

Quality Management Practices and Successful Completion of Building Construction Projects in Nakuru Town, Kenya

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ABSTRACT: This study aimed at examining the quality management practices of building contractors in Nakuru town and how these practices influence successful completion of projects. The study utilized the descriptive survey design where a sample of 107 building contractors was selected from the target population of 335 NCA registered building contractors in Nakuru town using the proportionate stratified sampling method. Data was collected from the selected companies using structured questionnaires, and analyzed using both descriptive and the multiple linear regression technique. Results revealed that all the four components of quality management have a statistically significant and positive relationship with successful completion of building projects in Nakuru town. Quality improvement practices were found to have the most significant influence on successful completion of projects followed by quality control practices. The regression model comprising of the four quality management variables as predictors explained eighty percent of changes in project completion success. The study recommended that building construction firm invest in quality management especially quality improvement in order to increase their rate of project completion success. Policy makers should also introduce quality management courses in the training curricular of key construction workers such as engineers and project managers so as to improve the implementation of construction projects.

KeyWords: Quality Planning, Quality Assurance, Quality Control, Quality Improvement

I. INTRODUCTION

Quality management is one of the knowledge areas in project management and is a discipline that seeks to ensure that the outcomes and benefits of projects are fit for purpose and meet requirements (Project Management Institute, 2013). Quality management has four main components: quality planning, quality assurance, quality control, and quality improvement. Quality planning entails establishing standards and requirements that the project ought to deliver. It is an important component of quality management as it provides the project team with a blueprint for managing project quality. An effective quality planning process should involve all stakeholders and establish elaborate quality standards (Senarathne & Jayarathna, 2012). The quality plan should also conform to values, requirements, and norms of the organization, as well as, external stakeholders such as government agencies. Quality assurance ensured that the standards developed during the planning stage are met during the actual implementation of project tasks (Kraft & Molenaar, 2014). It is a proactive process that seeks to ensure that the project tasks are implementing according to quality plan. Quality assurance is done through techniques such as monitoring of inputs, quality audits, training, benchmarking, and quality reviews. Quality control was involved in determining whether the outputs of the projects have met the acceptance criteria (Flyvbjerg, 2012). It is a reactive process that seeks to ensure that defect in project outputs are detected and corrected before the outputs are presented to the customer. Quality control is done through techniques such as inspections, testing, adjustment to processes, and reworks.

Quality improvement is also an important component of quality management. This component focused on using the information gathered during quality assurance and quality control stages to improve the project's quality management processes. Quality improvement is concerned with identifying root-causes of quality problems and addressing them so as to ensure that similar problems do not recur in the future. This process is especially important where projects are managed as part of a program or where project are managed with an organization context as the improvement made in

one project was benefit subsequent projects. Evidence from empirical researches suggests that, quality management has a significant impact on the success of project implementation processes. They asserted that quality management is the most important factor that separates a well-executed project from a failed or aborted one. They explained that quality management programs not only affect the quality of project outcomes, but also impacts other project constraints such as time, cost, and scope. Effective quality management contributed to superior project performance by enhancing process stability, increasing efficiency of project process, increasing the quality of outputs, and increasing customer satisfaction.

The building and construction industry is one of the key pillars of the Kenyan economy. However, it has been bedeviled by various issues. A significant problem entails safety violation associated with the use of substandard building materials, failure to observe protocols, and erecting buildings in unsafe sites. This problem has been illustrated by the collapse of several buildings across the country including the sunbeam building, Nyamakima building, and most recently, the Huruma building that claimed over 40 lives. The National Construction Authority (NCA) claims that it has shut down over 500 construction sites countrywide due to safety violation with 204 buildings in Nairobi set to be demolished in Nairobi (Otieno & Ogutu, 2016). Although necessary, the action taken by NCA is bound to have significant consequences to contractors and their clients including massive financial losses and potential lawsuits. Nakuru soils are unstable due to fault lines and escarpments. In 2008, there was appearance of large fault line across Mai mahiu road near Longonot creating a gapping hole caused massive traffic jam on the road and also destroyed farms and houses. Due to unstable soil in Nakuru town, the town council ruled limiting construction to not more than seven floors since some area in Nakuru lie on the fault line while others lie on the escarpment. But still some developers have ignored that. There have been a few cases of buildings collapsing while still under construction. Therefore the ongoing constructions should be supervised by the county engineers, planners, health departments and the National Environment Management Agency to make sure all the laid procedures are followed.

