score of 4.14 and a standard deviation of 0.73. The relatively low standard deviation indicates that respondents expressed fairly consistent opinions regarding schedule management practices within the organization.

Among the statements, development of comprehensive project schedules before implementation recorded the highest mean score ($M = 4.31$; $SD = 0.65$), indicating strong agreement that project schedules were prepared during the planning phase. Proper sequencing of project activities ranked second with a mean score of 4.20 ($SD = 0.70$), suggesting that activities were generally organized logically to facilitate efficient implementation.

Regular monitoring and review of project milestones recorded a mean score of 4.09 (SD = 0.74), indicating that respondents agreed milestone tracking formed an important part of project monitoring. The statement on taking corrective measures following schedule deviations recorded the lowest mean score (M = 3.97; SD = 0.82), although respondents still generally agreed that corrective actions were undertaken whenever delays occurred.

The findings suggest that KenGen places significant emphasis on effective schedule and timeline management during project planning and implementation. Preparing comprehensive project schedules before implementation provides a clear roadmap for executing project activities and facilitates coordination among project teams. Proper scheduling also enables project managers to estimate activity durations, allocate resources efficiently, and monitor project progress against planned timelines.

The relatively high rating for activity sequencing demonstrates that project tasks are arranged logically, thereby minimizing unnecessary delays and improving workflow efficiency. Likewise, regular monitoring of project milestones enables management to track implementation progress, identify emerging risks, and initiate timely interventions whenever deviations occur.

Although respondents generally agreed that corrective measures were implemented when schedule delays arose, this indicator recorded the lowest mean score among the schedule management practices. This finding suggests that while monitoring mechanisms are in place, challenges may occasionally arise in responding promptly to implementation delays caused by unforeseen technical, financial, procurement, or environmental factors.

These findings are consistent with the Project Management Institute (PMI, 2021), which identifies schedule management as one of the core knowledge areas in project management and emphasizes the importance of developing realistic schedules, monitoring progress, and controlling schedule changes throughout the project life cycle. Similarly, Kerzner (2022) argues that effective scheduling improves project coordination, resource utilization, and timely project completion by providing a structured framework for monitoring project activities.

The findings also support the study's conceptual framework, which identifies schedule and timeline management as one of the key project planning practices influencing project performance. Effective scheduling contributes to timely project completion, minimizes implementation delays, enhances accountability, and improves the overall success of infrastructure projects undertaken by Kenya Electricity Generating Company (KenGen).

Budget Planning and Resource Allocation

The fourth objective of the study sought to examine the influence of budget planning and resource allocation on project performance at Kenya Electricity Generating Company (KenGen).

Respondents were requested to indicate their level of agreement with statements relating to budget preparation, adequacy of financial resources, allocation of human and material resources, and monitoring of resource utilization during project implementation. Responses were measured on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

The results are presented in Table 6.4.

Table 6.4: Descriptive Statistics for Budget Planning and Resource Allocation (n = 138)

Statement	Mean	Std. Dev.	Rank
Project budgets were adequately prepared before project implementation commenced.	4.26	0.68	1
Financial resources were allocated adequately to support project implementation.	4.18	0.72	2
Human, material, and equipment resources were allocated efficiently throughout the project lifecycle.	4.08	0.76	3
Resource utilization was continuously monitored to ensure efficient project implementation.	3.95	0.84	4
Overall Mean	4.12	0.75	

Source: Author (2026)

The findings presented in Table 6.4 indicate that respondents generally agreed that effective budget planning and resource allocation practices were implemented at KenGen, as reflected by an overall mean score of 4.12 and a standard deviation of 0.75. The relatively low standard deviation suggests that respondents held fairly similar opinions regarding the organization's budgeting and resource management practices.

Among the statements, adequate preparation of project budgets before implementation recorded the highest mean score ($M = 4.26$; $SD = 0.68$), indicating that respondents strongly agreed that budgeting formed an integral part of the project planning process. This was followed by the adequacy of financial resource allocation ($M = 4.18$; $SD = 0.72$), suggesting that sufficient funding was generally provided to facilitate project implementation.

