PROJECT QUALITY MANAGEMENT PRACTICES AND PROJECT PERFORMANCE OF ROAD PROJECTS IN ELGEYO MARAKWET COUNTY, KENYA

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Abstract: Road projects undertaken by county governments in Kenya frequently encounter considerable delays, with many projects being completed two to five years beyond their original timelines, and some even facing indefinite suspension. The uncertainty regarding the completion of specific projects is largely attributed to inadequate workmanship, which compromises the overall quality of the projects. This situation leads to both delays and significant budget overruns. The present study intended to investigate the influence of quality management practices on the performance of road projects in Elgevo Marakwet County. In particular, the research aimed to evaluate the effects of various quality management practices, such as quality auditing, quality training, inspection, and continuous improvement, on the performance of road projects in the area. Anchored in total quality management theory and six sigma theory, this mixed-method study focused on a population of 115 respondents. A census approach was employed. Data was gathered through both quantitative and qualitative methods, utilizing questionnaires, interview and observation guides. This approach was chosen to facilitate a comprehensive exploration of the topic. The data collected was analyzed using descriptive and inferential statistical methods. Statistical Package for Social Scientists. Findings revealed that quality auditing and quality training had significant positive impacts on project performance. Specifically, auditing ensured compliance with standards, early defect detection, and improved quality (r = 0.281, $\beta = 0.860$), while training enhanced staff competence and execution efficiency (r = 0.417, β = 1.213). However, inspection and continuous improvement showed significant but negative relationships with performance, suggesting that poor implementation of inspections (r = -0.095, β = -0.339) and mismanaged continuous improvement efforts (r = -0.073, β = -1.201) could disrupt project flow and outcomes. The study concluded that quality auditing and training are essential to project success, while inspection and continuous improvement must be carefully planned and executed. It recommends structured auditing systems, targeted training, systematic inspection routines, and managed improvement strategies to enhance performance. For further studies, it is suggested that research should focus on the broader influence of total quality management (TQM) practices on the management and sustainability of construction projects in Kenya, to offer a more holistic view of quality practices across different project types and sectors.

Keywords: Quality Auditing, Quality training, Inspection, Continuous improvement and performance of road projects.

1. INTRODUCTION

Background of the study

Project quality management is a critical area of knowledge within the PMBOK Guide, focusing on the ongoing assessment of quality across all project activities and the implementation of corrective measures until the desired quality standards are met (Abdulazeez, 2022). The advantages of adopting Quality Management Practices (QMPs) encompass lower operational

costs, enhanced efficiency, increased productivity, improved financial performance, and the organization's capacity for continuous learning and operational enhancement (Nwafor, 2020). For quality management practices to effectively contribute to achieving essential project objectives, they must possess characteristics that are valuable, rare, inimitable, and non-substitutable (Barone, 2022). The processes involved in Project Quality Management encompass all organizational activities that establish quality policies, objectives, and responsibilities, ensuring that the project meets its intended goals. This involves the execution of a quality management system through established policies, procedures, and processes related to quality planning, quality assurance, and quality control, with ongoing quality improvement initiatives (Project Management Tutor, 2023). The primary aim of project quality management is to create a comprehensive framework for identifying quality standards and requirements, executing quality assurance and control measures, and implementing corrective actions to enhance project outcomes. According to Olawale (2022), organizations that employ effective project quality management strategies are more likely to meet client needs, ultimately resulting in higher levels of client satisfaction.

Project performance management emphasizes the overall perception of success rather than merely the completion of tasks. Effective project management, which has progressed from the planning and execution of project-related activities, is crucial for attaining project objectives (El-Baz, 2021). It is vital to incorporate project performance management as a comprehensive process that aligns with corporate strategy. Although many senior executives perceive their projects as being on track, nearly one-third of projects fail to achieve their intended goals. Organizations that strategically delegate responsibilities in accordance with their vision and successfully carry out these tasks tend to excel in resource allocation, which plays a significant role in their success. Such organizations effectively reduce waste, optimize operations, improve productivity, and make more strategic purchasing decisions.

According to the China Engineering and Technology Information Network, ÇETIN (2022), effective quality management is acknowledged when organizations establish a framework that directs both employees and stakeholders towards achieving optimal success. This is achieved by ensuring that the products and services provided adhere to quality standards and meet the specific requirements of the target audience. A prominent illustration of effective quality management is Toyota's adoption of the Kanban method. Created by Taiichi Ohno, Kanban serves as an inventory control system aimed at enhancing transparency for suppliers and customers, thus preventing the overaccumulation of inventory on the production line. Toyota integrated this concept to improve its Just-in-Time (JIT) system, enabling suppliers to align raw material orders with manufacturing timelines. This strategy enhanced Toyota's batch production efficiency by guaranteeing that adequate inventory was available to meet orders as they were received. The evaluation of quality management within organizations is conducted through various techniques, including benchmarking, quality auditing, inspection, and continuous improvement (Amir,Marita,Taherah, Payam and Bijain (2022).

Statement of the Problem

The road construction project in Elgeyo Marakwet County is encountering numerous challenges that adversely impact its outcomes, particularly due to inadequate quality control measures during the construction phase. Insufficient quality control can result in performance issues such as manifested into road defects, leading to increased maintenance expenses, potential accidents, and even jeopardizing the project's overall success that likely culminates in deficiencies in quality control practices (Zayed & El-Rayes, 2022).

The deficiencies in quality control practices can be traced back to various factors, such as insufficient training for construction staff, inadequate supervision, and the absence of appropriate quality control tools and equipment. These issues can contribute to substandard construction work, ultimately compromising the quality of the finished product. Furthermore, ineffective quality control can result in project delays and budget overruns, which may have significant repercussions for all stakeholders involved more particularly in connection to quality management and project performance (Creswell, 2023).

Numerous studies have been conducted locally regarding quality management and project performance. Research by Boventura and Kisimbii (2022) examined the impact of quality management on the performance of construction projects in Mombasa County, concluding that adherence to quality requirements positively influences project outcomes. Additionally, Nderitu and Nyaegah (2020) investigated the factors influencing the adoption of quality management practices in project implementation within County Governments in Kenya, finding that these practices have a significant effect on project performance. However, there is a scarcity of research focused on the performance of road projects executed by Elgeyo Marakwet County. Consequently, this study aims to explore project quality management practices and the performance of road projects in Elgeyo Marakwet County, Kenya.

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Research Objectives

The study was guided by the following general and specific objectives;

General Objective

The primary aim of this research was to assess the impact of project quality management practices on the performance of road projects in Elgeyo Marakwet County, Kenya.

Specific Objectives

The study also outlined specific objectives to achieve this aim.

- I. To determine the effect of quality auditing on the performance of road projects in Elgeyo Marakwet County.
- II. To establish the effect of quality training on the performance of road projects in Elgeyo Marakwet County.
- III. To examine the effect of inspection on the performance of road projects in Elgeyo Marakwet County.
- IV. To determine the effect of continuous improvement on the performance of road projects in Elgeyo Marakwet County.

Research Questions

The study sought to answer the following research questions:

- I. What is the effect of quality auditing on the performance of road projects in Elgeyo Marakwet County?
- II. How does quality training affect the performance of road projects in Elgeyo Marakwet County?
- III. To what extent does inspection affect the performance of road projects in Elgeyo Marakwet County?
- IV. How does continuous improvement affect the performance of road projects in Elgeyo Marakwet County?