II. STATEMENT OF THE PROBLEM

The building construction industry is a key pillar in the Kenyan economy as it contributes 4.8% to the country's GDP and employs thousands of people. The industry also supports other sectors such as steel and cement manufacturing, catering, and banking. In addition, the building construction industry plays a critical role in meeting the housing needs of the people. However, this industry is plagued by a number of problems the most significant became gross safety violation manifested by a series of incidents of collapsed buildings across the country. It is estimated that construction industry is responsible for 27% of fatal injuries to employees, which affects the completion rate of projects. The average completion rate for government construction projects is 35.6%, which is dismal. In Nakuru, studies have shown that the soils are unstable due to fault lines and escarpments, thus making quality management practice in construction. Theories of quality management practices suggests that quality management is one of the knowledge areas that project managers need to master in order for them to implement projects successfully. Despite the significant safety problems encountered in the Kenya construction industry, no study has been conducted to examine the quality management practices of players within the industry and how these practices influence project outcomes. This study was seeking to address this knowledge gap by examining quality management practices of building contractors operating in Nakuru Town and how these practices influence the successful completion of projects.

III. OBJECTIVES OF THE STUDY

The main objective of the study was to examine the influence of quality management practices on successful completion of building construction projects in Nakuru Town, Kenya. Specifically, the study sought:

- i. To find out the influence of quality planning practices on the successful completion of building construction projects in Nakuru Town, Kenya.
- ii. To determine the influence of quality assurance practices on the successful completion of building construction projects in Nakuru Town, Kenya.
- iii. To evaluate the influence of quality control practices on the successful completion of building construction projects in Nakuru Town, Kenya.
- iv. To examine the influence of quality improvement practices on the successful completion of building construction projects in Nakuru Town, Kenya.

IV. THEORETICAL REVIEW

This study was guided by three theories: Juran's Theory of Quality Management, Deming's Theory of Total Quality Management, and Shenhar, Levy, and Dvir's Four Dimensions of Project Success.

Juran's Theory of Quality Management

Joseph M. Juran is one of the gurus in the field of quality management. His theory established three key steps in quality management, also known as the quality trilogy. These steps include quality planning, quality control, and quality improvement. When it comes to quality planning, the theory suggests that building construction companies in Nakuru Town should identify the customer, determine his needs, develop product features, establish quality goals, and develop processes that have proven capabilities. On quality control, the theory proposes that the construction companies should choose control subjects, choose units of measurement, establish measurement, establish standards of performance, measure actual performance, interpret difference between actual performance and pre-established standards, and take action to bridge the gap. On the issue of quality improvement, the theory expects building contractors in Nakuru town to identify specific quality gaps, diagnose the causes of quality gaps, identify remedies, implement remedies, and evaluate outcomes (Nofal *et al.*, 2014). Juran's philosophy of quality management also emphasizes the active involvement of senior managements in quality issues. The theory contends that it is the responsibility of senior managers to establish quality standards, develop quality policies, define quality goals that are expressed in numbers and include time frame, and provide resources needed to realize the quality goals. Managers must also define measures of quality and how their entities will meet these measures consistently. This theory provides a useful framework for evaluating project quality management practices of building construction projects in Nakuru Town.

