International Journal of Management and Business Research

Volume 7, Issue 1, pg. 415-433, 2025 ***ISSN 29769-91723***

IJMBR https://grandmarkpublishers.com/index.php/IJMBR/index

QUALITY MANAGEMENT PRACTICES AND PERFORMANCE OF MINISTRY OF EDUCATION FUNDED BUILDING CONSTRUCTION PROJECTS IN SECONDARY SCHOOLS IN MACHAKOS COUNTY, KENYA

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ABSTRACT

Ensuring the consistent completion of construction projects in public secondary schools is a matter of significant concern for education stakeholders and contractors alike. The primary reasons and causes of project/task failure encompass four key dimensions: time, cost, quality, and content. Time and cost overruns are commonly observed features of project failures, resulting in delays in service or product delivery. The prevalence of failed, incomplete or abandoned building construction projects significantly undermines the performance of these projects. The purpose of this study was to examine the influence of quality management practices on the performance of MoE-funded building construction projects in secondary schools in Machakos County. The study's objectives were to evaluate the influence of top management commitment on the performance of these projects, to assess the influence of continuous improvement on performance. The quality management theory and the resource-based theory guided the study. It employed a descriptive research design. The population included the 32 MoE-funded building construction projects in secondary schools in Machakos County. The unit of observation comprised the project staff of these projects, including project managers and project team members. Simple random sampling was employed to select project managers from each category of projects, with a sample size of 224. Data was collected using a questionnaire. A pilot sample was selected from a classroom block project at Olkejuado High School in Kajiado County. The analysis was conducted using SPSS Version 26. The gathered data was tested for multicollinearity, normality, and heteroscedasticity. Descriptive statistics were used to analyze the data, while multiple and simple linear regression analysis were utilized to analyze the quantitative data that was collected and coded. The study's findings were presented in tables, interpreted, and discussed. Additionally, narrations were used to report qualitative data, providing a comprehensive understanding of the influence of quality management practices on the performance of MoE-funded building construction projects in Machakos County. The study revealed a significant and positive influence of top management commitment on performance of building construction projects in secondary schools in machakos county ($\beta = 0.377$, $p = 0.000$).The relationship between continuous improvement on performance of building construction projects was positive and significant ($\beta = 0.343$, $p = 0.000$). The study concludes that top management commitment enhances project objective clarity, continuous improvement boosts performance monitoring. This study recommends that project managers should ensure top management's active involvement, adopt continuous improvement practices to uphold high standards in construction projects.

Key Words: Quality Management Practices, Moe-Funded Building Construction Projects, Top Management Commitment, Continuous Improvement

Background to the study

A project is considered successful when completed on time and under budget, produces deliverables that were originally planned, and has its result accepted and used by people for whom it was designed. Success of project varies from one project to the next since each one is distinct (Nuraeni & Irawan, 2021). With the understanding that success means different things to different people, the concept of project performance has recently been treated in connection to stakeholders' perception, which has served to further enhance complexity (Marc, 2022). The greatest way to implement business changes, according to project practitioners, is through projects (Jradi et al., 2018). The objectives of projects, according to Gatimu, Gakuu and Ndiritu (2021), are to facilitate the implementation of strategies. Therefore, organisations must ensure that their projects succeed if they are to succeed at all.

Project performance refers to a project's ability to achieve its goals through effective administration, sound governance, and continuous dedication to results (Li, Ning, & Chen, 2018). Over the past several decades, both academics and practitioners have focused on project performance. According to Shehu (2021), project performance pertains to an organization's accomplishments relative to specific criteria, and it is a strong indicator of organizational effectiveness. Indicators such as efficacy, efficiency, financial viability, and stakeholder relevance can be used to evaluate an organization's success. Quality management practices have proven to be effective methods for enhancing quality performance (Khan, Imran & Hussain, 2019). Quality management is a set of practices first used in the manufacturing industry, has garnered global acclaim for its impressive results, including increased productivity, reduced product costs, and enhanced reliability (Albert, Shakantu & Ibrahim, 2018).

Quality management practices, initially successful in the manufacturing sector, have been adopted by other industries, including building construction (Adinyira, Agyekum, Danku, Addison & Kukah, 2020). The aim of quality management is to ensure all efforts are directed towards achieving the required quality level for a well-planned and organized product. In housing projects, managing quality involves maintaining construction operations at the appropriate level to satisfy customers, thereby ensuring long-term competitiveness and business sustainability (Htoo, Dodanwala & Santoso, 2023). Moreover, Ukochi and Oguaju (2023) note that quality management in construction encompasses various aspects like quality assurance, quality control, quality enhancement, and quality standards. According to Vishe (2023), quality management practices are effective techniques for driving organizational change and improving quality. Quality management has been noted to have an influence on performance of projects (Ezenyilimba & Ezejiofor, 2019; Parsamand, 2021). According to Simani (2018), quality management is a strategy used by organisations to continuously deliver projects that are consistent with required standards, and encompass a number of different elements — this study focuses on top management commitment, and continuous improvement.

Top management must be directly involved in the operational process and decision-making (Achieng & Gitonga, 2020). Okine & Kissi (2018) define top management commitment as the top management's participation in all organisational dynamics, such as the formulation of objectives, the quality of products, the management of processes and resources management. The supervision aspects of the top management enable the organizational processes to be undertaken in a timely and efficient manner leading to improved organizational performance (Rahman & Susanto, 2022). Top management supervision further ensures that the required standards are met in the organizational activities and the organizational policies adhered to leading to enhanced organizational performance (Gachugu, Awino, Iraki & Machuki, 2019). The top management are also involved in the resources sourcing and allocation which is key in ensuring quality and efficient processes in the organization (Khanai,

2020). The efficiency of the organizational processes leads to organizational performance (Lim, Regencia, Cruz, Ho, Rodolfo, Uson & Josefina ,2022). Top management sets and executes organizational vision, leading to enhanced organizational performance. Top management commitment entails involvement in operational process, goal setting, decision-making, formulation of objectives, quality of products, management of processes and management of resources (Rahman & Susanto, 2022).