Justification/Significance of the Study

The research provides significant academic advantages for future scholars interested in exploring quality management practices and their impact on project performance. The empirical results obtained from this study can serve as a valuable resource for subsequent investigations in this field. Additionally, the study contributes to theoretical advancement; the findings from hypothesis testing have reinforced the validity of the theories employed, while also offering critiques of those theories that may not universally apply to certain phenomena. Furthermore, the policy recommendations derived from this research can be utilized by policymakers within county governments in Kenya, aimed at improving the quality practices associated with projects.

Scope of the Study

The research concentrated on four key variables: quality auditing, quality training, inspection, and continuous improvement, all of which impact the performance of road projects. This investigation took place within the Elgeyo Marakwet County government, specifically focusing on road projects financed by Elgeyo Marakwet county. Road projects are prevalent in all its sub county regions. These are five in number; namely Keiyo South, Keiyo North, Marakwet West, Marakwet East and Kerio Valley sub county, (EMC government, 2025). In this regard respondents consisted of 115 respondents; 25 project managers, 60 Contractors and site supervisors, 30 Quality assurance officers. This has been detailed vide chapter three of this document. The duration of the study was set for three months in the year 2025. Primary data was collected from personnel overseeing these projects within the county government.

Limitations of the Study

Some individuals were hesitant to engage in the study due to concerns that their responses could be used against them. To encourage participation, the researcher provided assurance that the study was conducted solely for academic purposes by presenting a research authorization letter alongside a letter from the National Commission for Science, Technology, and Innovation (NACOSTI) to ensure the confidentiality of the information shared. This strategy aimed to facilitate the collection of reliable data based on candid feedback, thereby achieving a high response rate.Furthermore, the researcher utilized personal funds to finance the research, as the costs associated with fieldwork are expected to be considerable. This included the necessity for multiple trips between Mandela and Nairobi to remind participants of the importance of completing the questionnaire in a timely manner. Additionally, the researcher sought financial assistance from friends. Nevertheless, despite these financial constraints, the quality of the project report remained uncompromised.

2. LITERATURE REVIEW

Introduction:

Chapter two outlined the theoretical foundations that informed the study. Additionally, it provided a conceptual framework illustrating the relationships among the study variables. The chapter further reviewed the empirical literature, identified research gaps, and concluded with a summary of the existing literature.

Theoretical Review

The study will be guided by the theories that apply to the research objectives:

Total Quality Management (TQM) Theory

A leadership approach known as total quality management (TQM) focuses on delivering high-quality products and services to customers. As a comprehensive quality management strategy, TQM involves all employees in maintaining elevated standards within the workplace. Implementing TQM can provide organizations with a competitive advantage and improve employee productivity. Its significance lies in offering a versatile framework for executing effective quality and efficiency initiatives across all business functions (Bednarek et al., 2020). Although there is no single authoritative source, it is widely recognized that TQM emerged in the mid-1920s when Walter Shewhart developed a quantitative approach to quality management, which later became known as Statistical Process Control (SPC). The concept of quality is often linked to customer satisfaction. Consumers seek to derive maximum value from their purchases and typically evaluate products to ensure they meet their expectations before making a purchase (Bednarek et al., 2020). Consequently, businesses and organizations strive to ensure that the products they introduce or market are adequately designed to fulfill customer requirements. Total quality management embodies a company's culture, perspective, and organizational framework aimed at providing consumers with products and services that meet their needs. The processes within the organization must align with contemporary cultural expectations for quality across all areas, ensuring that tasks are executed correctly on the first attempt while minimizing errors and waste. The term total quality management gained prominence in the 1980s, significantly influenced by recommendations from key figures in the manufacturing sector. One essential aspect is quality governance, which emphasizes the necessity for management to take responsibility for product quality, supported by an appropriate strategy. Within the context of the book, the term quality technology encompasses the use of statistical methods and other technological or engineering solutions, as well as the adaptation to the latest quality programs to ensure ongoing customer satisfaction. Employee engagement is another critical factor, as enhancing organizational efficiency is a collective objective for all staff members, including administrative personnel, specialists, and production workers (Bednarek et al., 2020). A commitment to improving the quality of products or services can be demonstrated through motivation and training initiatives for the entire workforce. This theory is pertinent to the current research due to its importance in enabling managers to gain a competitive advantage over their counterparts by implementing high-quality practices that ensure satisfaction for all stakeholders. Additionally, the theory is relevant to the research aim: to assess the impact of quality auditing on the performance of road infrastructure projects in Elgeyo Marakwet County, Kenya.

Six Sigma Theory

A set of corporate tools, quantitative analysis, and evaluation expertise known as the Six Sigma Technique assists in optimizing organizational processes. It has the ability to minimize variability in procedures while improving efficiency and productivity. This methodology enhances employee morale and product quality, while simultaneously decreasing errors and increasing profitability. It is essential to eliminate inconsistencies, waste, and defects that could compromise customer satisfaction (Ahmed, 2022). The Six Sigma Methodology offers a significant level of assurance aimed at achieving excellence in the products or services provided by any business, organization, or enterprise. It is a data-driven approach focused on defect elimination and is characterized by its rigor. This technique facilitates a statistical assessment of operational performance, where any deviation from customer expectations is considered a defect. This widely adopted strategy has evolved over time and is now prevalent in the business sector. Its origins trace back to the 1980s, with Motorola, Inc. introducing it in 1986. During that period, a three sigma deviation from the norm was perceived as an error that needed rectification to enhance business performance. Subsequently, the theory was refined, and various measurement criteria were proposed. The advancement of this approach was driven by professionals' efforts to apply statistical analysis to resolve production-related challenges. The results of this analysis proved to be highly encouraging (Ahmed, 2022). They indicated

a more efficient and cost-effective manufacturing process, leading to a superior product that ultimately enhances customer satisfaction. This data-driven methodology elevates the quality standards in manufacturing adopted by companies. The resultant increase in productivity effectively meets the needs of a firm's clientele. This innovative and practical tool has gained significant popularity within the global industrial community. With the support of its users, both the concept and its tools have been further developed. It is essential for all management teams to ensure that the methodology is effectively communicated to those who will implement it. Leadership plays a crucial role in promoting the concept and inspiring future practitioners (Ahmed, 2022). When experts master and apply their unique creative strategies, certified Six Sigma Professionals can propel their organizations to new heights. The approach will continue to be utilized for the benefit of the firm if it is integrated into corporate policy. Consequently, this theory is applied in this study to investigate the impact of quality training on the performance of road projects in Elgeyo Marakwet County, Kenya.

Conceptual Framework

Onen and Oso (2022) observed that a conceptual framework serves as a diagrammatic representation of a theory. This framework is depicted as a model when the research variables and their interrelations are transformed into a visual format, thereby illustrating the connections among independent, intervening, and dependent variables. Consequently, the conceptual framework functions as a structured arrangement of concepts that the study will employ to attain its established objective.

Independent Variables



Figure 2.1: Conceptual Framework

Quality Auditing

Quality audits provide an independent assessment of project processes and deliverables, verifying adherence to quality standards and identifying areas for improvement. Several indicators are crucial for effective quality auditing: Frequency of Audits: Regular audits, conducted at appropriate intervals throughout the project lifecycle, provide ongoing assurance of quality. The frequency should be sufficient to identify potential issues early but not so frequent as to disrupt project flow. Auditor Competence and Independence: Auditors must possess the necessary skills and experience to conduct thorough and objective assessments. Independence from the project team is vital to ensure unbiased evaluations. Availing of Audit Reports to Relevant Parties:Audit reports should be readily accessible to project managers, team members, and other relevant stakeholders. This transparency facilitates understanding of audit findings and promotes accountability. Timeliness of Corrective Actions: Identifying deficiencies is only valuable if followed by prompt corrective actions. The speed with which corrective actions are implemented is crucial for minimizing negative impacts on the project.

