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PROJECT QUALITY MANAGEMENT PRACTICES AND PERFORMANCE OF AFFORDABLE HOUSING PROJECTS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

Project quality management practices play a pivotal role in the successful execution and completion of construction projects. Despite the efforts to implement project quality management practices in building construction projects in Kenya, there remains a notable disparity between planned quality and actual outcomes. The general objective of the study was to determine the effect between project quality management practices and the performance of affordable housing projects in Nairobi City County, Kenya. The specific objectives were to examine effect of quality planning and control and improvement on the performance of affordable housing projects in Nairobi City County. The study was guided by Juran trilogy theory and Crosby theory of quality management. The study used a descriptive survey. The unit of analysis was six affordable housing projects in Nairobi City County. The unit of observation was 6 project managers, 60 contractor representatives, and 54 project consultants. The study used a census hence the sample included 120 respondents. Questionnaires was used to collect data. A pilot was conducted with 10% of the sample hence 12 respondents took part in the pilot. The study used content and construct validity. Reliability was tested using Cronbach's Alpha Coefficient. The study used SPSS version 28. Findings were presented in tables. The content of the questionnaire was approved by supervisor and project management professionals in the affordable housing sector. Construct validity results show that all variables had AVE above 0.5. Reliability shows that all variables scored Cronbach alpha values of above 0,7 an indication that they were all reliable. Among the variables, quality control had the strongest impact ($\beta = 0.354$, $p = 0.001$), followed by quality planning ($\beta = 0.301$, $p = 0.002$). These findings confirm that projects prioritizing structured planning, strict quality control, strategies achieve better performance in terms of budget adherence, timely completion, and compliance with quality standards. The study concludes that strengthening material supply chains, enhancing risk management in quality assurance, improving defect resolution in quality control, and technology adoption and promoting knowledge-sharing in quality improvement will significantly enhance the performance of affordable housing projects. It recommends the adoption of digital monitoring tools, stricter enforcement of compliance measures, and continuous learning programs to optimize project execution. Since 23.6% of project performance remains unexplained, further research should explore the influence of financial management practices, policy frameworks, and emerging technologies on affordable housing project success.

Key Words: Project Quality Management Practices, Quality Control, Quality Planning, Performance, Affordable Housing Projects

Background of the Study

Project quality management practices play a pivotal role in the successful execution and completion of construction projects. Project quality management (PQM) is a systematic approach that ensures all project activities—from designing, planning, and implementation—are carried out efficiently and effectively to meet project objectives and performance expectations. The fundamental principle of PQM is to ensure that a project meets or exceeds stakeholder needs, regulatory requirements, and industry best practices (Chan & Tam, 2020). Quality management follows a repetitive cycle of measuring quality, updating processes, and reassessing outcomes until the desired quality is achieved. It comprises key components like quality planning and quality control all of which are essential for optimizing project performance (Ganaway, 2021).

The success of a construction project is typically evaluated based on project performance metrics. Performance measurement is a widely accepted method used to quantify and report information related to project efficiency, cost-effectiveness, and quality compliance. The three core indicators of project performance are time, cost, and quality, which determine whether a project has been delivered as planned (Jogdand & Deshmukh, 2024). Aziz and Abdel-Hakam (2024) further assert that a project's success is measured by its ability to meet design specifications, adhere to the allocated budget, and be completed within the scheduled timeframe. Moreover, Nesto (2021) highlights that stakeholder satisfaction is a critical determinant of project performance, emphasizing that cost savings and timely delivery are insufficient unless end-users' expectations are met. In the construction industry, meeting performance standards also requires compliance with national and county-level building regulations, adherence to safety measures, and sustainable project execution.

The importance of project quality management in construction has been widely emphasized in academic research (Abdul-Rahman & Wang, 2024; Loosemore, 2024). According to Abdul-Rahman and Wang (2024), effective PQM practices help minimize defects, improve stakeholder communication, and enhance compliance with legal and technical standards. These principles are particularly crucial in affordable housing projects, where balancing cost efficiency with high-quality standards is a challenge. In Nairobi City County, the demand for affordable housing has surged due to rapid urbanization and population growth, placing immense pressure on housing infrastructure (KNBS, 2023). While the Affordable Housing Program (AHP) was launched in 2017 with a target of delivering 500,000 housing units by 2022, progress has been hindered by poor quality management, budget overruns, and project delays (State Department for Housing, 2023). This underscores the need for a robust quality management framework to ensure affordable housing projects are delivered on time, within budget, and meet sustainable construction standards.

Despite its significance, quality management in Kenya's construction sector remains inconsistent, leading to frequent project failures (Transparency International, 2022). Studies indicate that over 50% of construction projects in Kenya face challenges related to poor workmanship, non-compliance with building codes, and inadequate project supervision (Unegbu et al., 2022). Additionally, corruption, weak regulatory enforcement, and limited expertise in quality assurance further compromise project success (Reinaldo & Neto, 2021). The situation is more critical in affordable housing projects, where cost-cutting measures often result in the use of substandard materials, rushed construction, and inadequate safety provisions (Khatib et al., 2023). Addressing these challenges requires a structured approach to project quality management, including the adoption of ISO 9001 standards, Building Information Modeling (BIM), and real-time project performance monitoring systems (Jamaluddin, 2023). These innovations can enhance project transparency, streamline construction processes, and ensure quality compliance across all stages of project execution.