Continuous improvement relates to the strategies that are deployed to marginally improve on the goods, services and processes to achieve organizational performance (Indana & Indartono, 2020). Continuous improvement of goods and services makes them more responsive to the customer needs hence improving on the organizational performance through increased sales and market penetration aspects (Sadyrova, Yusupov & Imanbekova, 2021). Continuous improvement of the processes influences on the organizational efficiency in goods and service delivery leading to the enhanced organizational performance (Indana & Indartono, 2020). Continuous improvement thus enables greater responsiveness to the customer needs, greater addressing of the stakeholder concerns, and improvement of efficiency in organizational process which enables achievement of organizational performance (Wambui & Bett, 2019). Continuous improvement is in terms of measured by performance monitoring, customer feedback loop, service innovation, influence evaluation and research and development (Shiku, 2022).

Partnering agreements can enhance relationships between parties, improve communication, increase productivity, and reduce disputes (Shirandula, Kisimbii & Otieno, 2018). Additionally, partnering agreements can lead to cost reductions, shorter project durations, higher levels of team integration, continuous quality improvement, and greater client satisfaction (Bresnen & Marshall, 2000). These agreements also foster innovation, reduce conflicts among stakeholders, enable more informed decision-making (Heravi, Kebria & Rostami, 2021), and expand future business opportunities (Nyakala, Pretorius & Vermeulen, 2021). Collaborative procurement and relational characteristics help overcome challenges during the construction phase (Adami et al., 2019). According to Willar (2017), sharing project profits in collaborative procurement approaches contributes to achieving the best possible project outcomes.

Problem statement

Education stakeholders and contractors are concerned about the consistent completion of construction projects in public secondary schools. According to Vishe (2023), project and task failure may be attributed to four main factors: time, cost, quality and content. A project's success or failure is also heavily dependent on the level of participation from the project's end users and other stakeholders. Ukochi and Oguaju (2023) asserted that there is a wide range of effects due to project failure, affecting people, communities and businesses in different ways. Project failures often include time and cost overruns, which cause delays in the supply of services or products (Adinyira, Agyekum, Danku, Addison & Kukah, 2020). The prevalence of failed, incomplete or abandoned building construction projects significantly undermines the performance of these projects (Adinyira et al., 2020). Report from the office of the auditor general (OAG) on ***"****the implementation of the schools upgrading programme****"*** indicated that secondary schools persisted in enrolling more students despite lack of investment in infrastructure upgrades and expansion (OAG, 2022). In Machakos County, numerous building construction projects in public secondary schools remain stalled or incomplete (Otido & Omwenga ,2019). Consequently, the significant number of stalled and incomplete projects in public secondary schools in Machakos County raises concerns about effectiveness of quality management practices overseeing the progress and timely completion of these projects within budget. Mwadime and James (2019) found that approximately 25-30% of building construction

projects in Machakos County remain stalled or incomplete due to ineffective quality management practices. There is a dearth of literature on influence of quality management practices on performance of MoE funded building construction projects in secondary schools. Shirandula, Kisimbii and Otieno (2018) researched how quality management practices affected performance in construction sector. Due to its exclusive emphasis on the construction industry and its location in Mombasa County, the research presents contextual gap. There was therefore the need to investigate influence of quality management practices on performance of MoE funded building construction projects in secondary schools in Machakos County.

Research objectives

General objective was to examine influence of quality management practices on performance of MoE funded building construction projects in secondary schools in Machakos County.

Specific objectives were:

i. To determine the influence of top management commitment on performance of MoE funded building construction projects in secondary schools in machakos county
ii. To assess the influence of continuous improvement on performance of MoE funded building construction projects in secondary schools in machakos county

LITERATURE REVIEW

Theoretical literature

Quality management theory

Deming (1986) quality management theory emphasizes the importance of strong relationships within top management for effective quality control. The theory suggests that structural shortcomings within firms are responsible for issues, and organization's commitment to cultivating these relationships is key. The absence of strong top-level management commitment renders quality management systems ineffective. The theory provides strategic guidance for addressing quality-related issues through efficient managerial approaches.

Quality management theory creates an organizational structure that prioritizes involvement and continuous learning. This, in turn, enables the adoption of process management principles that ultimately enhance performance. Oakland (2014) underscores the significance of top-level management responsibilities in orchestrating transformations in structures and processes. Institutions play a pivotal role in ensuring an organization attains excellence, as they provide the vision that propels the firm towards performance enhancement. The quality management theory warrants close examination due to its emphasis on implementing quality management practices within a structured framework. Organisations may achieve better performance with the use of this framework, which is built to increase product and service quality via continuous improvement. Quality management is presented as a holistic approach that requires customer participation, engaged employees, systematic attention, a robust quality system, and an unwavering dedication to continuous improvement (Deming, 1986).

Quality management theory, emphasizing continuous improvement, and relationship management, can be linked to a study examining its influence on building construction projects' performance in Machakos County's secondary schools. The study could investigate how implementing quality management practices affects project outcomes like cost, time and quality. The theory would aid to assess improvements in efficiency, stakeholder satisfaction

and overall project performance due to rigorous quality management practices in the educational infrastructure development context.

Resource based theory

It concentrates on advantages that resources provide to an organization's operations and performance aspects (Barney, 1991). Resources consists of tangible assets like buildings, vehicles and computers, while intangible resources are customer focus, expertise, and culture (Antonio & Gattermann, 2020). An organization's tangible resources include buildings, vehicles, machineries, desks, and computers etc (Antonio & Gattermann, 2020). The organizational resources could also include the intangible resources such as customer focus, expertise, and culture amongst others. The TQM can be considered to be an intangible resource that is at the disposal of the organization and which influences on the organizational performance (Ahmed, Khuwaja, Brohi, Othman & Othman, 2018). Various scholars have noted that customer focus influences performance. The customer focus is an intangible resource that enables the firm to undertake strategic initiatives to continuously address changing customer needs and to make efforts to continuously seek to meet these customer needs (Cheng, Lin, Ye & Hou, 2021). The customer focus drives the organizational performance through customer loyalty, customer relationship management, customer retention and market penetration which holistically improves on the organizational performance (Faisal, 2019; Ogollah & Kavulya, 2018; Sandrine & Patrick, 2020). Several scholars such as (Rodríguez-Fernández & Gaspar-González, 2020), (Khanai, 2020) and (Gachugu, Awino, Iraki & Machuki, 2019) have associated management support with performance.