Quality Training

Investing in quality training equips project teams with the knowledge and skills needed to implement quality management practices effectively. Key indicators include: Frequency and Duration of Trainings: Regular training sessions, of sufficient duration, ensure that team members stay updated on quality standards and best practices. Quality Training Budget & Other Resources: Adequate financial resources and access to training materials and tools are essential for delivering effective training programs. Type and Relevance of Training Received: Training content should be tailored to the specific needs of the project and cover relevant quality management principles, techniques, and tools. Establishment of a Quality Training Policy: A formal quality training policy demonstrates an organization's commitment to quality and provides a framework for planning and implementing training programs.

Inspection

Inspection involves examining project deliverables to verify compliance with quality requirements. Important indicators include: Frequency/Scheduling of Inspections: Regular inspections, scheduled at strategic points in the project lifecycle, help identify defects early and prevent them from propagating. Type and Scope of Inspections: The type and scope of inspections should be appropriate for the nature of the deliverables being inspected. Inspections can range from visual checks to detailed measurements and tests. Number and Competencies of Inspectors: The number of inspectors should be sufficient to cover the scope of inspections, and inspectors must possess the necessary skills and experience to perform their duties effectively.

Continuous Improvement

Continuous improvement is an on-going effort to identify and implement changes that enhance project quality. Key indicators include: Quality Steering Committee: A quality steering committee, composed of key stakeholders, provides oversight and guidance for quality improvement initiatives. Project Close-Out Meetings and Reports: Post-project reviews and reports provide valuable insights into what went well and what could be improved in future projects. Defect Review Reports: Analysing defect data helps identify patterns and root causes of quality problems, enabling targeted improvement efforts. Analysis and Evaluation of Data: Analysing data related to quality performance, such as defect rates and customer satisfaction scores, provides a basis for informed decision-making and continuous improvement.

Performance of Road Projects

The performance of road projects serves as the dependent variable in this analysis, encompassing multiple interconnected indicators that collectively measure project success. Time of completion emerges as a fundamental indicator, measured through metrics such as adherence to project timelines, completion dates relative to planned schedules, and overall project duration. This is complemented by cost variance, which assesses whether projects are completed within budgetary constraints, including total expenditure compared to allocated funds, cost overrun percentages, and financial efficiency metrics. Quality specifications and standards represent another crucial dimension of project performance, evaluated through indicators such as compliance with engineering standards, adherence to construction specifications, and fulfilment of technical requirements. Finally, stakeholders' satisfaction with projects serves as a comprehensive indicator, measured through metrics including client satisfaction ratings, end-user feedback, community acceptance levels, and overall project impact assessment.

Empirical Review

Quality Auditing and Project Performance

Abdul-Azeez (2022) conducted an evaluation of quality management practices in the Nigerian construction industry, motivated by the failure of several major road projects in Abuja. The research involved data collection from 20 construction companies operating in Abuja. The results revealed that construction managers predominantly relied on inspection as their main quality control method, while the practice of quality auditing was infrequently applied. Key challenges identified within the Nigerian construction sector included a lack of adequate quality planning, ineffective communication, and insufficient training in quality management. The study advocated for increased awareness regarding the implementation of comprehensive quality management practices within Nigeria's construction industry.

Sahil and Samiksha (2020) investigated the application of quality management systems in the South African construction sector. Their descriptive research encompassed 1,770 construction firms based in Dublin, aiming to evaluate the impact of quality management on the performance of construction projects in South Africa. The study focused on three critical components of quality management: quality assurance, quality control, and quality planning. Both descriptive and inferential statistical analyses, employing the least squares method, were utilized to assess the relationships among the variables under study. The findings demonstrated a significant positive correlation between quality control and quality planning with the performance of construction projects. Conversely, no meaningful relationship was identified between quality assurance and project performance, which stands in contrast to the conclusions reached by Abdul-Azeez (2022).

Shou et al., (2021) conducted a study on the impact of quality auditing on performance, with a particular emphasis on the waste management sector in Kosovo. The researchers utilized Ordinary Least Squares and the Gretl software to evaluate their hypotheses. Return on Assets (ROA) was designated as the dependent variable, indicative of profitability, while the independent variables encompassed debt, project age, size, investment, capital resources, cash flow, and profitability ratios. Furthermore, ROA was examined in connection with specific attributes of the waste management project. Metrics such as the scale of the audit project, its objectives, duration, and stakeholder engagement were taken into account. The study also explored the relationship between these factors and audit rotation. The findings indicated that significant elements affecting performance included project structure, leverage, and overall success. Notably, among the various audit factors analyzed, only the audit mandate exhibited a strong positive correlation with project performance in Kosovo. Therefore, it is crucial for project managers in Kosovo to prioritize these factors and strengthen the role of external audits within their operations.

Mavi (2021) investigated the impact of quality auditing on performance. The research emphasizes the importance of improving project profitability for infrastructure, businesses, shareholders, and various stakeholders. A critical element influencing a project's success is the quality of audits, commonly known as external monitoring. This study specifically explores the connection between audit quality and the profitability of information technology projects within Malaysian publicly listed companies from 2004 to 2015. In this context, audit quality is indicated by audit fees and the rotation of audit firms. The researchers employed Tobin's q and return on assets (ROA) as performance metrics for the companies studied. The findings indicated no significant relationship between ROA and the measures of audit quality (audit fees and firm rotation). However, the research demonstrated that audit fees exert a considerable positive influence on Tobin's q, while the association between audit firm rotation and Tobin's q was found to be weak.

A thorough comprehension of the challenges related to project quality is vital for upholding high standards that meet the expectations of all stakeholders involved in infrastructure projects while also providing beneficial outcomes for society, as noted by Kerzner (2022). This study seeks to outline the most prevalent procurement methods utilized in transportation infrastructure projects and to examine the impact of these methods on the anticipated quality of the final product concerning customer competency. To evaluate the quality standards in Swedish transportation infrastructure projects and to pinpoint the factors leading to quality-related issues, an online survey was administered to construction professionals. A balanced number of respondents reported that the quality of construction projects has either improved or remained consistent over the last two decades. Additionally, participants identified insufficient customer competency as a major concern. This issue is crucial for attaining the desired quality level through effective sourcing, inspection, and evaluation processes. Public clients predominantly depend on the traditional design-build procurement method, which necessitates significant client engagement in projects. Consequently, the link between subpar quality and insufficient customer competency may not be merely coincidental but could be an unintended consequence of the existing circumstances.

Quality Training and Project Performance

Hussain et al. (2021) conducted a study examining the influence of quality training on the performance of agricultural projects in Harfield, South Africa. The researchers observed that developments in various management disciplines have introduced new terminology, with instruction emerging as a crucial concept that significantly contributes to organizational development and project success. Employees are regarded as a vital yet expensive asset, underscoring the necessity to optimize their participation in achieving project objectives to ensure sustained economic growth and project efficacy.

The objective of the study was to determine the criteria for effective training within the agricultural project in Harfield and to underscore the considerable impact of quality training on employee engagement, project efficiency, and cost reduction. The findings indicated that effective training positively influences employees' skills, productivity, and profitability while simultaneously reducing costs. These results offer valuable insights for project managers and human resource professionals, highlighting the critical role of educational programs in improving overall project efficiency.

Stouten et al. (2021) investigated the impact of quality training on performance within engineering projects. The researchers observed that numerous engineering initiatives are currently experiencing low productivity levels, primarily due to inadequate training and development opportunities for staff. To tackle this challenge, a five-month study was conducted from March to July 2022, focusing on the effects of training and development on project personnel performance. The research involved a random sample of 80 participants selected from a total of 222 workers, which included administrators, coordinators, and instructors from five engineering projects overseen by leading companies in Phnom Penh, Cambodia. Ultimately, 76 responses were obtained. The analysis employed the ANOVA method in conjunction with the Statistical Package for Social Sciences (SPSS).