While existing studies have extensively explored quality management practices in large-scale infrastructure and commercial real estate projects, limited research has specifically examined the role of quality management in affordable housing projects in Kenya (Kravets et al., 2022). Most studies have focused on cost overruns, delays, and contractor inefficiencies, leaving a knowledge gap regarding the direct impact of quality management processes on affordable housing project outcomes. Given the Kenyan government's commitment to providing sustainable and cost-effective housing solutions under Vision 2030, it is essential to evaluate how project quality management influences the efficiency, durability, and long-term sustainability of affordable housing projects. This study, therefore, sought to fill this research gap by assessing the effectiveness of quality planning, quality control, and assurance mechanisms in Nairobi's affordable housing initiatives.

Statement of Problem

The construction industry is a critical driver of Kenya's economic growth, contributing approximately 10% of the Gross Domestic Product (GDP) in 2021 (KNBS, 2021). The real estate sector, a key sub-sector, has experienced rapid expansion due to rising demand for housing, estimated at 200,000 units annually against a supply of approximately 50,000–70,000 units (World Bank, 2023). Nairobi, the most urbanized region in Kenya, had a population of 4.39 million in 2021, projected to reach 7.03 million by 2030 (KNBS, 2021). In response to this housing deficit, the Government of Kenya launched the Affordable Housing Program (AHP) in 2017 with a target of delivering 500,000 housing units by 2022, (State Department for Housing, 2023). However, as of October 2024, only approximately 124,000 units have been completed, including 50,000 units developed through partnerships with private investors, (Capital FM, 2024). This completion rate indicates a significant shortfall, highlighting the ongoing challenge of addressing Kenya's housing deficit.

Despite the ambitious affordable housing initiative, many of these projects face significant quality management challenges, affecting their successful completion and long-term sustainability (Momanyi & Sang, 2021). Reports indicate that 48% of infrastructure projects in Kenya exceed their budgets, 87% experience time overruns, and only 13% are completed on schedule (Deloitte, 2022). The National Construction Authority (NCA) found that 50% of developments in Kenya are undertaken by unqualified personnel, significantly affecting project performance (NCA, 2023). Moreover, over 60% of beneficiaries in affordable housing projects, such as Kibera Soweto East, expressed dissatisfaction, with 35% stating that projects failed to meet their intended objectives (Kipkoech & Gachengo, 2023). These failures are attributed to unqualified contractors, poor workmanship, lack of adherence to specifications, inadequate quality control measures, and the use of substandard materials (Irungu, Diang'a, & Gwaya, 2023).

Weak regulatory oversight and corruption further exacerbate the problem. Transparency International (2020) reported that collusion between contractors, suppliers, and inspectors has compromised project quality, leading to safety risks and financial losses. In Nairobi County, only 15 inspectorate officers supervise over 600 construction sites, highlighting severe enforcement gaps (Omulo, 2022). Moreover, Kenya lacks a comprehensive policy framework defining affordable housing quality standards, resulting in inconsistencies in project execution (Osman & Muchelule, 2024). The consequences of poor-quality management are significant: for the government, substandard projects lead to wastage of public funds and hinder the achievement of Vision 2030's housing objectives; for contractors and developers, poor quality construction results in legal liabilities, reputational damage, and costly rework; and for end-users, these deficiencies translate to safety hazards, high maintenance costs, and compromised living standards (Ronoh & Kirui, 2020).

Most studies on quality management in Kenya's construction sector focus on general infrastructure projects rather than affordable housing projects. For example, research by

Boventura and Kisimbii (2022) confirmed that quality management enhances project performance in Mombasa's commercial buildings, while Nderitu and Nyaegah (2022) analyzed county government projects. Maingi and Marsh (2022) examined quality management in dam projects. However, there is limited research specifically examining how quality management practices influence the performance of affordable housing projects in Nairobi City County, Kenya. While studies have linked project quality management to overall construction success, few have explored how specific quality management components (planning, control, assurance, and improvement) affect project performance in affordable housing projects.

Most research focuses on cost overruns and time delays, rather than the impact of quality management systems on housing durability, compliance with regulations, and beneficiary satisfaction. Previous research methodologies vary widely. Some studies use qualitative approaches (e.g., Nora, 2023) that rely on expert opinions rather than quantifiable project performance metrics. Others, such as Salvi and Kerkar (2022), rely on secondary data sources, limiting their ability to verify accuracy. Furthermore, studies like Priyadharsan and Raja (2022) use interview schedules, which may not capture statistically significant relationships between quality management practices and project outcomes. This study filled this gap by employing a quantitative approach, using structured questionnaires and statistical analysis to establish the impact of quality management practices on affordable housing project performance.