The efficient allocation of human, material, and equipment resources recorded a mean score of 4.08 ($SD = 0.76$), indicating general agreement that project resources were appropriately distributed to support implementation activities. Continuous monitoring of resource utilization recorded the lowest mean score ($M = 3.95$; $SD = 0.84$), although respondents still agreed that mechanisms existed to monitor how project resources were utilized throughout implementation. The findings indicate that KenGen recognizes the importance of effective budget planning and resource allocation in enhancing project performance. The high rating for budget preparation suggests that project costs are estimated and planned before implementation begins, thereby providing a sound financial framework for project execution. Proper budgeting enables project

managers to anticipate financial requirements, prioritize expenditure, and minimize the likelihood of cost overruns.

Similarly, the positive ratings for financial resource allocation and the allocation of human, material, and equipment resources demonstrate that KenGen generally provides the necessary resources required for successful project implementation. Adequate resource allocation ensures that project activities are executed efficiently, minimizes interruptions arising from resource shortages, and contributes to improved project outcomes.

Although respondents agreed that resource utilization was monitored throughout project implementation, this indicator received the lowest mean score among the budget planning practices. This finding suggests that while monitoring systems are in place, there is room for strengthening continuous tracking of resource utilization to enhance efficiency, minimize wastage, and improve accountability.

These findings are consistent with the Resource-Based View (RBV) Theory, which emphasizes that organizational performance depends not only on the availability of resources but also on how effectively those resources are planned, allocated, and utilized (Barney, 1991). The findings also support the Project Management Institute (PMI, 2021), which identifies cost management and resource management as critical components of successful project planning. According to PMI, effective budgeting and prudent resource allocation contribute significantly to project efficiency, budget compliance, and overall project success.

Furthermore, the findings agree with Kerzner (2022), who argues that realistic budgeting and efficient resource allocation enhance project performance by reducing financial uncertainty, supporting informed decision-making, and ensuring that projects are completed within approved cost limits. Consequently, effective budget planning and resource allocation remain essential determinants of successful project performance at Kenya Electricity Generating Company (KenGen).

Project Performance

Project performance was the dependent variable in this study and was measured using four indicators derived from the conceptual framework, namely timely project completion, budget compliance, achievement of project objectives, and overall project success. Respondents were requested to indicate their level of agreement with statements relating to these performance indicators using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The descriptive statistics for project performance are presented in Table 6.5.

Table 6.5: Descriptive Statistics for Project Performance (n = 138)

Statement	Mean	Std. Dev.	Rank
Projects were completed within the planned timelines.	4.18	0.70	1
Projects were completed within the approved budgets.	4.10	0.75	2
Projects achieved their intended objectives and deliverables.	4.04	0.77	3
Overall, projects implemented by KenGen were successful.	3.96	0.81	4
Overall Mean	4.07	0.76	

Source: Author (2026)

The findings presented in Table 6.5 indicate that respondents generally agreed that projects undertaken by Kenya Electricity Generating Company (KenGen) performed satisfactorily, as reflected by an overall mean score of 4.07 and a standard deviation of 0.76. The relatively low standard deviation suggests that respondents expressed fairly consistent opinions regarding the performance of projects implemented by the organization.

Among the four performance indicators, timely project completion recorded the highest mean score (M = 4.18; SD = 0.70), indicating that respondents generally agreed that projects were completed within the planned implementation schedules. Budget compliance ranked second with a mean score of 4.10 (SD = 0.75), suggesting that projects were generally implemented within their approved financial allocations.

The achievement of project objectives recorded a mean score of 4.04 (SD = 0.77), indicating agreement that most projects successfully delivered their intended outputs and outcomes. Overall project success recorded the lowest mean score (M = 3.96; SD = 0.81), although respondents still agreed that projects implemented by KenGen were generally successful. The relatively higher standard deviation for this indicator suggests slight variation in respondents' perceptions regarding the overall success of projects.

The findings demonstrate that respondents perceived project performance at KenGen to be generally satisfactory across all four indicators measured in this study. The highest rating for timely project completion suggests that effective planning and scheduling practices have contributed to improving adherence to project implementation timelines. Timely completion is particularly important for energy infrastructure projects because delays may affect electricity generation, increase project costs, and postpone realization of project benefits.

The positive rating for budget compliance indicates that KenGen generally maintains effective financial control during project implementation. Completing projects within approved budgets reflects sound budgeting practices, prudent resource utilization, and effective monitoring of project

expenditures. Budget compliance also enhances accountability and ensures efficient use of organizational resources.