The results revealed that training and development programs had a positive effect on staff engagement, allowing engineering projects to achieve optimal outcomes while also boosting employee motivation. These initiatives provided employees with essential skills and enhanced their proficiency, resulting in increased efficiency and better alignment with project goals. The study concluded that a significant relationship exists between personnel effectiveness, training, and development, which plays a crucial role in the success of engineering projects.

Zhang et al. (2022) examined the impact of quality training on the performance of infrastructure projects in Beirut, Lebanon. The researchers observed that professionals create training and development programs even after employing skilled workers to ensure they acquire the essential skills, knowledge, and competencies for effective job execution. Project managers acknowledge that their workforce is a vital asset. Nevertheless, the specific ways in which infrastructure projects in Beirut enhance employee education and training remain ambiguous. The study included a sample of 100 participants who provided initial data. The researchers conducted surveys by visiting participants at locations separate from their project sites in Beirut. The results revealed that the three project managers in Beirut implemented a variety of skills training programs, which contributed to the overall success of the projects. Furthermore, two additional infrastructure project managers established long-term capacity-building strategies and short-term training initiatives. These efforts encompassed coordinating activities outside the workplace, attending workshops, and engaging in training sessions. As a result, the researchers proposed that continuous training is more advantageous for project performance than singular training events.

Chepkemoi (2020) examined the influence of project management competencies on the performance of road construction initiatives in Machakos County. The research concentrated on three essential skills: contract management, procurement, and financial management. The study involved 135 contractors registered with the National Construction Authority (NCA) at level 7 and above, which included site managers, project managers, foremen, site supervisors, and construction managers. Data were gathered through questionnaires. The results revealed significant positive correlations among the variables analyzed.

The research underscored that proficient contract management skills play a crucial role in enhancing the performance of road construction projects in Machakos County. Furthermore, it was determined that procurement management skills also exert a substantial positive effect on project results. Similarly, financial management skills were associated with improved performance in road construction endeavors. The study advocates for project managers to cultivate a collaborative project team comprising skilled contractors and laborers. It highlights that procurement management is a vital factor for success in road construction projects within Machakos County. Additionally, it recommends that financial managers should possess advanced expertise to ensure effective project leadership.

Inspection and Project Performance

Wu et al. (2021) sought to investigate the influence of inspections on the performance of engineering projects in China. The researchers identified that critical stages of engineering projects—such as planning, budgeting, quality assurance, and stakeholder satisfaction—are particularly vulnerable to errors. Allowing defective materials to advance through these stages can result in substantial losses in time, resources, and finances. Consequently, this study advocates for a project framework that includes an initial quality assurance phase. In contrast to the majority of existing literature, this approach analyzes the interplay between inspection costs, fault detection accuracy, and inspection duration through various linear and nonlinear factors to deepen the understanding of these dynamics.

The researchers formulated and validated a statistical model to ascertain the optimal batch size and inspection intervals during construction. Furthermore, they performed several numerical simulations to demonstrate the impact of different modeling parameters. The flexibility analysis revealed the resilience of the proposed model to minor modifications in its components. The findings indicate that while extending inspection time may increase costs, it can also enhance the detection rate of issues. The study concluded that addressing defective construction materials early in the planning and implementation phases can lead to reduced operational costs in subsequent stages. Additionally, a thorough comprehension of the relationships among inspection duration, costs, and detection effectiveness is crucial for maximizing benefits. The results further underscore the significance of accurately estimating defect rates; as the proportion of faulty materials rises, so do the timeframes, lot sizes, and budgets necessary for inspections.

Schmitt et al. (2020) investigated the impact of inspections on the performance of educational projects in Entebbe, Uganda. The study employed a descriptive design, focusing on twenty schools. The authors highlight that quality control is a crucial component of any project's quality management system and must be upheld throughout all project phases. Inspections play a vital role at various stages of educational projects to ensure that materials meet the required quality standards. While the field has been thoroughly examined regarding inspection methods, locations, and durations to reduce costs, there remains a gap in research concerning the relationship between inspection effectiveness and factors related to the workforce and the time allocated for inspecting different project materials. This study specifically explores offline inspections to ascertain the optimal number of assessors needed for various project items, taking into account their assessment errors, inspection volumes, and associated costs.

The primary aim of this research was to achieve optimal outcomes for key factors such as inspection costs, existing quality, and the frequency of inspections by identifying the best values for decision variables, including the number of inspectors in relation to their overall expertise. A stochastic approach was utilized within a multi-objective optimization model to derive the most favorable results for these objective functions and decision parameters. Initially, goal programming was applied with mathematical equations to validate the modeling framework, illustrating how inbound quantities affected inspection efficiency and determining the optimal configuration of decision factors. Descriptive and inferential statistics were employed to analyze the collected data. The results revealed a significant correlation between the quality of educational projects and established project management practices, including quality inspections.

Continuous Improvement and Project Performance

Nicholas et al. (2020) propose that the effectiveness of continuous improvement strategies can be assessed by their impact on project success. To achieve the best possible outcomes while fulfilling client expectations, it is crucial to prioritize continuous improvements. Consequently, project leaders at the City Council of Abuja, Nigeria, must comprehend the requirements necessary for ensuring project efficiency. This study aimed to investigate the influence of continuous improvement strategies on the outcomes of road infrastructure projects in Abuja, Nigeria. It analyzed various elements, including planning, scheduling, execution, and oversight, that play a role in the success of road construction projects. The research was informed by project management theory, the theory of constraints, and the resource-based view. A descriptive survey design was utilized, targeting 183 stakeholders involved in the process, which included four city officials from the Township Transport and Infrastructure Department, 48 site supervisors, and 131 members of construction project panels linked to 46 major road projects within the city administration.

The sample was obtained through stratified random sampling methods. Initial data collection was carried out using semistructured surveys. The analysis of responses from the open-ended questionnaires was conducted thematically, with coding and summaries based on the prominent topics identified. Descriptive and inferential statistical methods were utilized,

employing the Statistical Package for Social Sciences (SPSS). A multi-linear regression model was applied to investigate the relationships between continuous improvement strategies and the quality of road projects in Abuja City. The results revealed that project planning, scheduling, reporting, and waste minimization processes had a positive and significant impact on construction project outcomes. Effective reporting necessitates daily monitoring of essential performance indicators, which include inputs, activities, and results. The study recommended that project managers implement backward scheduling techniques upon establishing a delivery date, ensuring that activities are structured to achieve targets. Scheduling was developed and maintained throughout the entire project lifecycle. The research highlighted that continuous improvement should integrate budgeting strategies, timelines, delivery processes, quality standards, and other components during project execution. Furthermore, the researcher proposed that additional studies be conducted to evaluate the influence of continuous improvement strategies on the success of road projects in other cities throughout Nigeria.

Mungu (2021) investigated the impact of continuous improvement strategies on road construction projects in Narok County, Kenya, employing a descriptive research methodology. The study engaged 100 participants, comprising road engineers, supervisors, inspectors, surveyors, and contractors. It concentrated on completed infrastructure projects, new road constructions, and road upgrades within the area. For the initial phase of data collection, a survey was conducted alongside a questionnaire. Prior to the main analysis, the data collection instruments underwent pilot testing to verify their validity and reliability. The objective of the study was to collect both qualitative and quantitative data. Thematic analysis was utilized to interpret the statistical data, while descriptive and inferential statistics were employed to analyze the quantitative results. Diagnostic tests were performed before hypothesis testing to ensure that the requisite conditions, variables, and assumptions were met. The findings revealed a significant positive correlation between project management strategies and the successful delivery of road projects. Continuous improvement strategies were shown to account for 77.20% of road project performance, indicating that these approaches should be prioritized to enhance project effectiveness. The results demonstrated that all continuous improvement strategies positively correlated with road project delivery in Bomet County, although the extent of impact varied by specific strategy. Project planning exhibited the most considerable effect, followed by project monitoring and evaluation (M&E), project financing, and risk assessment. Therefore, this research offers valuable insights for continuous improvement management consultants engaged in road project execution, recommending that construction managers implement project management practices centered on continuous development. These practices encompass project planning, financing, M&E, and risk management to ensure the successful implementation of road projects.