This study aimed to bridge these contextual, conceptual, and methodological gaps by examining the effect of quality management practices (planning, control) on the performance of affordable housing projects in Nairobi City County, Kenya. Understanding these dynamics is critical for enhancing project outcomes, ensuring value for money, and achieving sustainable housing solutions in line with Kenya's developmental agenda and Vision 2030.

Research Objectives

General Objective

The general objective of the study was to determine the effect of project quality management practices and the performance of affordable housing projects in Nairobi City County.

Specific Objectives

The study was guided by the following objectives;

i. To determine the effect of quality planning on the performance of affordable housing projects in Nairobi City County, Kenya.
ii. To establish the effect of quality control on the performance of affordable housing projects in Nairobi City County, Kenya.

LITERATURE REVIEW

Theoretical Framework

Juran Trilogy Theory

The proponent of this theory was Juran (1986). This theory describes quality as fitness for purpose or use. According to Juran et al. (1974), as cited by Jepkoech (2015), the theory is anchored upon three processes of quality planning, quality control, and quality improvement which have been christened the Juran trilogy. According to Juran (1986) quality trilogy, planning involves all stakeholders concerned with the products or services in the firm including their contribution regarding the desired specifications during the process. The project being pursued must be defined first followed by the establishment of the target customers and their requirements. These requirements are thereafter mapped out to fit the firm's product specifications and put in place the requisite production plan to attain TQM implementation.

Masters (1996) posits that causes of failure of quality planning include inadequate commitment by the firm's leadership, inappropriate planning, and insufficient continuous training for proficiency acquisition. There, the construction firms should work to eliminate the challenges.

According to Juran trilogy theory (1986), the control element of quality management is concerned with operational procedures that are efficient and effective in meeting product design objectives to enhance performance and meet delivery targets. In a nutshell, it is about the implementation of plans put in place. To achieve quality control strategies in a firm, there must be a clear definition of quality, establishment of targets and outcomes to be achieved, and determining evaluation criteria to compare and contrast performance levels. This theory underpins the variable of continuous improvement for the successful implementation of TQM. Juran's theory application in projects has three main basic steps towards continuous improvement according to Goetsch & Davis (2015), namely: to achieve structured improvement continuously via dedication and a sense of urgency in a project, establishing an extensive quality management-based training programs, and to establish commitment and leadership.

Crosby Theory

This theory was advanced by Crosby (1987). Crosby defines quality as the conformity to specifications or requirements set by project managers, this is the notion behind Crosby's concepts like zero defects, getting it right the first time, and conformance to requirements. The Crosby theory of quality management involves various elements that expound on the journey of project quality improvement. The prevention process is an element in the Crosby Theory that acts as a control proactive style of ensuring continuous improvement. Quality vaccine is an element of the Crosby theory that is anchored on three main components: Determination of the standards requirement of the project; Education via the Six 'C' as explained by (Laxmi, 2024) which include, comprehension, commitment, competence, communication, correction, and continuance; and implementation of the remedies that ensures prevention of defects.

Quality vaccine enables to access the preventive mechanisms that can be applied in the adoption of quality management in the project. Crosby's quality management maturity grid is designed to assist project managers in understanding the standpoint of the organization's quality development and realizing the need gap of a logical quality management execution. The grid involves five stages namely; uncertainty, awakening, enlightenment, wisdom, and certainty. It also entails six categories as per Crosby (1979) namely management understanding and attitude, quality organization status, problem handling, cost of quality, quality improvement actions, and summation of the organization project quality posture. This theory is used to explain the effect of quality planning and control on the performance of construction projects.

Conceptual Framework

A conceptual framework is a representation that shows how the variables in a study relate to each other. The framework helps the reader see at a glance the proposed relationships between the variables in the study graphically or diagrammatically (Alan, 2021). Figure 2.1, shows the conceptual framework. The independent variables are quality planning, quality assurance, quality control, and quality improvement while the dependent variable is the performance of construction projects.