Resources are useful to the organization in achieving its mandates (Thanh, Ha, Dung, Thang & Ngoc, 2020). This implies that the resources can help the organization achieve effectiveness and efficiency in its operations and hence superior performance aspects. The resources being rare implies that it is not available to the competitors and this enhances competitive advantage (Freeman & Dmytriyev, 2021). The resources available to the organization must also be perfectly imitable. This has the effect of locking out the competitors since event after discovering the potential benefits of the resources they would have no capacity to imitate the resources for their own benefits. The trait of being non-substitutable implies that the resources cannot be replaced with another resource for the same set of benefits (Cruz & Haugan, 2019). This research fits theoretically since the idea emphasises that customer focus, customer loyalty, relationship management, retention and market penetration are key factors in enhancing performance. The theory will aid indicate how the involvement of top management and effective strategic planning, as critical organizational resources, contribute to enhanced project performance. The theory will aid assess improvements in project efficiency, quality and project performance.

Conceptual framework

In order to explain a specific phenomenon, researchers sometimes use conceptual frameworks, which are reflections of their synthesis of existing literature. Using what the researcher already knows about the issue and the opinions and results of other researchers, this framework lays out the procedures for carrying out the study (Crawford, 2019). It shows possible connections, providing a foundation for understanding how observations and interpretations are connected in terms of correlation or causation. The study's independent variables are: top management commitment (objectives formulation, organizational processes and goal setting), continuous improvement (performance monitoring, customer feedback loop and research and development) and relationship management (supplier management, supplier satisfaction and lead management). Performance of building construction projects is the variable that is dependent. Study's conceptual framework is illustrated in Figure 2.1.

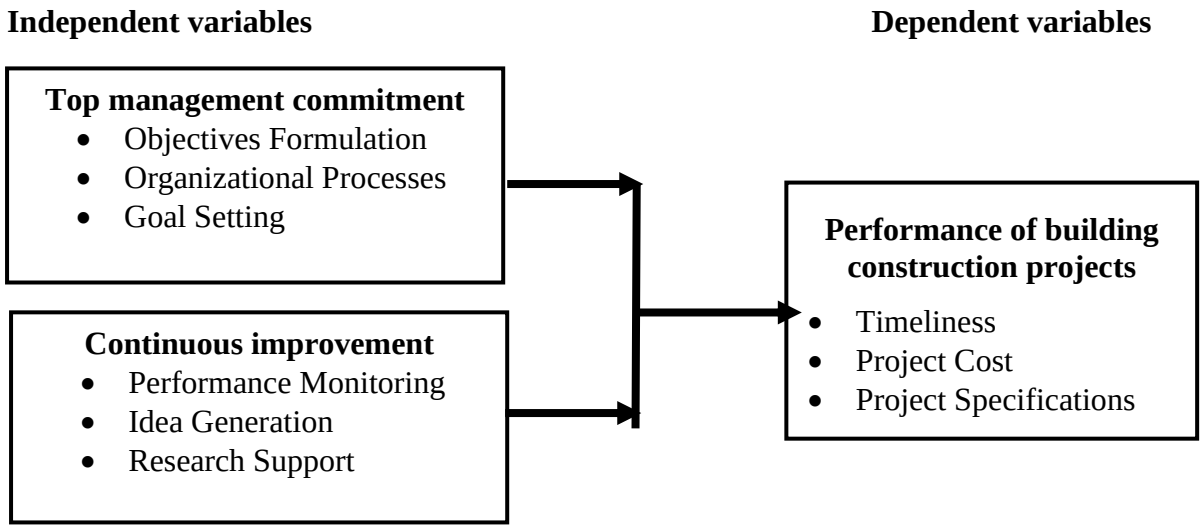

Figure 1: Conceptual framework

Top management commitment

It is important in management of projects. Significant, positive relationships are observed between measures of top management commitment and project performance (Vishe, 2023). Strategic decisions made by top management teams have a direct effect on organizational performance (Shehu, 2021). The level of commitment from top management determines effectiveness of project implementations: The higher the commitment, the more likely the project will succeed (Vishe, 2023). External pressures for social performance may lead to easily separable processes, but the commitment of top management can promote both easily separable and interconnected processes (Ukochi & Oguaju, 2023).

All businesses need managers who can inspire others to become more committed to achieving organizational objectives (Khan et al., 2019). Managers must be dedicated and concentrate on these strategies: facing the truth within the organization and explaining a strong reason for the transformation, showing confidence in the organization's potential for a successful future, and offering a plan to direct actions and choices (Vishe, 2023). Research has indicated that leaders who demonstrate dedication to their organizations achieve higher levels of success (Shehu, 2021). Through showing dedication, followers copy the behavior that leads to the organization's success. According to Li et al. (2018), top management commitment can build trust in an organisation by following through on their promises are more successful.

Continuous improvement

Due to fierce competition and diverse market sectors, strict policies and measures have been put in place to enhance continuous improvement (Albert et al.,2018). Businesses work in ever-changing and competitive environments that are dynamic and complex (Adinyira et al., 2020). Continuous improvement, as explained by Htoo et al. (2023), is a quality mindset that ensures continuous advancements and a functional system that can be monitored for possible enhancements. All companies require a rapid improvement program to streamline processes. Businesses that have effective processes save both time and money, leading to reduced wastage of time and energy (Muse & Josephine, 2022).Furthermore, they consistently enhance their processes.

Continuous improvement motivates the most effective and competitive companies according to (Ukochi et al., 2023). Organizations must work hard to achieve challenging goals; they must believe in consistently evaluating the effectiveness of their processes to meet customer needs through ongoing improvement. Striving to enhance products, services, or processes is often viewed as continual improvement. Vishe et al. (2023) focused on making small "incremental"

improvements before tackling a big "breakthrough" improvement in one go. Continuous improvement should involve all employees' suggestions, opinions and methods that can ultimately be implemented for enhancements in all aspects. While companies strive to stay competitive, continuous improvement brings about expenses like employee training, hiring experts, and other hidden costs that may go unnoticed initially (Otido et al., 2019).