Critique of the Existing Literature Relevant to the Study

Wu et al. (2021) concentrated on engineering projects within China, highlighting the critical role of inspections during essential stages such as planning and budgeting. Although their analysis of the interplay between inspection costs, fault detection accuracy, and inspection duration is praiseworthy, it does not thoroughly investigate how these elements interact with other project management practices. The dependence on statistical modeling, while beneficial, may overlook the intricacies of real-world situations where numerous variables concurrently affect project results. Furthermore, while the study emphasizes the importance of early defect detection, it fails to consider how organizational culture and communication practices may influence the effectiveness of inspections.

In a similar vein, Schmitt et al. (2020) explored educational projects in Uganda, underscoring the importance of quality control through inspections. Their descriptive approach lays a strong groundwork for comprehending the role of inspections; however, it does not adequately address the wider context of how workforce dynamics and the allocation of time for inspections impact overall project quality. The study recognizes existing literature on inspection methodologies but does not sufficiently investigate the gaps in research concerning the effectiveness of these methods across various environments or project types.

Summary of Literature Reviewed

The literature review has revealed several significant research gaps that warrant attention. Firstly, there is no clear agreement on the most effective quality control practices applicable to construction projects. Consequently, additional research is essential to determine the most effective quality control methods and their implementation in construction settings. Secondly, while there is a scarcity of literature regarding the application of quality control practices specifically within the Elgeyo Marakwet roads construction project, there is also a notable deficiency in research concerning the implementation

of these practices in other developing nations. Therefore, further investigation is required to explore the application of quality control practices in various developing countries and to identify the challenges encountered during their implementation.

Research Gaps

Abdul-Azeez (2022) conducted an evaluation of quality management practices within the Nigerian construction sector, prompted by the failure of significant road projects in Abuja. Their findings indicated that quality auditing was infrequently employed by construction managers. The research identified inadequate quality planning, ineffective communication, and insufficient training in quality management as the primary challenges facing the construction industry in Nigeria. However, it is important to note that this study was confined to the Nigerian construction sector and, as such, its conclusions may not be applicable to county government operations in Kenya, where the regulatory framework for construction differs. Additionally, the research focused solely on one aspect of quality management.

Nicholas et al. (2020) conducted research on continuous improvement strategies and their effects on project success within the City Council of Abuja, Nigeria. Their findings indicated that project planning, scheduling, reporting, and the minimization of waste processes significantly and positively impacted construction projects. However, the study focused solely on one aspect of quality management—continuous improvement—while numerous other facets, such as quality audits, inspections, quality control, and assurance, exist. Additionally, the research was situated in Nigeria, where the construction regulatory framework differs from that of Kenya. Therefore, it would be advisable to undertake a more comprehensive study encompassing various quality management areas within the Kenyan context.

Wu et al. (2021) examined the effect of inspection on performance in engineering projects in China. Their research demonstrated that the early identification of defective materials leads to reduced project costs. Nonetheless, this study was conducted in China, where the construction technology and regulatory landscape differ from those in Kenya. Furthermore, it was limited to a single variable—inspection—while numerous other critical quality management variables also influence project performance. Consequently, the current study aims to address this gap by conducting a localized investigation in Kenya and incorporating additional quality management variables into the model.

Schmitt et al. (2020) investigated the impact of inspection on the performance of education projects in Entebbe, Uganda. The results of the findings indicate that the quality of the education projects was significantly correlated with the project management practices including quality inspection that were established. The study was however in an education project whose dynamics and demands are very different from road projects. The study was also carried out in Uganda on only one variable, inspection as a quality management tool. It would be of great value to include other quality management variables in a road construction project.

3. RESEARCH METHODOLOGY

Introduction

The methodology of the study clarifies the organized approaches utilized to attain results that adequately respond to the research objectives and the inquiries the study seeks to address. Therefore, this chapter includes the research design that served as a framework throughout the investigation. It further outlines the target population and sample size, details the techniques and procedures for data collection, assesses the validity and reliability of the research tools, and ultimately describes the process of data analysis.

Research Design

The research utilized a mixed-methods framework that combines both quantitative and qualitative research techniques. This approach is selected to capitalize on the profound insights offered by qualitative research, particularly through comprehensive interviews, while also incorporating the generalizable and easily replicable data derived from quantitative methods, such as surveys. Quantitative techniques are adept at identifying current facts and gathering data from diverse sources. Creswell (2021) points out that qualitative method enhance the interpretation of quantitative data. By providing a detailed analysis of each case, the research outcomes become more accessible. Since this study intends to investigate predictor variables with direct effects, the integration of both quantitative and qualitative methodologies is deemed more suitable.

Target Population

The target population refers to the specific group of individuals, elements, or units that the researcher aims to study and from which conclusions are drawn (Nayak & Singh, 2021). This population included the entire set of subjects to which the research findings are intended to be relevant and applicable. Accurately defining the target population is crucial to ensure that the research outcomes can be appropriately generalized and applied to the intended group (Mishra & Alok, 2022). In this research, the target population consisted of 115 individuals, including of 115 respondents; 25 project managers, 60 Contractors and site supervisors, 30 Quality assurance officers, (EMC Government, 2025) The EMC has five sub counties namely, Keiyo South, Keiyo North, Marakwet West, Marakwet East and Kerio Valley sub county where road projects are being undertaken (EMC Govt, 2025).

Category	Number
Project managers	25
Contractors and site supervisors	60
Quality assurance officers	30
Total	115

Table 3.1	l: Distrib	ution of T	Farget Po	pulation
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Sampling Frame

A sampling frame refers to a comprehensive list or a specified collection of all individuals, elements, or units that constitute the target population from which a sample will be extracted in a research study (Khan, 2021). It acts as the foundation for choosing participants or items to be incorporated into the sample. Essentially, the sampling frame embodies the entire and thorough enumeration of all potential sampling units within the population under investigation. For this study, the sampling frame will consist of the project managers, project supervisors, quality assurance officers and procurement officers.

Sample and Sampling Technique

Given the small and manageable size of the population, the study did not utilize sampling techniques. Instead, a census approach was adopted to gather data from all respondents. It is generally accepted that a census is appropriate when the total population is fewer than 200 respondents (Kothari, 2023). As noted by Zakaria (2020), a census involves counting every element within a population, and it is also referred to as the complete enumeration method. The census method yields the most precise results compared to sampling methods, which rely on inference (Olorunfemi, 2020). Given that the population size for this study comprised 115 respondents, employing a census approach was deemed most suitable.