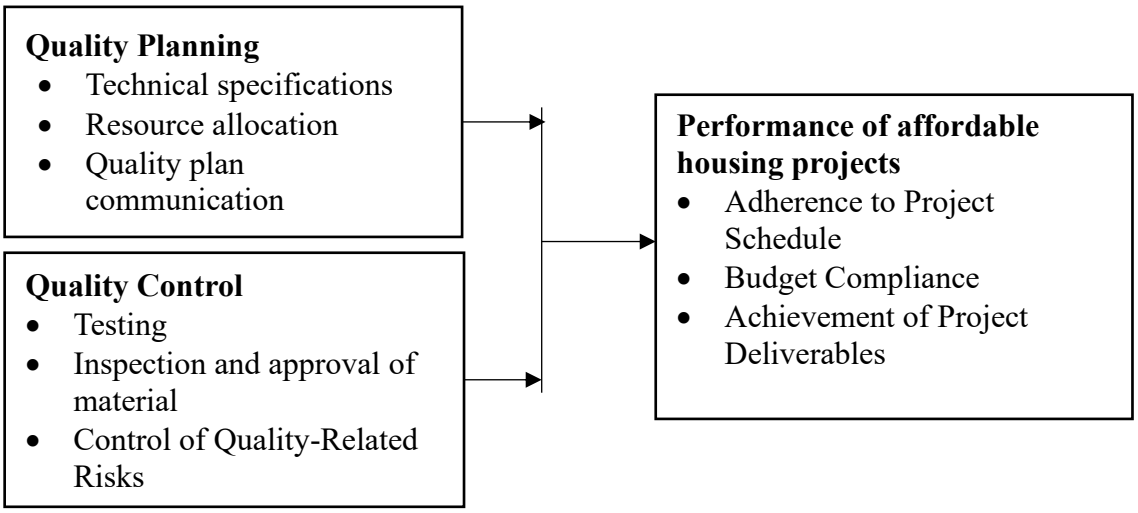

Figure 2.1: Conceptual Framework

Quality Planning

Quality planning involves identifying which quality standards are relevant to the project and determining how to satisfy them. It is one of the key facilitating processes during project planning and should be performed regularly and in parallel with the other project planning processes. Prior to development of the ISO 9000 Series, quality planning activities were widely discussed as part of quality management (Chauhan & Subedi, 2023). Quality planning has always been successful in showing the best project results. It determines how a project should be measured and what steps should be taken to boost any organization. Project quality management is most important in establishing the standards so that customers remain satisfied with work delivered (Mizuno, 2020).

A project manager in quality planning plays a key role as they are liable for arranging top-class deliverables and run the project. The entire project management is a circle involving everyone. From the benchmarks to all the stakeholders, everyone is answerable for assuring the quality of a project (Hellingsworth et al., 2020). Changes in quality planning affect cost and project delivery timelines. Project quality planning helps develop a guideline for the project with sufficient detail to inform the project team about the necessary work packages that have to be executed and when the work has to be done. A program plan also helps to keep track of the overall progress of the project and maintaining the record of the project for future use. Project planning also ensures that the stakeholders involved understand all the activities and aspects of the project with sufficient details, along with the time, quality, and cost constraints (Tague, 2023).

Quality Control

Quality control is the process of inspecting the completed facilities to ensure that it is done on a regular basis they satisfy contract's specifications. Quality control is viewed as the client's responsibility, as he or she determines the project's standards and desires. Quality control is an aspect of quality management that assures that products and services fulfill requirements (Jain, 2021). The Project Management Body of Knowledge (PMBOK) refers to quality control as the technical aspect of quality management. Project team members who have specific technical expertise on the various aspects of the project play an active role in quality control. They set up the technical processes and procedures that ensure that each step of the project provides a quality output from design and development through implementation and maintenance. Each

step's output must conform to the overall quality standards and quality plans, thus ensuring that quality is achieved (PMI, 2024).

Quality control is essential to the success of any project, and it should be followed from start to finish, from design to construction and installation. Supervision during the construction process leads to saving of funds in the long term by avoiding costly repairs once the project is completed. Inspectors, engineers, contractors, funding agencies, permission agencies, and employee (Sahil & Samiksha, 2020). According to Zenebe (2021), quality control involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results. It should be performed throughout the project. Project results include both product results such as deliverables and management results such as cost and schedule performance.

Empirical Review

Quality Planning and Project Performance

Ifran and Khan (2021) assessed the role of project planning on project success in the public sector. The study adopted a survey research design. The sample was 260 project engineers. Data was collected using questionnaires. Findings showed that planning has a significant positive impact on the success of public sector projects. Baleni and Gande (2023) assessed the effect of project planning and scheduling on projects' success in Botswana. The sample was 72 employees of the mining company. Data was collected using questionnaires utilizing Google forms. Findings showed that project-scheduling techniques are not significant predictors of project success of capital projects at the mining company. The study concluded that project planning best practices have benefited capital projects at the mining company, although with a moderately high success rate.

Kaluai (2020) studied effect of project planning on performance of women and girls economic empowerment programs in Kiambu and Nairobi City Counties, Kenya. The study a descriptive research design. Questionnaires were used to collect data. Findings revealed that effective planning and designing of the project enhances project performance. Effective project monitoring plans, tools, and processes were statistically significant in explaining project performance changes. Kinyumu and Mungai (2022) examined effect of project quality on performance of Bank financed housing programs in Nairobi Metropolitan Area. The study employed a descriptive research design. The target population was 91 housing project team members (project managers, project engineers, quantity surveyor, architect, electrical engineer, structural engineer, and procurement officers) from 13 Bank financed housing projects in Nairobi Metropolitan Area. Data was collected using questionnaires. The study concluded that quality planning has a positive and significant effect on performance of Bank financed housing programs in Nairobi Metropolitan Area. The study revealed that scope baseline, work breakdown structure and cost baseline influence performance of Bank financed housing programs in Nairobi Metropolitan Area.