Similarly, respondents agreed that projects generally achieved their intended objectives, suggesting that project deliverables were aligned with planned outputs established during the planning phase. Achievement of project objectives demonstrates the effectiveness of project planning, implementation, and monitoring processes in delivering the expected project outcomes. Although overall project success recorded the lowest mean score among the four indicators, respondents still expressed agreement that KenGen projects were generally successful. This suggests that while most projects achieved acceptable performance levels, opportunities still exist for improving project delivery through enhanced planning, coordination, and resource management.

These findings are consistent with the Project Management Institute (PMI, 2021), which identifies project success as the extent to which projects achieve planned objectives while meeting schedule and budget requirements. The findings also support Kerzner (2022), who argues that effective project planning contributes significantly to improved project performance by enhancing schedule compliance, cost control, and successful achievement of project objectives.

Furthermore, the findings reinforce the study's conceptual framework, which identifies project performance as the dependent variable measured using timely project completion, budget compliance, achievement of project objectives, and overall project success. The generally high mean scores across these indicators suggest that effective project planning practices positively contribute to the successful implementation of projects at Kenya Electricity Generating Company (KenGen).

Correlation Analysis

Pearson Product-Moment Correlation analysis was conducted to determine the direction and strength of the relationship between the study variables. The analysis examined the relationship between project scope definition and management, project objectives and goal clarity, schedule and timeline management, budget planning and resource allocation, and project performance. The findings are presented in Table 6.6.

Table 6.6: Pearson Correlation Matrix

Variables	Scope Definition	Objectives Clarity	Schedule Management	Budget Planning
Project Scope Definition and Management	1			
Project Objectives and Goal Clarity	.654**	1		
Schedule and Timeline Management	.621**	.677**	1	
Budget Planning and Resource Allocation	.593**	.618**	.691**	1
Project Performance	.714	.748	.779	.732

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

Source: Author (2026)

The findings in Table 6.6 indicate that all the independent variables were positively and significantly correlated with project performance. This implies that improvements in project planning practices were associated with improved project performance at Kenya Electricity Generating Company (KenGen).

Project scope definition and management recorded a strong positive correlation with project performance ($r = 0.714$, $p < 0.01$). This suggests that clearly defining project scope, documenting project deliverables, developing work breakdown structures, and effectively managing scope changes contribute significantly to successful project implementation. The findings imply that projects with well-defined scope are more likely to achieve timely completion, remain within budget, and accomplish their intended objectives.

Project objectives and goal clarity exhibited a strong positive correlation with project performance ($r = 0.748$, $p < 0.01$). The findings indicate that projects characterized by clearly defined, well-communicated, and aligned objectives are more likely to achieve successful outcomes. Clear objectives improve coordination among project stakeholders, facilitate decision-making, and provide a common direction during project implementation.

Schedule and timeline management recorded the strongest positive correlation with project performance ($r = 0.779$, $p < 0.01$). This finding suggests that effective scheduling, proper sequencing of project activities, continuous monitoring of milestones, and timely corrective action contribute substantially to successful project implementation. The results demonstrate that schedule management plays a critical role in ensuring projects are completed within planned timelines and approved budgets.

Budget planning and resource allocation also showed a strong positive relationship with project performance ($r = 0.732$, $p < 0.01$). This implies that realistic budgeting, adequate financial planning, efficient allocation of personnel and equipment, and effective monitoring of resource utilization significantly enhance project performance.

Overall, all the independent variables exhibited statistically significant positive relationships with project performance, suggesting that strengthening project planning practices is likely to improve project outcomes at KenGen.

The findings agree with the Project Management Institute (PMI, 2021), which identifies project planning as one of the most critical phases of project management and argues that projects characterized by effective planning generally achieve superior performance. The strong positive correlations indicate that comprehensive planning contributes significantly to timely project completion, budget compliance, achievement of project objectives, and overall project success.

The findings also support Kerzner (2022), who argues that project success largely depends on effective planning, particularly in defining project scope, establishing realistic schedules, allocating resources efficiently, and setting achievable project objectives. Similarly, Pinto (2020) observed that projects with clear objectives and effective planning systems consistently outperform projects characterized by inadequate planning practices.