Instruments

The study employed primary data that encompasses both quantitative and qualitative elements. A questionnaire served as the instrument for collecting this primary data. According to Iovino and Tsitsianis (2020), a questionnaire consists of a series of questions or items designed to gather primary data from participants regarding their attitudes, experiences, or opinions. The questionnaire comprised of both open ended and closed ended questions. Open ended questions allow respondents to provide detailed, unrestricted answers in their own words (Creswell, 2023). Closed ended questions restrict responses to predefined options such as "yes" or "no" answers, multiple choice selections, or Likert scale ratings (Lewis and Thornhill, 2022). The decision to use a questionnaire is based on its cost-effectiveness and efficiency in data collection, particularly given the size of the sample. A 5-Point Likert Scale was utilized, where 1 indicates strongly agree, 2 signifies agree, 3 represents neutral, 4 denotes disagree, and 5 indicates strongly disagree. Tanujaya et al. (2023) noted that the Likert scale, developed by Rensis Likert, is intended to assess the attitudes of research participants. Douven (2020) mentioned that the Likert scale functions as a measurement tool in quantitative questionnaires, requiring respondents to select a single option from the provided questions or statements. The implementation of the Likert scale is crucial as it helps reduce potential biases from respondents and enhances the validity and reliability of the study (Rahman, 2020). Numerous studies have demonstrated that the Likert scale is both meaningful and easy to complete (Tanujaya et al., 2023). Additionally, a self-administered questionnaire approach will be utilized in this research, as the study's objectives do not require direct observation of the information. The questionnaire will primarily consist of closed-ended questions, supplemented by a limited number of open-ended questions, thereby improving the overall quality of the research findings.

De Rada (2022) indicated that self-administered questionnaires are generally more straightforward and quicker to complete compared to alternative methods. This aspect is particularly significant for the current study, as it enables the researcher to gather data on a large scale simultaneously. Utilizing a self-administered questionnaire to collect both quantitative and qualitative data will not only accelerate the data collection process but also ensure that the information obtained is uniform, accurate, and consistent. Furthermore, the open-ended section of the questionnaire allowed respondents to articulate and reflect on the study phenomenon in their own terms (Twis et al., 2020; de Rada, 2022). The researcher plans to engage research assistants to distribute the questionnaires using the drop-and-pick method, as recommended by Saunders et al. (2022). The questionnaire was divided into two sections: the first focused on demographic details, while the second addressed the research questions. The researcher designed the interview in alignment with the research questions to obtain qualitative data. This approach aimed to extract insights from senior management. The interview took the form of a one-on-one conversation between the interviewer and the interviewee. The information obtained from this interview primarily consisted of qualitative data.

Data Collection Procedure

The researcher was required to obtain the appropriate research authorization from the university, which was then utilized to secure a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). Following this, the researcher arranged meetings with the respondents, bringing along the research authorization and permit. The administration of the questionnaires took place at a time convenient for the selected respondents, ensuring that the organization's regular operations are minimally affected and that proper permissions are obtained. The questionnaires were subsequently be distributed to the respondents, allowing them ample time to provide their responses.

Pilot Test

The pilot was conducted in the neighbouring county, Uasin Gishu, Ainabkoi sub county. It was conducted with particular reference to the sub county of Ainabkoi. The pilot was carried out in random, 10% of the target population was used, that's 12 people were randomly sampled. Following a review and clarification of the questions based on feedback from the pilot respondents, the researcher enhanced their confidence in the effective use of the research tools.

Validity of the Research Instruments

Validity pertains to the degree to which a data collection instrument accurately measures its intended target. It evaluates whether the outcomes derived from a test can be reliably utilized to make pertinent and beneficial inferences (Asenahabi, 2022). The pilot study was conducted to assess both the face and content validity of the questionnaire. Asenahabi (2022) notes that validity acts as a measure of the precision of the measurement items. To ensure face validity, a panel of experts examined the research instruments to verify that they adequately encompassed all intended variables while integrating their professional perspectives. This study incorporated both construct and content validity. To establish construct validity, the questionnaire was structured into sections that corresponded with specific objectives and were closely aligned with the subconstructs detailed in the conceptual framework. For content validity assessment, the instrument was presented to a conveniently selected focus group of five experts with specialization in project management and water projects pertinent to the study's variables. Furthermore, a review of the questionnaire with the supervisor served as an initial validation check, with their feedback taken into account to improve the content validity of the instrument. Meyers, Gamst, and Guarino (2022) emphasize the significance of considering face, content, construct, and concurrent validity in research.

Reliability of Research Instruments

Reliability refers to the extent to which a research instrument consistently yields comparable results or data across multiple applications (Bhardwaj, 2022). In this study, a model was considered satisfactory if it attained a Cronbach's alpha coefficient of 0.6 or higher for each construct. A reliability coefficient of 0.6 or above is widely recognized as acceptable (Stratton, 2021). The reliability of the research instrument was evaluated through the Cronbach Alpha coefficient. According to Bhardwaj (2022), when research tools employ similarity-type scales with diverse responses for data collection, the Cronbach coefficient assesses the reliability of the collected data by analyzing the internal consistency of samples from the chosen group. The instrument's reliability was quantified by calculating its Cronbach's Alpha Coefficient, which acts as an indicator of internal consistency.

Data Processing and Analysis

Upon the completion of quantitative data collection, the gathered information underwent a process of cleaning, coding, and subsequent entry into Excel for analysis, utilizing both Microsoft Excel and the Statistical Package for Social Sciences (SPSS) version 29.0. The analytical approach incorporated both descriptive and inferential statistics. Descriptive statistics was employed to summarize and elucidate the data, thereby enhancing the comprehension of the distribution of scores or measurements. Correlation analysis was undertaken to assess the relationships among the variables. Furthermore, multiple regression analysis was executed to ascertain the impact of the independent variable on the dependent variable. The findings were presented through frequency tables, while regression analysis served to illustrate the inferential statistics. A multiple regression model was utilized in this research to investigate the relationship between the dependent and independent variables, organized as follows.

 $Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \epsilon$

Where: Y= Project Performance

 $\beta 0$ = Constant $\beta 1$ to $\beta 4$ =Coefficients

X1 = Quality Auditing

X2= Quality Training

X3 = Inspection

X4 = Continuous Improvement

 ϵ =Error term.

The final findings were presented through tables and graphs.

Qualitative data obtained from the interview guide and observation guide was systematically organized into themes and subthemes. Subsequently, the researcher consolidated these themes into coherent sub-themes. These sub-themes then underwent coding and analysis to form distinct categories. Creswell (2021) emphasized the importance of coherence in writing, indicating that ideas should be interconnected and logically progress from one sentence to the next. This approach facilitated a seamless transition between paragraphs, potentially resulting in more accurate findings. Ultimately, the researcher synthesized the themes, present relevant quotes, and interpret the results derived from the two data sources. Additionally, the researcher sought to identify areas of convergence, divergence, contradictions, and relationships between the two data sources. Data triangulation was conducted by comparing the information gathered from questionnaires and interviews.

4. RESEARCH FINDINGS AND DISCUSSIONS

Introduction

This chapter outlines the findings and outcomes of the study in alignment with the research objectives. The results are derived from the responses collected through the questionnaires. The initial portions of the chapter detail the demographic information of the respondents, including their gender, age, highest educational level and work experience. In contrast, the later sections focus on the results obtained from the questionnaire, encompassing descriptive analysis.

Response Rate

In the course of data collection, research questionnaires were distributed to 115 employees in the study area. Of the questionnaires distributed, 93 were completed, yielding a validity rate of 80.9%. As stated by Pielsticker and Hiebl (2020), a response rate of 50% is deemed adequate, 60% is regarded as good, and a rate of 70% or higher is classified as very good. Further, as noted by Cerar, Nell, and Reiche (2021), a response rate exceeding 70% is deemed effective, indicating that the study population is sufficiently represented. This high response rate also gave examination accuracy. Consequently, the response rate achieved is considered both adequate and acceptable/ satisfactory for the purposes of this study for drawing conclusions.