Mithika and Moronge (2024) examined effect of quality management on performance of water and sanitation construction projects in Nairobi, Kenya. The study adopted a descriptive design. The study targeted 105 projects in Nairobi County. Primary data was collected using questionnaires. Findings showed that project quality planning and project funding were important factors that needed to be enhanced to boost effective quality management of water and sanitation infrastructure projects. Ronoh and Kirui (2020) investigated the influence of resource scheduling on the performance of residential construction projects in Nairobi City County, Kenya. The target was 79 gated community residential construction projects. Data was collected using questionnaires. The study found a significant relationship between resource scheduling and project performance. The study concluded that the proper allocation of project equipment facilitates smooth operations and successful project completion.

Quality Control and Project Performance

Priyadharsan and Raja (2020) studied effect of quality control and management on construction projects. Primary data was collected using interview schedules. Findings showed that quality control is a simple technique of TQM and is very effective in construction industry. Quality control helps to prevent the safety accidents that may occur during project implementation. Muhammad and Harkamal (2023) analyzed influence of quality control on building projects by using the RII method of analyses so as to know the relative importance of different factors critical to quality in construction. A questionnaire was used to collect data from 153 respondents. Findings showed that quality control is essential to the success of any project, and it should be followed from start to finish, from design to construction and installation. Supervision during the construction process leads to saving of funds in the long term by avoiding costly repairs once the project is completed. Inspectors, engineers, contractors, funding agencies, permission agencies, and employees should carry out the inspection of all relevant papers and give positive advice on faults.

Hagan (2020) studied effects of quality control measures on construction project schedules. Data was collected from different construction sites in Ghana. This study showed that most workers are not aware of quality control measures before the commence of construction project. This makes it difficult and tedious for project team members, management and stakeholders to implementation quality control measures in their various construction sites. This research also revealed that quality control has a contributing effect factor of less than or at most 10% of the total delay in construction project schedule. In the cause of identifying an issue from the implementation of the quality control measures, team members on the other hand do not report to the quality control team who are expert in dealing with the quality control measures. Moreover, workers are not knowledgeable about the effect of environmental control on the success of construction project

Nderitu and Nyaegah (2020) sought to establish determinants for adoption of quality management system on projects implementation in the County Governments in Kenya. The study adopted a survey research design. The sample comprised of 104 respondents selected through purposive sampling techniques. Data was collected using questionnaires. Findings revealed that the cost of project increased than budgeted. The project quality was poor due to poor monitoring and evaluation practices. Otaalo and Asinza (2020) investigated the effect of risk management practices on road construction project performance in Kenya. The study adopted a descriptive survey design. The target population was 554,622 and simple random sampling was used to select respondents. The study questionnaires and observation schedules. Findings revealed that the project team is involved during the risk analysis. Through the various techniques in risk analysis, the project team is aware of the entire risk management process of the project.

RESEARCH METHODOLOGY

The study used a descriptive survey. Descriptive survey design enables the researcher to summarize and organize data effectively. The target population was affordable housing programs in Nairobi City County. According to the State Department for Housing, Urban Development, and Public works (2023) the complete affordable housing projects in Nairobi County are 6. The affordable houses were the unit of analysis. The unit of observation was the project managers, site managers, and the project team members. The study used census since the target population for the project staff is accessible and easily manageable. This sample size is acceptable as noted by Cooper and Schindler (2023) that when the target population does not exceed 200, census is the most suitable. The study sample size was all the 120 project staff.

This research used questionnaires to collect primary data. A pilot study was conducted to measure questionnaire's validity and reliability. Copper and Schindler (2022) asserted that 5-

10% of the sample is adequate for sampling. In this study, the sample for piloting was 12 project staff representing 10% of the sample. Data was analyzed using SPSS Version 28. The study statistics included descriptive and inferential statistics. The descriptive statistics comprised of percentages, means and standard deviations. Inferential statistics included correlation and regression. Data was presented in tables, graphs and charts.

RESEARCH FINDINGS AND DISCUSSION

The study targeted 108 respondents after the pilot test phase, and 96 completed questionnaires were returned, yielding a response rate of 88.9%. According to Mugenda and Mugenda (2003), a response rate above 70% is considered adequate for social science research, while Babbie (2020) suggests that a response rate of above 50% is acceptable for survey studies.

Descriptive Analysis of Study Variables

This section presents the descriptive analysis of the study variables: Quality Planning, Quality Control and Project Performance. Descriptive statistics, including mean (M) and standard deviation (SD), are used to summarize respondents' perceptions of each variable. The mean score indicates the central tendency of responses, while the standard deviation reflects variability in responses. The Likert scale used was: 1 – Strongly Disagree, 2 – Disagree, 3 – Not Sure, 4 – Agree, 5 – Strongly Agree. The results provide insights into the extent to which quality management practices are implemented and their influence on project performance. The findings are discussed in the following subsections.