Organizations rely on employee productivity for success in both local and global markets, which is why managers are working hard to maintain high levels of motivation among employees. The workplace environment, specifically motivation, has been thoroughly examined in efforts to boost productivity. Wamalwa et al. (2021), highlight that the work environment can affect employee creativity and innovativeness. It directly affects the morale and engagement levels in the organization. This means that the design of the workplace environment affects employee engagement and morale (Muse et al., 2022). Enhancing continuous improvement requires management to prioritize improving employee-organization engagement and morale

Performance of building construction projects

The building construction sector is crucial for driving economic growth in any nation. Global observations indicate that delays in finishing construction projects are a widespread issue. Because of the inherent difficulties in production within this industry, it has been observed that tasks planned to be carried out in a specific way are occasionally altered by certain individuals in a careless manner, without considering the perspectives and opinions of other stakeholders. The growing trade in Kenya has led to a strong need for improved infrastructure, including roads, communication systems, buildings and essential utilities like electricity, water and sewage facilities.

From an economic perspective, the construction sector in Kenya has emerged as one of the most dynamic industries, drawing in a significant number of investors (Htoo et al., 2023). Ukochi et al. (2023) argued that for construction projects to be completed successfully, adherence to government regulations is essential. This research also found that successful project completion is influenced by reducing frequent design changes by the client, the client's improved financial capabilities, and minimizing delays in decision-making by the client. Competent consultants should create project designs that are reviewed by all stakeholders before finalization and implementation, in order to minimize change orders and high-cost overruns during construction.

Empirical literature

This part outlines empirical studies as per the study objectives.

Top management commitment and performance of building construction projects

Identifying success criteria (SC) and the critical success factors (CSFs) is crucial for effective performance and delivery project so as to attain success of the project. Amora and Juanzon (2022) identified the critical achievement elements and achievement criteria by adopting Analytic Hierarchy and Pareto Analysis Process with a validated questionnaire to form a framework for structural works in a building construction mixed-use project by identifying notable SC and key CSFs (Shehu, 2021). A validated questionnaire was used to assess CSFs using the analytic hierarchy approach in this investigation, determining the prioritized elements including client focus, top management commitment, training and education, project mission, personnel and teamwork and communication (Vishe, 2023). Moreover, the study identified the top five most acknowledged achievement approach in the literature as satisfaction of other

stakeholders, time – schedule, cost-budget, client/customer satisfaction, quality – performance (Muse & Josephine, 2022). The structural phase of construction projects may now make use of a framework that has been created according to important success criteria and critical success determinants (Amora & Juanzon, 2022). The study reveals methodological gaps as a questionnaire was used. Additionally, the study was a meta-analysis of already completed projects.

Collaboration in the construction sector is a subject of interest for academics and professionals alike. Improving team effectiveness is crucial as it enhances the chances of effective project completion. Having the known idea that influence dynamics of influence team is vital for enhancing team performance. Yap, Leong and Skitmore (2020) examined an extensive literature review and a survey questionnaire with 25 attributes and 10 aspects of construction teamwork. Feedback was collected from construction practitioners of Malaysia in contractor, consultant and client organizations to prioritize these variables. Next, the study used reliability analysis method. This research used descriptive statistics and exploratory factor analysis. Importance of these qualities and characteristics was explained. The 3 key factors were “problem-solving skills”, "decision-making ability" and "project performance". The authors found out six fundamental dimensions including cooperative work environment, team structure and accountability, leader competencies, environment of trust and respect, support from top management and participative involvement and dedication to tasks. Identifying these elements of team effectiveness offers a solid foundation for effective team-building procedures creation to enhance teamwork among project stakeholders and ultimately enhance performance project. Contributing to the current understanding of how team effectiveness might boost performance project in literature management construction, this research covers the highlighted gap of information on the dimensionality of cooperation traits in construction settings. The study was a systematic literature review, while this study employed primary data collection procedures and analysis.

Ensuring high standards in construction projects is essential for their success, which can be accomplished. Yet, the crucial elements of implementing quality management in the construction sector of developing nations have not been thoroughly investigated. Riaz, Iqbal, Ullah, Bilal, Alqurashi and Alsulami (2023) examined how quality management implementation works in developing countries' construction sector. A literature review identified 28 essential factors of quality management. After that, a total of 12 important key elements were selected. A weak organisational quality culture, unsatisfied customers, inadequate quality education and a lack of backing from top management are some of the problems that have affected quality management initiatives. Relationships between the twelve variables were shown using a Causal Loop Diagram (CLD). In addition, an SDM, or system dynamics model, was developed. Outcomes of constructed SDM simulation showed a rise in the adoption of quality management throughout the defined timeframe. The study was a literature review, hence a methodological gap.

The importance of construction projects extends beyond stakeholders to the overall economic and social progress of the country. Success of a project's construction is often dependent on CSFs, which are considered essential components of good project management. Ullah, Jhatial, Sohu, Lakhiar and Shahzaib (2018) identified and ordered CSFs for construction highway projects in Pakistan. A comprehensive review of literature was performed to recognize a group of critical effective elements for construction projects. Following this, a survey developed from identified critical success factors (CSFs) was created and administered to construction professionals. The CFS included proper project planning by experienced individuals, commitment from all parties involved, a skilled design team, efficient site management, and

competent project team management. The research highlights a gap in context, with a specific focus on road construction projects.

Abdulmalek and Ahamat (2022) suggest that the architectural industry has become increasingly competitive worldwide, and to succeed, companies need to prioritize improving their operational efficiency. This study is driven by a critical demand to fill the gap in empirical studies on quality management in Yemen's architectural sector. This study utilized quantitative research methodologies. The quantitative method involved using a questionnaire to gather primary data from the study respondents. Three hundred and thirty five construction project managers, engineers, and workers from Yemen were surveyed. This research discovered that in Yemen, there are strong and beneficial connections between top management commitment, human resources, customer focus, and the performance of architectural organizations. Recent studies suggest that construction project owners and managers should incorporate total quality management practices throughout all phases of architectural project development. There is contextual gap because the research was carried out in Yemen.

Performance evaluation system is crucial for maintaining the quality of employees' work, and it is typically used for all levels of employees including top management. The goal is to boost the efficiency and competence of the company's employees. An outstanding performance by construction workers has a direct influence on both project management and project delivery. Their dedication, mindset, and adherence are crucial in preventing issues on the construction site. Therefore, it is thought that the system could enhance their performance by implementing performance appraisals. Arof, Ismail, Saleh, Wahab and Amat (2019) explored how construction workers perceive the contractor's performance evaluation system. 157 construction participants received a series of surveys and were then analyzed. It was noted that construction participants possess a good grasp of the current contractor's performance evaluation system and believe it is beneficial, although certain enhancements are necessary.