Questionnaires	Frequency	Percentage	
Returned	93	80.9%	
Not returned	22	19.1	
Total	115	100.0	

Table 4.1: Response Rate

Validity of the Data Collection Instruments

Validity refers to how effectively a data collection tool measures what it is supposed to assess. It assesses if the results obtained from a test can be dependably used to draw relevant and useful conclusions (Asenahabi, 2022). The preliminary study was carried out to evaluate the face and content validity of the questionnaire. Asenahabi (2022) points out that validity serves as an indicator of how precise the measurement items are. To guarantee face validity, a group of experts reviewed the research tools to confirm that they sufficiently covered all targeted variables while incorporating their professional insights. This research included both construct and content validity. To ensure construct validity, the questionnaire was organized into sections that matched particular objectives and were closely tied to the sub-constructs outlined in the conceptual framework. To assess content validity, the tool will be shown to a conveniently chosen focus group of five specialists in project management and water projects relevant to the study's variables. Additionally, discussing the questionnaire with the supervisor will act as an initial validation check, with their input considered to enhance the content validity of the tool.

Meyers, Gamst, and Guarino (2022) highlight the importance of taking into account face, content, construct, and concurrent validity in research. It proceeds to assess the presentation of the questions in the survey based on their readability, practicality, formatting, reliability, ease of understanding, and clarity concerning the language employed to convey information to the respondent. Content validity pertains to evaluating a data collection tool for surveys to ensure it encompasses all essential items or questions needed for the research investigation. Consequently, it removes undesirable items or inquiries related to a particular construct domain. To enhance the content validity of the questionnaire, the following actions were taken: an analysis of the questions within the questionnaire and other related research studies was conducted, alongside a thorough review of various journals, relevant books, and models pertaining to this research topic. Moreover, advice was sought from skilled and informed individuals in the area of project quality management.

The information gathered from the pilot study was utilized to evaluate the construct validity of the data collection tool. The validity of the questionnaire content was ensured by consulting with experts in Project Quality Management regarding the relevance of the questions in relation to the constructs they aim to assess. The professionals included in this research were the Chief Executive Officer, Project Manager, and CEC Roads of the Elgeyo Marakwet County Government. The research also requested the perspective of Dr. Julius Miroga, who serves as study supervisor. The questionnaire was modified by changing questions and rewording statements based on expert opinions. To calculate the content validity index for the relevance and clarity of each item (I-CVIs), the count of judges rating the item as relevant or clear (ratings of 3 or 4) was divided by the total number of content experts. There were six experts in total. The table below displays the results regarding the content validity index. A minimum of six experts is required, with an acceptable CVI value being no less than 0.83.

					•			
Qns.	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Total experts Who Agree	I-CVI
Q1	0	1	1	1	1	1	5	0.833
Q2	1	1	1	1	0	0	4	0.667
Q3	1	1	1	1	1	0	5	0.833
Q4	1	0	1	1	1	0	4	0.667
Q5	0	1	1	1	1	1	5	0.833
Q6	1	0	1	1	1	0	4	0.667

Table 4.	2: Content	Validity	Index
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Q7	1	1	1	1	1	1	6	1.000
Q8	1	1	1	1	0	1	5	0.833
Q9	0	1	1	1	1	1	5	0.833
Q10	1	1	1	1	1	1	6	1.000
Q11	1	1	1	1	0	1	5	0.833
Q12	1	1	1	1	1	0	5	0.833
Q13	1	1	1	1	1	1	6	1.000
Q14	1	1	0	1	1	0	4	0.667
Q15	1	1	1	0	1	1	5	0.833
Q16	1	1	1	1	1	0	5	0.833
Q17	1	1	1	0	1	1	5	0.833
Q18	0	0	1	1	1	1	4	0.667
Q19	1	1	1	1	0	1	5	0.833
Q20	1	0	0	1	1	1	4	0.667
						Averag	e I-CVI	0.830

According to the calculation provided, it was determined that the I-CVI reached an acceptable level, and therefore the questionnaire's scale attained a satisfactory level of content validity. Construct validity was pursued to evaluate how effectively the indicators in the questionnaire represented the constructs (study variables). This was founded on the pilot data gathered. The evaluation of construct validity was conducted using the results from factor analysis. Construct validity is established when items intended to assess the same study construct (latent variable) are at least moderately inter-correlated (convergent validity). Additionally, a group of observed variables evaluating different constructs displays discriminant validity through low inter-correlations. Convergent validity is indicated when the average variances extracted (AVEs) for the constructs exceed 0.5, while discriminant validity (the degree to which measures of different traits or characteristics are unrelated) is confirmed if the squared multiple correlations are lower than the construct AVEs. The results in the table below indicate that all the AVEs for the constructs exceed 0.5, suggesting convergent validity, while the squared multiple correlations are lower than the construct validity of the study instrument. The findings indicate that the questionnaire achieved construct validity and was suitable for gathering data for the main study.

Respondents' Demographic Information

An extensive examination of the demographic characteristics of the respondents was conducted, including factors such as gender, age, educational background, and professional experience. The results are presented via graphical illustrations.

Distribution of Respondents by Gender

The research identified the gender of the participants. The findings are presented in Table 4.3.

Gender	Frequency	Percentage	
Male	40	43.0	
Female	53	57.0	
Total	93	100.0	

Fable 4.3: Distribution of	f the	Respondents	by	Gender
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The study sought to assess the gender distribution among the respondents involved in the research. The results revealed that 43% of the respondents were male, while majority of 57% were female. This demonstrates a fairly diverse gender composition among the participants. The slight variation in gender representation suggests that the study-maintained inclusivity and was mindful of the gender balance, aligning with the two-thirds gender principle stipulated in the Kenyan Constitution. This balanced participation also indicates that the data collected was likely to reflect views from both male and female perspectives, enhancing the objectivity and reliability of the findings.

Distribution of Respondents by Age

The research found differences in age among the individuals involved. The results are shown in the table below.

Age brackets	Frequency	Percent	
21-30 years	21	22.6	
31-40 years	50	53.8	
41-50 years	7	7.5	
51-60 years	15	16.1	
Total	93	100.0	

Table 4 4	Resn	ondents'	Aσe	Brackets
1 aute 4.4.	ncop	onucints	Age	DIACKEIS

The research focused on determining the age distribution of the respondents. The findings revealed that the majority of participants were aged between 31 and 40 years, accounting for 53.8% of the total sample. This was followed by respondents aged 51 to 60 years, who made up 16.1%. Those in the 21 to 30 years age bracket comprised 22.6%, while the smallest group was those aged 41 to 50 years, at 7.5% of the total respondents. It is acknowledged that individuals across different age groups may offer diverse viewpoints shaped by their life stage and professional experience. The inclusion of respondents from all age categories implies that the study captured a broad spectrum of insights, enhancing the representativeness and objectivity of the findings. The age variation among respondents thus strengthens the validity of the study by ensuring a balanced demographic perspective.

Distribution of Respondents by Level of Education

The research identified the number of respondents based on their educational attainment. Participants were requested to indicate their highest level of education, and the findings are illustrated in Table 4.5.

Educational	Frequency	Percentage	
Diploma	22	23.7	
Bachelor's Degree	45	48.3	
Master's Degree	26	28.0	
Total	93	100.0	

Table 4.5: Highest Educational of the Respondents

The research results concerning the educational qualifications of the respondents indicated that a significant majority, precisely 48.3%, held bachelor's degrees. Additionally, 28.0% of the respondents had attained master's degrees, while 23.7% possessed diplomas from tertiary institutions. These findings suggest that the respondents were generally well-educated, which likely enhanced their understanding of the subject matter addressed in the questionnaire. Such a high level of educational attainment among participants increases the credibility and reliability of the data collected, as it implies informed responses rooted in relevant knowledge and experience.