Quality Planning

The first objective was to determine the effect of quality planning on the performance of affordable housing projects in Nairobi City County, Kenya. The study therefore examined the extent to which quality planning is conducted in affordable housing projects. Table 1 presents the descriptive statistics for quality planning indicators.

Table 1: Descriptive Statistics for Quality Planning

No.	Quality Planning Statements	M	SD
i.	Quality plans are developed and finalized before the commencement of housing programs.	4.219	0.785
ii.	The quality plan is effectively communicated to all project team members.	4.073	0.826
iii.	Roles and responsibilities are assigned to project team members in an appropriate manner.	3.917	0.906
iv.	Project team members have a clear understanding of their roles and responsibilities.	3.885	0.950
v.	Management ensures the timely availability of materials for all housing programs.	3.583	1.017
vi.	Project managers establish and enforce clear quality standards.	4.052	0.874
vii.	Housing projects have a clear and detailed description outlining all necessary tasks	4.135	0.799
	Aggregate Score	**3.978**	**0.880**

The findings indicate that the development of quality plans before the commencement of housing programs had the highest agreement (M = 4.219, SD = 0.785), suggesting that most projects ensure that quality planning is in place before execution. The existence of a clear and detailed description of what needs to be done in housing projects (M = 4.135, SD = 0.799) was also rated highly, indicating that projects establish specific implementation guidelines. The effective communication of quality plans to all project team members (M = 4.073, SD = 0.826) and the setting of project quality standards by managers (M = 4.052, SD = 0.874) were also rated favorably, demonstrating that project teams recognize the importance of structured

quality expectations. Roles and responsibilities being assigned appropriately (M = 3.917, SD = 0.906) and clarity of roles for project team members (M = 3.885, SD = 0.950) were rated moderately, indicating some gaps in team organization. The timely availability of materials on all housing programs (M = 3.583, SD = 1.017) had the lowest score, suggesting that material shortages remain a concern for project implementation.

With an aggregate mean score of 3.978 (SD = 0.880), the results suggest that quality planning is well-integrated into project execution but faces challenges in material availability and role clarity. This aligns with Ifran and Khan (2021), who found that effective project planning significantly improves project success in public sector projects. Similarly, Kinyumu and Mungai (2022) emphasized that scope baseline, work breakdown structures, and cost baselines enhance performance in housing programs. However, Baleni and Gande (2023) found that project scheduling techniques were not always significant predictors of success, particularly in capital-intensive projects, suggesting that while planning is crucial, execution strategies must also be emphasized.

Quality Control

The second objective of the study was to establish the effect of quality control on the performance of affordable housing projects in Nairobi City County, Kenya. This section assesses the extent to which quality control measures are enforced. Table 2 presents the results.

Table 2: Descriptive Statistics for Quality Control

No.	Quality Control Statements	M	SD
i.	The quality of project materials and equipment is regularly tested to ensure compliance with standards	4.250	0.688
ii.	Project materials undergo continuous inspection and approval before use.	4.083	0.749
iii.	Established procedures are in place to compare project deliverables with the project plan	3.990	0.822
iv.	Site meetings and inspections are regularly conducted to monitor the quality of work.	4.073	0.785
v.	Corrective actions are implemented in a timely manner to address project issues	3.875	0.923
vi.	Potential project risks are proactively identified and controlled in a timely manner	3.708	1.016
vii.	Complaints related to the project are addressed promptly and resolved efficiently.	3.667	0.975
	Aggregate Score	**3.949**	**0.851**

The study found that frequent testing of project materials and equipment had the highest rating (M = 4.250, SD = 0.688), suggesting that material testing is a key aspect of quality control in affordable housing projects. Continuous inspection and approval of project materials (M = 4.083, SD = 0.749) and regular site meetings and inspections to monitor quality of work (M = 4.073, SD = 0.785) were also rated highly, indicating strong quality enforcement practices. Having set procedures to compare project deliverables with the project plan (M = 3.990, SD = 0.822) and ensuring timely corrective actions on issues (M = 3.875, SD = 0.923) were moderately rated, suggesting that while corrective measures are in place, their effectiveness may vary. Anticipated risks being identified and controlled on time (M = 3.708, SD = 1.016) and prompt rectification of complaints (M = 3.667, SD = 0.975) had the lowest ratings, indicating gaps in risk mitigation and defect resolution.

The aggregate mean score for Quality Control was 3.949 (SD = 0.851), indicating effective implementation but gaps in defect rectification and control of quality-related risks. These

results align with Priyadharsan and Raja (2020), who found that quality control, particularly through inspections and material testing, prevents project failures and enhances safety. Muhammad and Harkamal (2023) also emphasized that supervision and corrective actions reduce long-term project costs, reinforcing the importance of proactive quality control measures. However, Hagan (2020) noted that many construction workers are unaware of quality control measures, leading to implementation challenges, which may explain the relatively lower scores for complaint handling and control of quality-related risks in this study.

Project Performance

The general objective of the study was to determine the effect of project quality management practices and the performance of affordable housing projects in Nairobi City County. This section therefore presents the descriptive analysis of project performance, which is the dependent variable in the study. The Table 3 below presents the summary statistics for project performance.