The Nigerian standards organization has been diligent in ensuring quality compliance. This suggests that the push for management quality is currently picking up speed and strength. The quality management practices aim to ensure that construction projects meet delivery requirements by directly influencing the construction output environment. Nonetheless, the construction sector in Nigeria is plagued by frequent building collapses, deteriorating structures, and substandard construction projects. So, Rugu, Tanko, Gumgaro, Markus, Ojoko and Akademia (2018) analysed main elements affecting construction firms' quality management practices. Construction practitioners were given 95 questionnaires to fill out by themselves. Cross-tabulation analysis and relative importance index were utilized to examine data. SPSS was employed. It was noted that empowerment and involvement, education and training, customer satisfaction, quality management culture and top management commitment are key elements for implementing total quality management construction companies. The study advised that every implementation should start with the dedication of top management leadership because doing so is essential to the success of quality management. Sustaining a focus on quality improvement is crucial for boosting the overall worth of construction projects. More research is needed in state, commercial and residential government projects. Th study used a small sample, hence a limitation in analysis.

Shirandula, Kisimbii, and Otieno (2018) investigated how quality management practices affected productivity in the construction sector. The study looked at the effect on construction industry performance of factors including customer focus, continuous improvement, staff engagement and management commitment. Companies involved in construction in Mombasa County, Kenya, were the target population. Two hundred and eighty-five firms were surveyed

out of 377 registered in the population. Key statistics were used for analysis, including mean, standard deviation, and various tests. Firm performance in the industry is positively influenced by customer focus, continuous improvement, staff engagement and management commitment. Further research in different Kenyan counties within the same sector was recommended for chapter five to validate findings. Since the study was limited to the construction industry and took place in Mombasa County, it presents a contextual gap.

Continuous improvement and performance of building construction projects

Heravi, Kebria and Rostami (2021) examined how the application of continuous flow, just in time (JIT), total productive maintenance (TPM) and value stream mapping (VSM) techniques influence the assembly and production of pre-fabricated steel frames (PSFs) in projects construction. After the VSM method was implemented, JIT method was introduced at the initial phase of lean management. The second phase of lean management consisted of implementing the continuous flow and TPM techniques. Discrete event simulation (DES) was used to assess the potential enhancement in project performance by implementing lean techniques to reduce wastes. This study focused on analyzing a residential building project (eight-story) located in Tehran, Iran. Utilizing lean techniques simultaneously in the process of erection and production of PSFs results in a notable enhancement in the performance of both stages. The findings showed a 43 percent decrease in the cost and time of PSFs erection and production processes, with a 17 percent reduction in each. Only the influences of applying lean methods on the manufacturing and installation of PSFs were assessed in the current research. Nevertheless, the lean approaches and key strategies could also be utilized for pre-fabricated or other modular methods of construction. The main advancement in knowledge came from improving construction project performance through merging production processes, as well as applying lean techniques for phased lean management. The current study's findings offered important information on potentially combining and enhancing pre-fabricated construction processes.

The systematic use of quality practices during construction projects is widely believed to enhance project performance. It is well-known that Small and Medium-Sized Enterprises (SMEs) need effective compliance management as part of their quality management systems to successfully complete road-building infrastructure projects. In spite of the benefits provided by these quality practices, there are potential drawbacks. There is a growing need for innovation and adaptation from small construction firms in South Africa as low-cost economies expand. Nyakala, Pretorius and Vermeulen (2021) investigated how design, construction, and execution influence the work quality from construction SMEs during the process of regulatory road building. A survey questionnaire was carried out with 165 SME contractors and designers in South Africa to gather their feedback on performance improvement and construction quality standards in completed public sector projects. Descriptive and inferential statistics were used for data analysis. It showed that five factors related to construction quality processes have an effect on the road infrastructure quality projects carried out by small and medium-sized construction companies. This research identifies factors influencing road infrastructure quality projects in the construction SME sector, such as quality procedures, site management, design, benchmarking, communication, and enhancement. Designers, consultants, and managers can benefit from this information to achieve a competitive edge in similar settings. The findings also offered a blueprint for effectively implementing quality of construction in medium and small-sized construction projects. The study’s unit of analysis were SMEs, while the proposed study focuses on construction projects.

Indonesian construction sector must see a significant increase to address current challenges such as quality, organizational performance, and global competition, as well as to overcome

ongoing national issues affecting the industry. When vying for contracts with global builders, it is essential to provide top-notch construction goods and services. Creating an evaluation system for Indonesian construction firms is crucial to inspire them to enhance their performance in constructing projects. Willar (2017) researched the important qualities related to evaluating the efficiency of construction projects in Indonesia. The 216 construction specialists from medium and big construction firms in five regions of Indonesia were the subjects of a research. According to data analysis findings, 39 key attributes were identified that could form foundation for developing a system to examine performance of construction projects in Indonesia. It was noted that continuous improvement enhances project performance. The established characteristics identified in this research are the first stage in creating a comprehensive quality performance evaluation system for Indonesian construction.

The construction sector is embracing a joint approach by merging Lean Construction (LC) principles with BIM capabilities. Current research is insufficient in providing enough case studies and performance reviews, particularly focusing on the reconstruction and disassembly phase, leading to a disparity in the possibility of implementing BIM with Lean Construction (BIM-LC) in China. Hei, Luo, Zhang, Zhou, Cong and Ye (2024) assessed BIM-LC method for bridging this gap in a Dezhou, China relocation project. The project utilized BIM-LC methods like Kanban, JIT, LPS, VSM and Continuous Improvement to improve productivity of construction and reduce inefficiencies. The research focused on two primary aspects of the relocation process: finding common obstacles and solutions for implementing BIM-LC and assessing construction efficiency, carbon-emission and performance. Findings indicated that BIM-LC method boosted productivity. The study reveals a conceptual gap as it leaned on quality management processes.