Furthermore, the findings provide empirical support for the three theories underpinning this study. The strong relationship between project scope definition and project performance supports the Project Management Theory, which emphasizes systematic planning as a prerequisite for successful project implementation. The positive relationship between project objectives and project performance is consistent with the Goal-Setting Theory, which argues that clearly defined goals improve organizational performance. Likewise, the positive association between budget planning and project performance supports the Resource-Based View (RBV) Theory, which emphasizes the strategic allocation and utilization of organizational resources to achieve superior performance.

Multiple Regression Analysis

Multiple linear regression analysis was performed to determine the combined influence of project planning practices on project performance. It comprised the Model Summary, Analysis of Variance (ANOVA), and Regression Coefficients as follows.

Table 6.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.864	0.747	0.739	0.342

Predictors: (Constant), Project Scope Definition and Management, Project Objectives and Goal Clarity, Schedule and Timeline Management, Budget Planning and Resource Allocation

Dependent Variable: Project Performance

Source: Author (2026)

The regression model demonstrated a strong explanatory capability ($R = 0.864$) and explained 74.7% of the variation in project performance ($R^2 = 0.747$, Adjusted $R^2 = 0.739$). The relatively small difference between R^2 and Adjusted R^2 indicates that the regression model was stable and provided a good fit for the observed data.

Regression coefficient analysis established that all four project planning practices positively and significantly influenced project performance:

Predictor	Standardized β	t-value	p-value
Project Scope Definition and Management	0.236	4.085	<0.001
Project Objectives and Goal Clarity	0.281	4.968	<0.001
Schedule and Timeline Management	0.345	6.154	<0.001
Budget Planning and Resource Allocation	0.189	3.417	0.001

The estimated regression equation was:

$$\text{Project Performance} = 0.412 + 0.241(\text{Scope Definition}) + 0.286(\text{Objectives \& Goal Clarity}) + 0.331(\text{Schedule Management}) + 0.217(\text{Budget Planning}) + \varepsilon$$

These results indicate that improvements in each planning practice significantly enhance project performance, with Schedule and Timeline Management exerting the greatest influence.

Analysis of Variance (ANOVA)

The ANOVA results were used to determine whether the regression model was statistically significant in explaining variations in project performance. The results are presented in Table 6.8.

Table 6.8: ANOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	45.276	4	11.319	96.841	0.000
Residual	15.549	133	0.117		
Total	60.825	137			

Dependent Variable: Project Performance

Predictors: Project Scope Definition and Management, Project Objectives and Goal Clarity, Schedule and Timeline Management, Budget Planning and Resource Allocation

Source: Author (2026)

The ANOVA results indicate that the overall regression model is statistically significant ($F = 96.841$, $p = 0.000$). Since the p-value is less than the significance level of 0.05, the regression model is considered statistically significant.

These findings imply that the four project planning practices, when considered together, significantly influence project performance at Kenya Electricity Generating Company (KenGen). The results provide sufficient evidence that the independent variables jointly explain a significant proportion of the variation in project performance and that the regression model is appropriate for predicting project performance.

The significant F-statistic further confirms that the relationship between project planning practices and project performance is unlikely to have occurred by chance. Consequently, the regression model is suitable for estimating the effects of the individual project planning practices on project performance, which are presented in the subsequent section on regression coefficients and hypothesis testing.

Regression Coefficients

The regression coefficients were analyzed to determine the individual contribution of each project planning practice to project performance at Kenya Electricity Generating Company (KenGen). The regression coefficients indicate the magnitude and direction of the influence of each independent variable while controlling for the effects of the other variables. The results are presented in Table 6.9.

Table 6.9: Regression Coefficients

Variable	Unstandardized Coefficient (B)	Std. Error	Standardized Beta (β)	t-value	Sig.
Constant	0.412	0.185	—	2.227	0.028
Project Scope Definition and Management	0.241	0.059	0.236	4.085	0.000
Project Objectives and Goal Clarity	0.286	0.062	0.274	4.613	0.000
Schedule and Timeline Management	0.331	0.058	0.345	5.707	0.000
Budget Planning and Resource Allocation	0.217	0.056	0.209	3.875	0.000

Dependent Variable: Project Performance

Source: Author (2026)

The results presented in Table 6.9 indicate that all four project planning practices had positive and statistically significant effects on project performance since their p-values were less than 0.05.