Table 3: Descriptive Statistics for Project Performance

No.	Project Performance Statements	M	SD
i.	Projects are implemented within the set budget.	4.073	0.818
ii.	Projects are delivered within the project scope.	4.010	0.882
iii.	Projects meet time objectives.	3.979	0.902
iv.	Project developers are satisfied with project outcomes.	3.875	0.947
	Aggregate Score	**3.984**	**0.887**

The findings indicate that projects being implemented within the set budget had the highest rating (M = 4.073, SD = 0.818), suggesting that financial management practices are largely effective in ensuring cost control. Meeting project scope objectives (M = 4.010, SD = 0.882) and achieving time objectives (M = 3.979, SD = 0.902) were also rated favorably, indicating that projects generally adhere to scope and timelines, though some delays may still occur. The lowest-rated indicator was stakeholder satisfaction with project outcomes (M = 3.875, SD = 0.947), suggesting that while technical performance metrics are met, stakeholder expectations and perceptions may require further improvements.

With an aggregate mean score of 3.984 (SD = 0.887), the results suggest that while project performance is generally satisfactory, there are areas that need improvement, particularly in stakeholder satisfaction and meeting time objectives. These findings align with Kipkoech and Gachengo (2021), who found that beneficiaries of affordable housing projects in Kenya often express concerns over the quality and timeliness of project completion. Similarly, Ronoh and Kirui (2020) emphasized that resource scheduling influences project success, which may explain why projects face occasional budget and timeline constraints. The results indicate that while most affordable housing projects in Nairobi are delivered within budget and meet scope requirements, achieving time efficiency and satisfying all stakeholders remain challenges that require enhanced quality management strategies.

The descriptive analysis shows that quality assurance was the most implemented practice, followed by quality planning, control, and improvement. Project performance was generally satisfactory but faced challenges in timeliness and stakeholder satisfaction. The next section presents inferential statistics, including correlation and regression analysis, to examine the strength and effect of quality management practices on project performance.

The study conducted a Pearson correlation analysis to determine the strength and direction of relationships between the independent variables (quality planning

quality control

and the dependent variable (project performance). Pearson's correlation coefficient (r) ranges from -1 to +1, where: +1 indicates a perfect positive relationship; -1 indicates a perfect negative relationship; and 0 indicates no relationship. The correlation matrix is presented in Table 4.9.

Table 4: Correlation Matrix

Variables		Project Performance	Quality Planning	Quality Control
Project Performance	Pearson Correlation	1.000		
	Sig. (1-tailed)			
	N	96		
Quality Planning	Pearson Correlation	0.612*	1.000	
	Sig. (1-tailed)	0.000		
	N	96	96	
Quality Control	Pearson Correlation	0.649*	0.525	1.000
	Sig. (1-tailed)	0.000	0.172	
	N	96	96	96

*. Correlation is significant at the 0.05 level (1-tailed).

Quality planning had a strong correlation with project performance ($r = 0.612$, $p < 0.05$), signifying that well-structured quality plans improve project execution, efficiency, and adherence to objectives. This is consistent with Jong, Sim, and Lew (2021), who argued that clear scope definition, early identification of risks, and detailed project schedules improve project timelines and cost adherence. Similarly, Kenya National Bureau of Statistics (2021) reported that projects with weak planning frameworks in Nairobi suffer from extended timelines and budget constraints, supporting the need for strong planning mechanisms.

Quality control exhibited the strongest correlation ($r = 0.649$, $p < 0.05$), indicating that projects with robust inspection mechanisms, material testing, and risk control. This finding aligns with Love et al. (2022), who found that poor quality control leads to costly project rework and delays, reinforcing the need for continuous monitoring and compliance with regulatory requirements. Nesto (2021) also emphasized that strict quality control measures reduce risks of structural failures and financial overruns in public housing projects.

Regression Analysis

The regression coefficients in Table 5 provide detailed insights into the influence of each quality management practice—quality planning and quality control on project performance. The magnitude, direction, and statistical significance of these coefficients help determine which factors have the most substantial impact on affordable housing project success.

Table 5: Regression Coefficients of Study Variables

Model	**Unstandardized B**	**Std. Error**	**Standardized Beta**	**t-Statistic**	**Sig.**
(Constant)	0.452	0.183		2.470	0.015
Quality Planning	0.301	0.072	0.289	4.180	0.002
Quality Control	0.354	0.069	0.332	5.130	0.001

Based on the findings, the fitted regression equation is:

Project Performance = 0.452 + 0.301 (Quality Planning) + 0.354 (Quality Control)

The constant ($B = 0.452$, $p = 0.015$) represents the baseline level of project performance in the absence of quality management practices.

Quality planning (B = 0.301, p = 0.002) was the second most significant predictor of project performance, suggesting that well-defined technical specifications, resource allocation, and quality plan communication enhance implementation efficiency. This supports the findings of Boventura and Kisimbii (2021), who established that effective planning frameworks improve construction project timelines, mitigate risks, and enhance budget adherence.