Deming's Theory of Total Quality Management

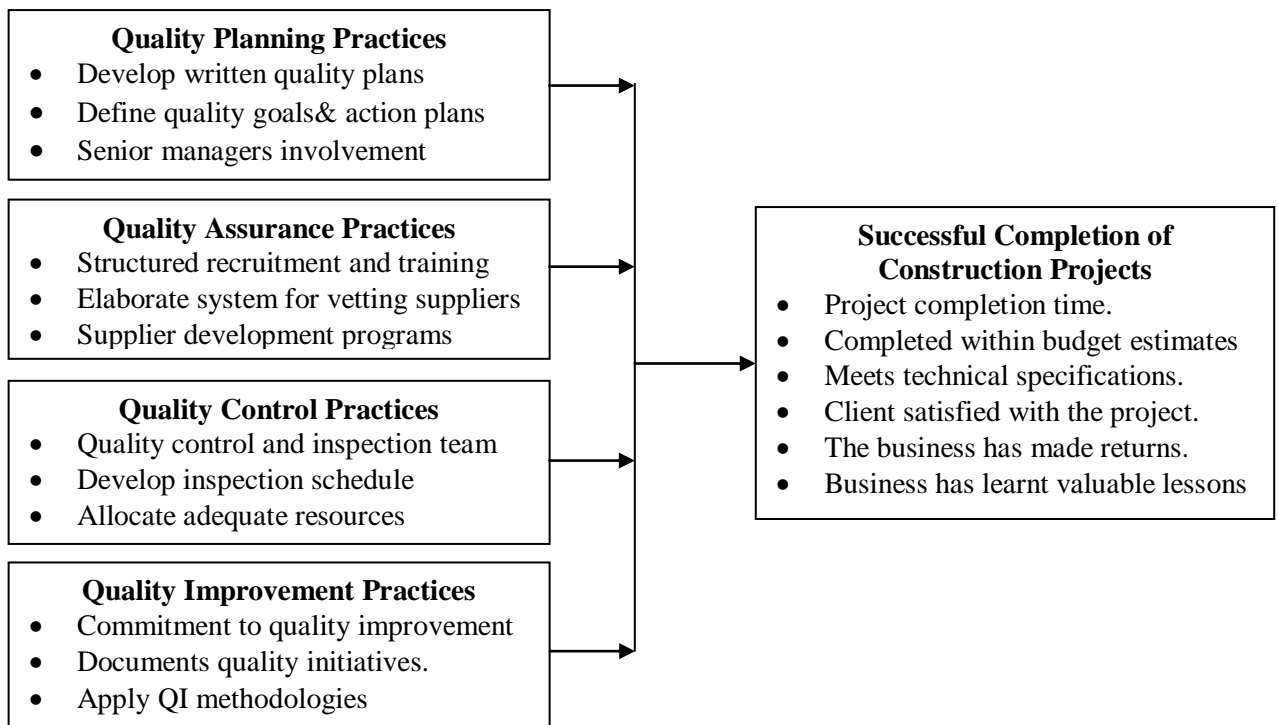
Edward Deming was also a renowned quality expert. The main proposition made in Deming's Theory is that it is possible for organizations to improve their productivity and competitiveness by improving quality (Nofal *et al.*, 2014). Deming argued that low quality leads to high costs resulting in loss of competitive position in the market. Quality improvement reduces cost by ensuring less rework, and minimal waste of material and manpower (Khan, 2010). Deming's Theory of Total Quality Management proposes fourteen points for managing quality including creating constancy of purpose, aiming at continuous improvement of production and services, and training and education. Deming's philosophy also emphasizes the need to value employees, the use statistics to identify and measure quality gaps, and active involvement of leaders in quality management. The theory contends that in order to improve project outcomes, contractors in Nakuru Town need to do things right the first time so as to avoid expensive reworks (Nofal *et al.*, 2014). They should develop long-term relationships with suppliers, institute training on the job, adopt modern methods of leadership, create a climate of innovation, and break down communication barriers. They need to improve processes, replace defect detection systems with defect prevention and continuous improvement system. Deming's introduced the Plan-Do-Check-Act cycle as a tool for use in improving quality.

2.2.3 Four Dimensions of Project Success

The Four Dimensions of Project Success is a framework proposed by Shenhar in 2001 measuring project success. The framework identifies four dimensions of project success: efficiency, impact on customer, business success, and preparing for the future. The project efficiency dimension is concerned with short term measures such as projects being completed on time and within specified budgets, as well as, project meeting technical and operational specifications. Impact on customer assess whether the project has deliver expected benefits to customers. This dimension measures the outcomes of the projects rather than the output (Kylindri *et al.*, 2012). It is concerned with issues such as whether customers' needs and expectations were met, whether the product is actually being utilized by the customer, and level of customer satisfaction. The business success dimension assesses the impact of the project on the business/ contractor. This dimension is concerned with impact of the project on measures such as sales, profitability and market share. This dimension can only be measured after one or two years. The final dimension examines the long-term impact of the project such as improving the organization technological infrastructure and organizational learning. This dimension can only be assessed three to five years after project completion. The model suggested that in order to measure the extent to which building construction projects in Nakuru town have been successful, the researcher should collect data on efficiency, impact on customer, business impact, and impact on future activities.