Xing, Hao, Qian, Tam and Sikora (2021) sought to increase project value while cutting down on costs and waste, the lean construction (LC) methodology was effectively and officially put forward in the construction, engineering and architecture sector in 1993. Even though LC has improved quickly since then, it wasn't applied in a Chinese construction project until 2005. Nevertheless, the initial try at lean construction in China was insufficient due to ineffective implementation and lack of enough knowledge. Therefore, this research set out to determine if the China construction industry had mastered execution of lean principles to reduce waste, streamline project timelines, enhance project value and enhance project quality. A case study investigation of an LC project in Suzhou, China was successful. Incorporating lean techniques like quality and safety management, JIT, prefabrication, Kanban system, IoT, LPS, and continuous improvement during the project improved project performance as noted by findings. The case study was enhanced by surveying global lean professionals for their thoughts on disparities between international and Chinese LC and by interviewing project stakeholders for their perspectives. Results showed that participants from surveys and interviews agreed that Lean Construction (LC) could significantly decrease project errors and delays. They believed improving project efficiency and quality and enhancing construction processes were the top benefits of employing lean practices. It was widely acknowledged that the greatest obstacles were the stakeholder capabilities and lack of trust.

The implementation of construction quality processes is widely acknowledged to enhance construction project performance by consistently applying quality practices. It is well acknowledged that SMEs require compliance management through quality management systems in order to successfully complete road-building infrastructure projects. Even though these quality practices present opportunities, there are also potential pitfalls. With the rise of low-cost economies, South African construction SMEs face growing demands to become more adaptable and creative. Nyakala, Pretorius and Vermeulen (2021) analyzed how the design,

construction, and execution phases of a regulatory road building procedure influence the work quality of construction SMEs. A survey questionnaire was carried out with 165 SMEs contractors and designers in South Africa to gather information about their experience with construction quality standards and performance improvement on public sector projects. Descriptive and inferential statistics were used for data analysis. It was found that five elements in the quality construction process influence quality of road infrastructure projects conducted by SMEs construction enterprises. The components include building process and design, maintaining quality control during construction, setting and enforcing quality standards, quality protocols and necessities, aiming for ongoing enhancement and communication. The study focused on SMEs, hence a contextual gap.

Construction companies encounter numerous difficulties, particularly when deciding on management strategies to ensure the consistent delivery of quality products that satisfy customer requirements and expectations. To ensure that the building sector consistently produces high-quality results, quality management is a popular management strategy. Oruma (2014) found the elements affecting adoption of quality management in construction firms in Nakuru County. Primary tools utilized in this study were questionnaires and structured surveys, with the involvement of more than 15 construction companies. Findings revealed that, in addition to top management's commitment, other elements affect effectiveness of quality management and it also showed that top management's commitment significantly affects project implementation. This research looked at secondary school construction projects in Machakos County, although the previous study was in Nakuru County.

METHODOLOGY

This study employed a methodology of descriptive research, which ensured that variables were studies without adjustment (Siedlecki ,2020). The aided to examine the influence of quality management practices on performance of building construction projects in secondary schools in Machakos County. This study's population were the 32 MoE funded building construction projects in secondary schools in Machakos County. The study's unit of observation were the project staff of these projects, who comprised project managers and project team members. The Yamane (1973) formula was used to get the sample for project team members. The equation yielded the result of n being equal to 217. Thus, the sample size for the study was 217 added to 7 for the project managers which equals 224. The sample size distribution is as illustrated in Table 1.

Table 1: Sample size

Project	Population	Project managers	Project team members	Sample	Factor load
Dining halls	38	1	16	17	45%
Multipurpose halls	30	1	13	14	47%
Science laboratories	60	1	26	27	45%
Classroom blocks	225	1	96	97	43%
Computer laboratories	50	1	21	22	44%
Administration blocks	67	1	29	30	45%
Ablusion blocks	38	1	16	17	45%
Total	**508**	**7**	**217**	**224**	**44%**

A semi structured questionnaire was administered to the project team members. Data were edited, coded and tabulated for analysis. The analysis used SPSS Version 26. Descriptive and inferential statistics were used to analyze quantitative data. A multiple regression model was

RESEARCH FINDINGS, ANALYSIS AND PRESENTATION

The study issued 224 questionnaires whereby 202 of them were filled and returned. A response rate of 90% was achieved with the completion and return of 202 forms.

Descriptive analysis

Influence of Top Management Commitment on Performance

The first objective was to determine the influence of top management commitment on performance of MoE funded building construction projects in secondary schools in Machakos County. Respondents were asked 5 questions and responses presented on a likert scale. Table 9 presents the results. Twenty six percent of the respondents strongly agreed, 62% agreed and 12% were not sure that top management's commitment significantly improved the clarity and precision of project objectives (Mean=4.14; Std. Dev=0.60), 39% strongly agreed, 54% agreed and 7% were not sure that the involvement of top management ensured that project objectives were aligned with organizational goals (Mean=4.32; Std. Dev=0.60). Indeed, Rahman and Susanto (2022) asserted that top management's involvement enhances clarity in project direction. Additionally, Shehu (2021) identified top management commitment as a critical success factor that ensures alignment between project objectives and organizational goals. Forty four percent of the respondents strongly agreed, 53% agreed and 3% were not sure that top management's commitment positively influenced the efficiency of organizational processes in construction projects (Mean=4.41; Std. Dev=0.55), 57% strongly agreed, 42% agreed and 1% were not sure that the dedication of top management led to better coordination and communication within the project team (Mean=4.56; Std. Dev=0.52). Khanai (2020) emphasized that effective resource allocation and oversight by leadership are central to process efficiency in construction projects. Additionally, Gachugu et al. (2019) noted that top management enhances internal collaboration. Forty six percent of the respondents strongly agreed, 50% agreed and 4% were not sure that the top management's active role in goal setting enhanced the likelihood of achieving project milestones (Mean=4.42; Std. Dev=0.57).

Table 2: Influence of Top Management Commitment on performance of building construction projects

Statements	N	Mean	Std. Dev.
Top management's commitment significantly improves the clarity and precision of project objectives	202	4.14	0.6
The involvement of top management ensures that project objectives are aligned with overall organizational goals	202	4.32	0.6
Top management's commitment positively influences the efficiency of organizational processes in construction projects	202	4.41	0.55
The dedication of top management leads to better coordination and communication within the project team	202	4.56	0.52
Top management's active role in goal setting enhances the likelihood of achieving project milestones	202	4.42	0.57
Aggregate mean		**4.37**	

Source: Field data (2024)

The respondents were required to indicate the effect of commitment level of top management on the success of building construction projects in secondary schools. Respondents indicated that high commitment ensures that sufficient funds, skilled personnel and time are devoted to the projects, minimizing delays and cost overruns. Furthermore, committed top management promoted clear communication, effective monitoring and timely resolution of challenges, leading to improved project outcomes. Conversely, low commitment resulted in stalled projects, inadequate oversight and poor quality of construction.