The constant coefficient ($\beta_0 = 0.412$, $p = 0.028$) indicates that when all the independent variables are held constant, project performance would have a baseline value of 0.412.

Project Scope Definition and Management had a positive and statistically significant influence on project performance ($\beta = 0.236$, $t = 4.085$, $p < 0.001$). This implies that improving scope definition and management by one unit would increase project performance by 0.241 units, holding other variables constant.

Project Objectives and Goal Clarity also had a positive and statistically significant influence on project performance ($\beta = 0.274$, $t = 4.613$, $p < 0.001$). The findings indicate that clearly defined project objectives significantly improve project outcomes.

Schedule and Timeline Management recorded the highest standardized beta coefficient ($\beta = 0.345$, $t = 5.707$, $p < 0.001$), indicating that it had the greatest influence on project performance among all the independent variables. This finding suggests that effective scheduling, monitoring of milestones, and adherence to implementation timelines are the strongest predictors of successful project performance at KenGen.

Budget Planning and Resource Allocation also had a positive and statistically significant influence on project performance ($\beta = 0.209$, $t = 3.875$, $p < 0.001$). This implies that effective budgeting and efficient allocation of financial, human, and material resources contribute significantly to successful project implementation.

Overall, all the independent variables were statistically significant predictors of project performance, demonstrating that effective project planning practices enhance project success.

The estimated regression model was:

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

Substituting the coefficients obtained from the regression analysis gives:

$$Y = 0.412 + 0.241X_1 + 0.286X_2 + 0.331X_3 + 0.217X_4 + \varepsilon$$

Where:

Y = Project Performance

X₁ = Project Scope Definition and Management

X₂ = Project Objectives and Goal Clarity

X₃ = Schedule and Timeline Management

X₄ = Budget Planning and Resource Allocation

ε = Error term

The equation indicates that improvements in any of the four project planning practices lead to improvements in project performance, with Schedule and Timeline Management having the greatest influence.

Hypothesis Testing Results

The hypotheses were tested using regression coefficients at a 95% confidence level ($\alpha = 0.05$). the results were as follows:

- **H₀₁:** Project Scope Definition and Management has no statistically significant influence on project performance. Rejected ($\beta = 0.236$, $p < 0.001$).
- **H₀₂:** Project Objectives and Goal Clarity has no statistically significant influence on project performance. Rejected ($\beta = 0.281$, $p < 0.001$).
- **H₀₃:** Schedule and Timeline Management has no statistically significant influence on project performance. Rejected ($\beta = 0.345$, $p < 0.001$).
- **H₀₄:** Budget Planning and Resource Allocation has no statistically significant influence on project performance. Rejected ($\beta = 0.189$, $p = 0.001$).
The findings demonstrate that each project planning practice contributes positively and significantly to project performance at KenGen.

SUMMARY OF FINDINGS

The study established that effective project planning practices are critical determinants of project performance within KenGen. Among the four planning dimensions, Schedule and Timeline Management emerged as the strongest predictor of project success, followed by Project Objectives and Goal Clarity, Project Scope Definition and Management, **and** Budget Planning and Resource Allocation. Overall, the findings demonstrate that strengthening project planning practices improves timely project completion, budget compliance, achievement of project objectives, and overall project success in civil engineering projects.

Project Scope Definition and Management

The study established that project scope definition and management positively and significantly influence the performance of civil engineering projects. Projects with clearly defined scope statements, comprehensive work breakdown structures, and effective change-control mechanisms were more likely to achieve their intended objectives within the approved budget and schedule. These findings suggest that well-defined project boundaries reduce ambiguity, minimize scope creep, improve stakeholder coordination, and facilitate effective project monitoring throughout the implementation process.

Project Objectives and Goal Clarity

The study further established that project objectives and goal clarity significantly enhance project performance. Clearly communicated project objectives were associated with improved coordination among project teams, stronger stakeholder commitment, better decision-making, and more effective implementation. Respondents indicated that projects characterized by well-defined objectives experienced fewer implementation challenges because all stakeholders possessed a common understanding of expected deliverables and performance expectations.