2.4. Conceptual Framework

The conceptual framework for this study four independent variables namely: quality planning practices, quality assurance practices, quality control practices, quality improvement practices, and quality improvement practices.



V. EMPIRICAL REVIEW

Influence of Quality Planning on Successful Completion of Projects

Quality management activities, like any other aspect of business, must be well thought-out and directed. Strategies and action plans for managing quality must be properly coordinated and be aligned with other initiatives within the firm. This what quality planning entails. It is a process that seeks to provide a structured sequence of activities that should be completed in order to improve and sustain quality (Senaratne & Jayarathna, 2012). It entails providing a road map on how the organization intends to realize quality goals. The quality planning process should culminate in the development of a quality plan, which is a document that describes how quality was achieved during the project. A good quality management plan should define quality goals, establish indicators that will act as measures of quality, establish action plans for realizing quality goals, assign responsibility for each action plan to individuals, and establish ways for monitoring and evaluating outcomes (Bhonde & Shaikh, 2015). It should also include define timelines, identify resources required to achieve quality goals, and include milestones. In their study, Duicu *et al.*, (2013) found that quality planning increased the probability of project success by ensuring quality management activities are well coordinated. Leong *et al.*, (2014) found that using quality indicators that are customer focused improved the effectiveness of quality plans in terms of helping projects realize quality outcomes. In Kenya, Githenya and Ngugi (2014) revealed that quality planning was among the significant factors that influenced housing project implementation. Ong’ondo (2016) found that the most important issues that project managers ought to pay attention to include clarity of scope statement, clarity of performance benchmarks, competency of project teams, and clarity of roles.

Influence of Quality Assurance on Successful Completion of Projects

Quality assurance is a proactive approach of managing quality. It entails putting in place checks that will ensure that quality is built into the project from the start (Goswami, 2015). It may encompass activities such as hiring qualified staff, selecting qualified and committed suppliers, training of staff and suppliers, improving the level of employee and supplier engagement, monitoring and inspecting inputs to ensure they meet required standards, and analyzing and approving designs (Bhonde & Shaikh, 2015). The prime objective of quality assurance is to avoid defects. There are a number of studies that have examined quality assurance practices in the context of project management. In their study, Ruxwana *et al.*, (2014) revealed that there were a number of weaknesses in the application of quality assurance such

quality assurance being formally applied in structured manner, lack of user involvement, and the absence of independent QA evaluations. However, it was established that despite these limitations, quality assurance contributed to the success of some e-health projects. Khraiwesh (2014) found that quality assurance increased the probability for success of software engineering projects by offering adequate level of confidence that the end product will satisfy quality requirements. Alshamamri (2013) recommended that in order to entrench quality assurance practices in project management, there is a need to create a separate department for executing quality assurance methodologies. Mallawaarachchi and Senaratne (2015) also found that construction project with minimal defects were more likely to have seamless and smooth transition from design to the commissioning and qualification phase resulting in realization of time and cost targets. This finding stressed the significance of having elaborate quality assurance system that will help the project team to minimize the number of defects.