Quality control (B = 0.354, p = 0.001) had the highest influence on project performance, indicating that a one-unit increase in quality control leads to a 0.354 increase in project performance. This suggests that rigorous material inspections, meetings and inspections, and corrective action implementation significantly enhance affordable housing project success. These findings align with Love et al. (2022), who confirmed that poor quality control leads to increased project rework, cost overruns, and delays. Similarly, Willar and Agung (2022) emphasized that strict quality control mechanisms improve compliance with regulatory frameworks, ensuring long-term project sustainability.

Conclusions

The study concludes that quality planning is a crucial factor in ensuring the success of affordable housing projects. Well-structured planning processes, clear project objectives, defined quality standards, and effective stakeholder coordination contribute to improved project performance. However, the findings indicate that material availability challenges and unclear role assignments remain key obstacles, leading to potential delays and inefficiencies. Strengthening supply chain management and improving team role clarity will enhance the effectiveness of quality planning in housing projects.

The study established that quality control has the strongest impact on project performance, emphasizing the importance of material testing, inspections, and corrective action implementation. The findings suggest that housing projects that enforce strict quality control measures experience fewer defects, improved compliance, and better overall performance. However, delays in defect rectification and ineffective risk control mechanisms remain challenges, indicating a need for faster response systems and stronger enforcement of corrective measures.

Contribution to New Knowledge

This study makes a significant contribution to the body of knowledge in the field of project management, specifically within the context of affordable housing initiatives under Kenya's devolved governance structure. By focusing on Nairobi City County—a region with the highest demand for low-cost housing in Kenya—this study provides empirical evidence linking project quality management practices (PQMPs) to measurable performance outcomes in county-level construction projects. Unlike most existing literature, which concentrates on private sector or large-scale infrastructure projects, this research contextualizes project quality within the public housing sector in an urban African setting.

One of the key contributions of this research is the development and empirical validation of a localized conceptual framework that maps the relationship between four quality management dimensions—quality planning, quality control,—and project performance outcomes. The study confirms that all four dimensions significantly influence the performance of affordable housing projects; however, it reveals that quality control has the strongest positive impact. This insight advances the existing discourse by emphasizing the role of site-level technical supervision, inspection processes, and defect management in enhancing delivery timelines, budget adherence, and scope fulfillment in public housing projects.

Recommendations

Recommendations for Enhancing Quality Planning

To strengthen quality planning, it is essential that housing projects adopt more structured and comprehensive planning frameworks. The findings revealed that while quality plans were developed before project commencement, challenges remained in material availability and role clarity. To address this, project managers should enhance supply chain planning by establishing strategic partnerships with suppliers and adopting procurement forecasting tools to minimize material shortages. Furthermore, clearer role assignments and responsibilities should be explicitly outlined in project charters, ensuring that each team member fully understands their duties from the outset. Additionally, stakeholder engagement should be improved during the planning phase to enhance the alignment of project objectives with regulatory requirements and community needs. Involving contractors, supervisors, and developers early in the planning process will foster collaboration and ensure that all quality aspects are well-integrated into the project scope. Moreover, technology-driven project design tools such as Building Information Modeling (BIM) should be embraced, allowing for better visualization, risk prediction, and coordination among project teams.

Recommendations for Improving Quality Control

The study found that quality control had the strongest impact on project performance, yet defect rectification and risk control remained key challenges. To address these issues, project teams should establish a more responsive defect resolution mechanism, ensuring that identified defects are rectified immediately to prevent costly rework. This can be achieved by implementing an automated defect-tracking system that assigns and monitors corrective actions in real-time.

Additionally, affordable housing projects should enhance their material testing protocols by introducing more rigorous and frequent inspections at all project stages. This will help in eliminating substandard materials before they are incorporated into construction, reducing project risks and ensuring that housing structures meet the highest safety and durability standards. Furthermore, continuous on-site training should be provided to workers on quality control best practices, ensuring that everyone involved in construction adheres to standardized quality measures. The study also found that risk control measures were not as effective as expected, indicating that project teams should integrate proactive risk management into quality control processes. Establishing dedicated risk management teams within project implementation units will ensure that quality-related risks are identified early and mitigated effectively. Additionally, the use of drone technology and digital inspection tools should be encouraged to enhance site monitoring and identify defects before they escalate into major issues.

Suggestions for Further Studies

Future research should explore other factors that may influence project performance, such as policy frameworks, financial management practices, and stakeholder engagement strategies. Additionally, studies should assess the impact of emerging technologies, such as Building Information Modelling (BIM) and artificial intelligence, on quality management in construction projects. Comparative research across different counties or countries would also provide insights into best practices and challenges in affordable housing initiatives globally. Additionally, future studies should investigate the long-term sustainability of quality management interventions, focusing on how continuous improvement practices influence the durability and functionality of affordable housing projects over time. Lastly, further studies can be carried out in examining stakeholder engagement models and their role in improving project satisfaction.

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