Schedule and Timeline Management

Among all the planning dimensions examined, schedule and timeline management emerged as the strongest predictor of project performance. The findings indicate that projects characterized by realistic schedules, effective monitoring of milestones, and timely corrective actions were significantly more likely to achieve successful completion within the planned implementation period. Effective schedule management also contributed to improved cost control, enhanced coordination among project participants, and higher levels of stakeholder satisfaction.

Budget Planning and Resource Allocation

The findings also demonstrated that budget planning and resource allocation have a positive and statistically significant influence on project performance. Projects supported by realistic budgets, adequate financial resources, timely procurement, and efficient allocation of personnel and equipment were more likely to achieve successful implementation. Effective resource planning minimized operational disruptions while improving implementation efficiency and project quality.

CONCLUSION, RECOMMENDATIONS AND AREAS FOR FURTHER RESEARCH

Conclusion

This study examined the influence of project planning practices on the performance of civil engineering projects at the Kenya Electricity Generating Company (KenGen). Specifically, it assessed the effects of project scope definition and management, project objectives and goal clarity, schedule and timeline management, and budget planning and resource allocation on project performance. The findings demonstrate that project planning practices are fundamental determinants of successful project implementation. The study established that all four planning dimensions have positive and statistically significant effects on project performance, indicating that improvements in planning practices enhance the likelihood of completing projects within scope, on schedule, within budget, and according to the required quality standards.

Project scope definition and management were found to improve project coordination by minimizing scope creep, facilitating stakeholder engagement, and strengthening project control throughout implementation. Clearly defined project objectives and goal clarity enhanced communication, accountability, and organizational commitment, thereby improving implementation effectiveness. Among the four planning dimensions, schedule and timeline management emerged as the strongest predictor of project performance, highlighting the importance of realistic scheduling, continuous monitoring, and timely corrective actions in infrastructure project delivery. Budget planning and resource allocation also significantly contributed to project success through improved financial planning, efficient resource utilization, and enhanced operational efficiency.

The study further confirms the relevance of Project Management Theory, Goal-Setting Theory, and Resource-Based View Theory in explaining the relationship between project planning and project performance. Collectively, these theories demonstrate that successful infrastructure projects require systematic planning processes, clearly articulated objectives, and effective deployment of organizational resources. The study further contributes to the existing body of knowledge by providing empirical evidence from Kenya's energy sector, an area where limited studies have examined the specific contribution of project planning practices to civil engineering project performance. The findings therefore provide practical and theoretical insights for improving project management within public infrastructure organizations.

Recommendations

Based on the findings, the study makes the following recommendations:

- i. Project scope management should be strengthened by developing comprehensive scope statements, adopting standardized Work Breakdown Structures (WBS), and institutionalizing formal change management procedures to minimize scope variations during project implementation.
- ii. Project objectives should be developed using the SMART framework and communicated clearly to all project stakeholders before implementation begins. Continuous stakeholder engagement should be maintained throughout the project lifecycle to ensure alignment between project objectives and organizational priorities.
- iii. Project schedules and timeline management should be enhanced through the adoption of advanced project scheduling and monitoring technologies, including integrated project management information systems, Earned Value Management (EVM), and real-time project performance dashboards. Periodic schedule reviews should be conducted to identify implementation risks and facilitate timely corrective actions.
- iv. Budget planning and resource allocation should be strengthened by improving financial forecasting, integrating procurement planning with project scheduling, and implementing enterprise resource planning systems that support efficient utilization of financial, human, and physical resources.
- v. Project planning should be institutionalized as a strategic organizational capability through continuous professional development, regular training in project management best practices, and adoption of internationally recognized project management standards. Such initiatives will enhance organizational capacity to deliver complex civil engineering projects successfully.

Areas for Further Research

Although this study explains a substantial proportion of project performance, a portion of the variation remains attributable to factors not examined in this research. Future studies should therefore investigate the influence of other project management practices such as stakeholder

management, project risk management, communication management, leadership, organizational culture, and digital transformation on infrastructure project performance.

Comparative studies involving other state corporations, private infrastructure organizations, and projects in different sectors would also improve the generalizability of the findings. In addition, longitudinal studies could provide deeper insights into how project planning practices influence project performance throughout the entire project life cycle.

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