Quality Control and Successful Completion of Projects

Quality control is another important step in quality management. Quality control entails inspecting and analyzing project outputs so as to determine whether these outputs meet pre-established standards (Goswami, 2015). Where it is found that the outputs fall short of the required standard, the quality control officer is expected to initiate corrective measures. In the construction setting, corrective measures may entail reworking some parts of the building. The goal of quality control is to identify and correct defect. It is a reactive approach of managing quality. However, it is a necessary step in quality management since it may not be possible for the project team to achieve 100% defect prevention. Reyes (2012) recommended several best practices in conducting quality control in construction projects including the establishment of a Quality Control Inspection unit, recruitment of qualified personnel into this unit, and creation of inspection schedules. The author also recommended that the Quality Control and Inspection team determine the level of nonconformance that requires corrective action in order to promote project efficiency. Arachchi, Chong, and Madhushani (2015) found that quality control was one of the important determinants for successful and effective implementation of Enterprise Resource Planning (ERP) systems as it leads to identification and correction of gaps that may affect the quality of ERP data. In their study, Githenya and Ngugi (2014) found that there was a significant relationship between project control measures and successful implementation of housing projects. Wambugu (2013) found that the supply of quality materials was a critical determinant for successful completion of rural electrification projects. It was revealed that unreliable supply of materials cause project delays and dampened the moral of workers resulting in low productivity.

Quality Improvement and Successful Completion of Projects

Quality improvement is a popular concept in routine manufacturing and service activities. However, the concept is not so common in the project management setup because most practitioners view projects as independent and temporary undertaking. This perception is misleading especially in the context of construction project where contractors are involved in the implementation of multiple projects (Hernandez & Aspinwall, 2008). In such settings, quality lessons and improvement learnt in one project can be transferred to subsequent projects. There are number of empirical studies that have examined the application of quality improvement practices in construction projects. Ahmed *et al.*, (2013) revealed that the main obstacles to the implementation of quality improvement efforts in construction projects including negative attitude and behavior towards the concept of quality the quality improvement concept, lack of expertise in the area quality improvement, inadequate employee commitment, inadequate resources, and lack of education and training. Aziz and Hafez (2013) showed that the application of the lean methodology enabled contractors to deliver better value to owners while making higher profits. In different study, Pestana *et al.*, (2014) demonstrated that it is possible to apply lean methodology to identify and eliminate quality gaps in construction projects. Taner (2013) noted that several factors were key to the successful application of Six Sigma including leadership and commitment of top management, linking quality initiatives to customers, and linking quality initiatives to suppliers. Although most of these studies have focused on construction projects, they do not link quality improvement practices with project success.

VI. RESEARCH METHODOLOGY

The study utilized the descriptive survey design. According to Bryman and Bell (2015), descriptive research design entails studying research variables as they occur in the natural setting with minimal manipulation. This design was selected because the researcher does not have control over the study variables; hence, they have to be studied in the natural setting. The target population for study comprised of all building contractors registered by the National Construction Authority (NCA) to operate in Nakuru town. According to the National Construction Authority (2016), there were 335 registered building contractors in Nakuru town in the 2015/ 2016 fiscal year. Key respondents included senior managers, project managers, technical managers, architects, quantity surveyors, and engineers working with

these registered building contractors. Using statistical formula a sample of 107 building contractors was obtained and which was allocated proportionately according to the various classes. Structured questionnaires were the main instruments of data collection and they were preferred because they facilitate statistical analysis by enabling the collection of large amount of data and limiting participants' responses to the same question allowing comparison (Cooper & Schindler, 2013). Questionnaires were distributed to participants using the drop-and-pick method where the researcher approached potential participants in person, explained the study to them, left the questionnaire, and picked it at an agreed future date. The drop-and-pick method was preferred because it increases response rate by adding a personal appeal to the data collection process (Bryman & Bell, 2015). Data collected was sorted, coded, and entered into the Statistical Package for Social Sciences (SPSS) version 24. The data was then analyzed using descriptive statistics and the multiple linear regression technique.

VII. RESEARCH FINDINGS AND DISCUSSION

Out of the 107 questionnaires that were distributed to potential respondents, 79 were duly filled and returned to the researcher translating to a response rate of 73.8%. Gender of participants was one of the demographic features that were analyzed and 70.9% of the respondents were male while women made up the remaining 29.1%. This finding is consistent with the study by Majid *et al.*, (2015), where it was found that women were underrepresented in the skilled workforce of the Malaysian construction industry. Another demographic trait that was analyzed was the age of participants and a majority of the respondents (43.1%) were within the 30-39 years age bracket, 36.7% were within 40-49 years while 10.1% were within 20-29 years and another 10.1% were above 50 years. This age distribution matches expectations given that the study targeted senior employees within the building construction companies such general managers and project managers. Another trait that was analyzed was the position of participants within their current organization and majority of the respondents (25.3%) were quantity surveyors, 20.3% were technical managers, 13.9% were engineers, 13.9% were project manager, another 13.9% were general managers, and 12.7% were architects. The study examined the length of time that the participants have worked in their current organizations and majority of the respondents (43.0%) had worked in the current organization for 1-3 years, 27.8% had worked for 4-6 years, 10.1% had worked for 7-9 years, another 10.1% had worked for 10 years and above, and 8.9% had worked for less than 1 year.