Respondents were required to highlight ways in which top management demonstrated their commitment to enhance project performance. Top management demonstrated their commitment to enhancing project performance. They allocated adequate funding and resources, ensuring that project execution proceeded without interruptions. Clear policies and guidelines were established to streamline project planning, monitoring and evaluation processes. Management actively participated in project progress meetings and key decision-making activities, reflecting their hands-on involvement. Transparency and accountability were upheld in procurement and resource use.

Influence of continuous improvement on performance

The second objective was to assess the influence of continuous improvement on performance of MoE funded building construction projects in secondary schools in Machakos County. Respondents were asked 5 questions and responses presented on a likert scale. Table 10 presents the results. Twenty two percent of the respondents strongly agreed, 72% agreed and 6% were not sure that continuous improvement practices enhanced the effectiveness of performance monitoring in construction projects (Mean=4.16; Std. Dev=0.50), 45% strongly agreed, 50% agreed and 5% were not sure that regular performance monitoring driven by continuous improvement led to timely identification and resolution of project issues (Mean=4.40; Std. Dev=0.59). Heravi et al. (2021) demonstrated that the use of lean techniques such as value stream mapping and just-in-time practices improves project monitoring and responsiveness. Twenty nine percent of the respondents strongly agreed, 66% agreed and 4% were not sure that implementing a continuous improvement framework improved the integration of customer feedback into construction project processes (Mean=4.25; Std. Dev=0.53), 39% strongly agreed, 57% agreed and 4% were not sure that the continuous improvement approach ensured that customer feedback was regularly reviewed and acted upon to enhance project outcomes (Mean=4.35; Std. Dev=0.56). Forty three percent of the respondents strongly agreed, 50% agreed and 7% were not sure that continuous improvement enhanced research and development that led to innovative solutions in construction projects (Mean=4.36; Std. Dev=0.61). This aligns with findings of Nyakala et al. (2021), who found that continuous quality enhancement and innovation enhance project performance.

Table 3: Influence of Continuous Improvement on performance of building construction projects

Statements	N	Mean	Std. Dev.
Continuous improvement practices enhance the effectiveness of performance monitoring in construction projects	202	4.16	0.5
Regular performance monitoring driven by continuous improvement leads to timely identification and resolution of project issues	202	4.4	0.59
Implementing a continuous improvement framework improves the integration of customer feedback into construction project processes	202	4.25	0.53
The continuous improvement approach ensures that customer feedback is regularly reviewed and acted upon to enhance project outcomes	202	4.35	0.56
Continuous improvement enhances research and development that leads to innovative solutions in construction projects	202	4.36	0.61
Aggregate mean		**4.3**	

Source: Field data (2024)

The study inquired how implementing continuous improvement strategies affect the efficiency and outcomes of construction projects in secondary schools. Respondents noted that strategies enable project teams to identify inefficiencies, correct errors promptly and optimize process for better results. Respondnets indicated that by regularly assessing project progress and incorporating feedback, stakeholders can minimize resource wastage, reduce delays and ensure high-quality construction outcomes. Continuous improvement also strengthens collaboration among team members, as it encourages open communication and the sharing of innovative ideas. These strategies lead to projects being completed on time, within budget and to the desired standards, benefitting both the schools and the surrounding communities.

The study inquired from respondents' examples of continuous improvement practices that had led to successful project completions**.** Respondents indicated that the practice of conducting regular site inspections and progress review meetings had ensured successful project completions. This allowed the project team to address material shortages and contractor delays promptly, ensuring the project stayed on schedule. Schools had adopted a feedback mechanism where teachers, students and local community members voiced concerns or suggest improvements during construction. This resulted in better designs that catered to the school's specific needs.

Performance of building construction projects in secondary schools

The study investigated influence of quality management practices on performance of MoE funded building construction projects in secondary schools in Machakos County. Respondents were asked 5 questions and responses presented on a likert scale. Table 13 presents the results. Twenty two percent of the respondents strongly agreed, 72% agreed and 6% were not sure that the project was within the scheduled timeframe (Mean=4.16; Std. Dev=0.50), 44% strongly agreed, 51% agreed and 5% were not sure that there were minimal delays in the project's timeline due to effective project (Mean=4.38; Std. Dev=0.59). Thirty one percent of the respondents strongly agreed, 66% agreed and 3% were not sure that the project was executed within the allocated budget (Mean=4.28; Std. Dev=0.51), 38% strongly agreed, 58% agreed and 4% were not sure that cost management practices during the project were effective in preventing budget overruns (Mean=4.34; Std. Dev=0.55). Forty eight percent of the

respondents strongly agreed, 50% agreed and 2% were not sure that the completed project met the specified requirements and quality standards (Mean=4.45; Std. Dev=0.55).

Table 4: Performance of building construction projects

Statements	N	Mean	Std. Dev.
The project is within the scheduled timeframe	202	4.16	0.50
There are minimal delays in the project's timeline due to effective project management	202	4.38	0.59
The project is executed within the allocated budget	202	4.28	0.51
Cost management practices during the project are effective in preventing budget overruns	202	4.34	0.55
The completed project meets specified requirements and quality standards	202	4.45	0.55
Aggregate mean		**4.32**	

Source: Field data (2024)

Respondents indicated that performance of building construction projects could be significantly improved by focusing on better project planning, clear communication and effective risk management. Establishing realistic timelines, defining clear roles and ensuring the availability of resources from the start would reduce delays and cost overruns.

Correlation Analysis

Correlation is a statistical method for determining the strength and direction of a relationship between two variables. Depending on the strength of the link, the correlation coefficient might range from +1 to -1. The table shows the p-values and Pearson correlations for the relationship between building construction project performance and quality management practices. The p-values and Pearson correlation coefficients are shown in Table 5.

Table 5: Correlation analysis

		Performance
Performance	Pearson Correlation	1
	Sig. (2-tailed)	
	N	202
Top management commitment	Pearson Correlation	.625**
	Sig. (2-tailed)	0.000
	N	202
Relationship management	Pearson Correlation	.445**
	Sig. (2-tailed)	0.000
	N	202

**. Correlation is significant at the 0.05

Source: Field data (2024)

The success of building construction projects moderately and significantly correlated with the commitment of top management ($r = 0.625$, $p = 0.000$). Indeed, Vishe (2023) and Shehu (2021) emphasize that top management's strategic decisions significantly influence project success. Rahman and Susanto (2022) also stress the importance of top leadership in providing direction, supervision, and resources.