Distribution of Respondents by Length of Service

The research assessed the duration of time that the participants had been employed in their present office.

Working Experience	Frequency	Percentage	
1-3 years	29	31.2	
4-6 years	49	52.7	
Over 7 years	15	16.1	
Total	93	100.0	

The objective of the study was to assess the working experience of participants involved in road construction projects. The research findings revealed that the majority of respondents, accounting for 52.7%, had been working for a period ranging from 4 to 6 years. Additionally, 31.2% of the respondents indicated that they had between 1 to 3 years of work experience, while 16.1% had served for over 7 years. This data implies that a large portion of the respondents had substantial experience in the field, thus enhancing the credibility and reliability of the information provided. The results suggest that the participants were well-positioned to provide informed responses regarding quality management practices and project performance.

Deceptive Analysis

In this section, an examination and discussion of the study variables, including both independent and dependent elements, were carried out. A Likert scale was used to assess the responses received, with a score of 5 indicating strong agreement, 4 representing agreement, 3 showing neutrality, 2 denoting disagreement, and 1 indicating strong disagreement.

Quality Auditing and Performance of Road Construction Projects

The first objective of the study sought to examine the effect of quality auditing on the performance of road construction projects in Elgeyo Marakwet County, Kenya.

Statements	Mean	Std. Dev .707	
Quality auditing ensures adherence to project standards and specifications.	4.00		
Quality auditing helps identify and rectify defects early in the project.	3.99	.715	
Quality auditing improves overall project quality and reduces rework.	4.16	.811	
Quality auditing contributes to timely project completion.	4.16	.680	
Quality auditing enhances project efficiency and cost-effectiveness.	3.88	.806	
Aggregate Mean and Std. Dev	4.04	.744	

Table 4.7: Descriptive Statistics for Quality Auditing

The findings of the study revealed that respondents generally agreed with statements regarding the positive influence of quality auditing on project performance. Respondents reported that quality auditing ensures adherence to project standards and specifications (M = 4.00, SD = .707). It was also agreed that quality auditing helps identify and rectify defects early in the project life cycle (M = 3.99, SD = .715). Further, the findings indicated that quality auditing improves overall project quality and reduces rework (M = 4.16, SD = .811), and that it contributes to timely project completion (M = 4.16, SD = .680). Additionally, the respondents agreed that quality auditing enhances project efficiency and cost-effectiveness (M = 3.88, SD = .806). Interview data supported these findings. One respondent stated, Quality auditing helps identify and aspect deficiencies in road projects, leading to improved construction quality and project performance, while another noted, Quality auditing ensures road projects adhere to established standards and guidelines. The observation guide further validated this, revealing that audits are conducted as scheduled, auditors are well-qualified, and corrective actions are timely. Audit reports are also shared with stakeholders, reinforcing transparency and responsiveness.

Overall, the responses yielded a composite mean of 4.04 and a standard deviation of .744, which suggests that the respondents agreed that quality auditing significantly contributes to the performance of road construction projects in the county, with relatively low variation in responses. The findings indicated that quality auditing processes in infrastructure projects play a critical role in assuring compliance, controlling quality risks, and promoting efficiency. Early defect detection and correction through quality auditing not only saves costs but also improves timely delivery and customer satisfaction. Therefore, integrating robust quality auditing practices in road construction is vital to achieving sustainable project outcomes in Elgeyo Marakwet County.

Regression Analysis

Regression analysis is a statistical technique employed to comprehend the connection between variables. The aim of regression analysis is to identify the optimal linear combination of independent variables that can forecast the dependent variable. The regression analysis encompasses model fit evaluation, variance analysis, and coefficient regression. The findings of the model's adequacy are shown in Table 4.8.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.683ª	.466	.441	.61570

Table 4.8: Model Fitness

a. Predictors: (Constant), Continuous improvement, Quality training, Inspection, Quality auditing

The study results in Table 4.8 show that the R Square value is 0.466, indicating that approximately 46.6% of the variance in the dependent variable, which is the performance of road construction projects, can be explained by the selected quality management practices—quality auditing, quality training, inspection, and continuous improvement.

This moderately high R Square value suggests that the regression model including these predictors has a reasonable explanatory power and captures a substantial portion of the variation in project performance within the sampled road construction projects in Elgeyo Marakwet County. While the model does not account for all influencing factors, it reflects the importance of quality-focused practices in shaping construction project outcomes. Furthermore, the Adjusted R Square value is 0.441, which adjusts for the number of predictors in the model and still indicates that 44.1% of the variance is reliably explained by the independent variables. The Standard Error of the Estimate (0.61570) indicates the average deviation of the observed values from the predicted values, implying the model has a moderate level of prediction accuracy. The analysis of variance results in the analysis are presented in Table 4.9.

Model		Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	28.431	4	7.108	18.750	.000 ^b	
	Residual	32.602	86	.379			
	Total	61.033	90				

Table 4.9: Analysis of Variance (ANOVA)

a. Dependent Variable: Performance

b. Predictors: (Constant), Continuous improvement, Quality training, Inspection, Quality auditing

The study results presented in Table 4.9 show that the p-value associated with the Analysis of Variance (ANOVA) for the regression model is 0.000. This p-value is less than the conventional significance threshold of 0.05, indicating that the overall regression model is statistically significant. In essence, this result means that the combination of the predictor variables—continuous improvement, quality training, inspection, and quality auditing—significantly explains the variation in the dependent variable, which is the performance of road construction projects in Elgeyo Marakwet County, Kenya. The F-statistic value of 18.750 further confirms that the regression model provides a better fit to the data than a model without any predictors. This implies that the selected quality management practices meaningfully contribute to predicting and understanding the performance of the projects. Therefore, the regression model is a good fit for the data and can be reliably used for making inferences regarding the influence of quality practices on project performance. The regression of coefficient results is presented in Table.

5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter offers the presentation of the outcomes derived from chapter four, forming the basis for the conclusions and recommendations. Furthermore, it will delve into several research concepts to provide in-depth insights related to this chapter.

Summary of Findings

The first objective was to examine the effect of quality auditing on the performance of road construction projects in Elgeyo Marakwet County, Kenya. The Pearson correlation results indicated a positive and significant relationship between quality auditing and project performance (r = 0.281, p = 0.006). This suggests that effective quality auditing practices significantly enhance project performance outcomes. The regression analysis revealed that a unit increase in quality auditing would result in a significant increase in project performance, with a regression coefficient of $\beta = 0.860$ (p = 0.000). This indicates that quality auditing is a critical factor in ensuring compliance and maintaining standards in construction activities.

Conclusion

The study concluded that quality auditing, quality training, regular inspection, and continuous improvement significantly influence the performance of road construction projects in Elgeyo Marakwet County, Kenya. Quality auditing was found to play a crucial role in enhancing project performance by ensuring compliance with set standards and specifications, enabling early defect detection, improving overall project quality, minimizing rework, and promoting timely completion. These findings affirm that structured auditing processes are essential in assuring efficiency, reducing risks, and delivering sustainable road infrastructure outcomes.

Recommendations

Construction companies and project implementers should institutionalize structured quality auditing processes throughout the project lifecycle. This includes routine auditing checkpoints, adherence to predefined quality standards, and integration of digital audit tools for real-time monitoring. Training internal auditors and involving third-party audit bodies can enhance objectivity and help detect defects early, thereby minimizing rework, reducing project risks, and promoting timely project completion.

Suggestions for Further Studies

The study suggests that further research to be conducted on influence of total quality management practices on the management and sustainability of construction projects in Kenya. Additionally, further studies should be carried out to determine the determinants of project performance of construction projects in Kenya.

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