Descriptive Analysis of Quality Planning Practices

The descriptive findings of quality planning practices are shown in Table 1.

Table 1: Descriptive Analysis of Quality Planning Practice

Statement	Mean	S.D
A quality plan is developed for each and every project undertaken by the company	4.51	.972
Quality plans are usually well written and documented	4.15	1.199
Quality plan defines quality goals and objectives for each project	4.28	1.061
Quality plans stipulate action plans that the project team intend to pursue in order to realize quality goals	4.16	1.103
Quality plans stipulate ways for evaluating the implementation of the plan	4.14	1.022
Senior managers are actively involved in the development of quality plans	4.15	1.133
Line employees and clients are involved in the development of quality plans	2.39	1.475

The first statement was that a quality plan is developed for each and every project undertaken by the company. As Table 1 shows, the mean score for responses to this statement was 4.51, which indicates that a majority of the participants were in strong agreement with this statement. This finding is consistent with the study by Senaratne and Jayarathna (2012), where it was found that modern construction companies in developing countries are pay more attention to improving the quality planning process. The second statement sought to determine the extent to which the quality planning process in the surveyed organization was formalized. A mean of 4.15 suggest that a majority of the research participants reported that quality plans are usually documented. The finding is not consistent with Bhonde and Shaikh (2015) who found that most construction companies do not have elaborate system for documenting the quality requirement, standards and procedures. When participants were asked whether the quality plans formulated in their organizations define quality goals and objectives, the mean for the responses was 4.28 indicating that a majority of the participants gave a positive response. A majority of the participants (mean= 4.16) also reported that their quality plans stipulate action plans that the project team would pursue in order to realize quality goals. These findings are also not consistent with Senaratne and Jayarathna (2012) who found that developing countries still lag behind in terms of quality planning in construction projects. As indicated by a mean of 4.15, a majority of participants reported that senior managers within their organizations were actively involved in the quality planning process. However, a mean of 2.39 indicates that a

majority of the respondent refuted the statement that line level employees are usually involved in the quality planning process. This finding is consistent with the study by Okoye *et al.*, (2014), where it was found that many construction companies hire line employees on causal basis.

Descriptive Analysis of Quality Assurance Practices

The descriptive findings for quality assurance practices are shown in Table 2

Table 4.7: Descriptive Analysis of Quality Assurance Practices

Statement	Mean	S.D.
The company has structured systems for recruiting construction workers	3.99	1.127
The company has elaborate programs for improving workers capacity and engagement levels	4.15	1.075
The company has an elaborate system for vetting and selecting suppliers	3.87	1.090
The company has comprehensive programs for improving suppliers capacity and engagement level	2.44	1.298
The company has effective systems for evaluating design and engineering drawings	4.11	1.121