Continuous improvement had a significant moderate correlation with performance of building construction projects (r = 0.445, p = 0.000). This is in line with findings of Albert et al. (2018) and Ukochi et al. (2023) , who observed that continuous improvement enhances responsiveness, efficiency and innovation. The use of performance monitoring and feedback loops, as explained by Shiku (2022) and Otido et al. (2019), moderately correlates with project performance.

Linear regression model

The purpose of linear regression, a statistical method, is to estimate the degree to which one or more independent variables are linearly related to a single dependent variable (Hirsch, 2024). While multiple linear regression makes use of several explanatory variables, simple linear regression just makes use of one (Pisică, Dammers, Boersma & Volovici, 2022). The effect of the independent variable on the dependent variable was examined by a multiple regression analysis.

Table 6: Coefficients

	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t	Sig.	VIF
(Constant)	0.722	0.255		2.832	0.005	
Top management commitment	0.377	0.061	0.377	6.155	0.000	1.669
Continuous improvement	0.343	0.054	0.386	6.367	0.000	1.634
a. Dependent Variable: performance						

Source: Field Data (2024)

Table 6 displays regression equation for the model:

$Y = 0.722 + 0.377 X_1 + 0.343 X_2 + \varepsilon$

The study indicated a significant and positive influence of top management commitment on performance of building construction projects in secondary schools in machakos county (β = 0.377, p = 0.000). This conforms to Yap, Leong and Skitmore (2020) study, who concluded that support from top management promotes teamwork and project performance. This supports the current study's emphasis on managerial commitment as a driver for improving project outcomes by creating a favorable environment for collaboration and task completion. Similarly, Riaz et al. (2023) identified poor top management support as a main challenge to implementing quality management in the construction sectors of emerging nations.

Findings also resonate with Ullah et al. (2018), who highlighted the importance of commitment from all involved parties, including management, for the success of construction projects. The current study quantifies this impact in the Kenyan context, providing further evidence of its importance. Abdulmalek and Ahamat (2022) similarly identified a strong connection between top management commitment and organizational performance in Yemen, reinforcing the idea that management's dedication significantly influences construction project outcomes across different contexts, despite variations in methodological and contextual settings. Arof et al. (2019) demonstrated that construction participants perceive performance evaluation systems as beneficial, noting the importance of managerial commitment in ensuring the effectiveness of such systems. This aligns with the Machakos County findings, emphasizing how leadership fosters improved outcomes in construction projects.

In Nigeria, Rugu et al. (2018) identified top management commitment as one of the key elements for implementing total quality management in construction companies, further illustrating its importance in achieving project success. Their findings suggest that management leadership is crucial for driving quality improvement and addressing challenges in the construction sector. Similarly, Shirandula, Kisimbii, and Otieno (2018) noted that management commitment positively affects firm performance in Mombasa County's construction industry. They recommended further research in different Kenyan counties to validate their findings, aligning with the current study's context in Machakos County. This broad body of literature underscores the universal importance of top management commitment in driving performance in construction projects.

Relationship between continuous improvement on performance of building construction projects was positive and significant ($\beta = 0.343$, $p = 0.000$). This aligns with results of Heravi, Kebria, and Rostami (2021), who examined the application of lean techniques such as continuous flow, JIT, TPM and VSM in the assembly and production of pre-fabricated steel frames in Tehran, Iran. Their study demonstrated that phased lean management using these techniques significantly enhanced project performance, reducing costs and timelines by 43% and 17%, respectively. This highlights the importance of systematic continuous improvement strategies in boosting project efficiency, a perspective further supported by Willar (2017), who highlighted continuous improvement as a critical element in evaluating construction performance in Indonesia. Similarly, Nyakala, Pretorius, and Vermeulen (2021) emphasized the role of quality processes, including ongoing enhancement, in improving road infrastructure projects in South Africa, while Hei et al. (2024) demonstrated the value of combining lean construction principles with BIM capabilities to enhance productivity and reduce inefficiencies in China. Collectively, these studies highlight the universal applicability of continuous improvement techniques, aligning with the current study's findings that underscore their positive impact on construction project performance in Machakos County.

Conclusions

The study concludes that top management's commitment significantly improves the clarity and precision of project objectives, aligning them with organizational goals. This positively influences the efficiency of organizational processes in construction projects by enhancing coordination and communication within project teams. Furthermore, the active involvement of top management in goal setting increases the likelihood of achieving project milestones, contributing to overall project success.

Continuous improvement practices enhance the effectiveness of performance monitoring in construction projects. These practices enable the timely identification and resolution of project issues, ensuring smoother project implementation. Through the integration of a continuous improvement framework, customer feedback is effectively incorporated into project processes and regularly acted upon to improve outcomes. Additionally, continuous improvement promotes innovation through research and development, leading to innovative solutions that enhance project performance.

Recommendations

Top management commitment and performance of building construction projects

This study recommends that project managers should prioritize active involvement and commitment from top management. They should establish clear communication channels between top management and project teams to ensure alignment with organizational goals.

Project managers should also facilitate regular goal-setting sessions involving top management to increase the likelihood of achieving project milestones. This would improve coordination, communication, and overall project success.

Continuous improvement and performance of building construction projects

Project managers should adopt continuous improvement practices as an integral part of project management. This involves implementing frameworks that facilitate regular performance monitoring and timely identification of project issues. Managers should create systems to integrate customer feedback into project processes effectively, ensuring feedback is reviewed and acted upon to enhance outcomes. Furthermore, encouraging research and development within the team can lead to innovative solutions, boosting the overall performance of construction projects.

Suggestions for further studies and research

This study examined the influence of quality management practices on performance of building construction projects in secondary schools in machakos county. The study was thus limited to machakos county. Further studies could investigate other counties. The study focused on secondary schools. Other studies could focus on tertiary institutions projects to better understand the influence of quality management practices on performance of building construction projects. Further research could examine how policy and regulatory frameworks influence the adoption and effectiveness of quality management practices in MoE-funded construction projects. This would provide insights into areas where policy adjustments might enhance project performance.

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