Quality assurance is the second step in the quality management process. The first statement was that the company has structured systems for recruiting construction workers. As shown in Table 2, the mean score of the responses to this question was 3.99, which indicates that a majority of the participants were in agreement with the statement. This finding is consistent with the study by Wells (2014), where it was found that construction workers in Kenya are often recruited through “gang leaders”; artisans with many years of experience and good reputation who lead a group of skilled and unskilled men. The second statement sought to establish whether the contractors had elaborate programs for improving the workers capacity and engagement levels. A mean score of 4.15 to this statement connotes that a majority of the participants gave a positive response. This finding is in line with Wells (2014), who also found that training standards and schemes have been developed and implemented mainly by professional bodies relevant to the construction industry such as the engineering board with aim of upgrading skills. and selecting suppliers and the mean score for responses to this statement was 3.87. This score indicates that a majority of the participants gave a positive response. The finding is consistent with Kimondo *et al.*, (2015), who found that a majority of registered construction company had structured supplier management systems. The fourth statement sought to establish whether the surveyed companies had comprehensive programs for improving the capacity and level of engagement of their suppliers. A mean of 2.44 to this statement indicates that a majority of the participants did not agree with the statement. The finding is consistent with Ang’ana (2015), who found that road contractors in Kenya had not made adequate investment in supplier relationships resulting in poor material flows and, consequently, late delivery of projects. The final statement sought to establish whether the surveyed contractors had effective systems for evaluating designs and engineering drawings and the mean score for responses to this statement was 4.11, which indicates that a majority of the participants gave positive responses. The finding is consistent with Ang’ana (2015) who found that construction companies had elaborate mechanism for reviewing designs and drawing.

Descriptive Analysis of Quality Control Practices

The descriptive findings on quality control practices are shown in Table 3.

Table 3: Descriptive Analysis of Quality Control Practices

Statement	Mean	S.D.
The company has independent quality control and inspection (QCI) teams	4.15	1.220
The company creates inspection schedule for each of its projects	4.16	1.055
The company allocates adequate resources to its QCI teams	3.68	1.161
The company applies statistical methods to identity quality variations	4.10	1.069
The company takes corrective measures whenever quality gaps are identified during inspections	4.06	1.090
Senior managers are actively involved in quality control activities	3.87	1.114

The first statement was that the construction company has an independent quality control and inspection unit and as Table 3 show, the mean score of responses to this statement is 4.15 which indicated that a majority of the participants were in agreement with the statement. This finding is consistent with Fernandez (2014), who found that building projects that are managed by registered contractors often have inspection teams that comprises of engineers and architects. As indicated by a mean of 4.16, participants also affirmed the statement that their company creates inspection

schedule for each of its projects. The also supported the claim that their company allocates adequate resources to the quality control and inspection teams. When participants were asked whether their companies make use of statistical techniques in quality control, the mean of their responses was 4.10. This mean implies that a majority of the respondents supported the claim that their companies make use of statistical methods in controlling quality. This finding is congruent with the study by Fernandez (2014), where it was observed that technicians and inspectors from registered construction companies in Kenya were involved in collecting samples of poured concrete from construction sites and test them in laboratories using calibrated hydraulic press. As indicated by a mean of 4.06, a majority of the participants confirmed the statement that their companies usually take corrective measured whenever quality gaps are identified. This finding is also consistent with Fernandez (2014), who found that inspectors from registered contractors recommend remedial actions based on the result of their inspection. As indicated by a mean of 3.87, a majority of study participants reported that their company’s senior managers are actively involved in quality control activities. This finding is consistent with Otieno (2015), who found that senior managers of construction companies in Mombasa County expressed commitment to quality control activities by accepting responsibility and incorporate quality control goals in the company’s vision and strategies.

Descriptive Analysis of Quality Improvement Practices

The descriptive findings on quality improvement practices are shown in Table 4.

Table 4.8: Descriptive Analysis of Quality Improvement Practices

Statement	Mean	S.D.
Senior managers are committed to improving quality in our projects	4.14	1.248
The organization has employees who are qualified in the quality improvement field	4.19	1.241
The organization applies quality improvement methodologies such Lean and Six Sigma	2.28	1.330
The company has systems for documenting quality improvement initiatives	3.99	1.296
The organization has the infrastructure for facilitating transfer of knowledge	4.18	1.206
The company encourages its employees to learn and improve themselves	4.23	1.219

The first statement was that senior managers are committed to improving quality in projects. As shown in Table 4, the mean score for responses to this statement is 4.14. This mean connotes that a majority of the participants agreed with the statement. This finding is consistent with Otieno (2015), who also found that top managers of building contractors supported quality improvement initiatives by incorporating improvement goals in the company’s vision. A majority of the participants (mean= 4.19) also reported that their company had employees who are qualified in the quality improvement field. Quality improvement efforts are likely to be more successful when organizations use proven methodologies and approaches such as Lean, Six Sigma, and 5S. Participants were asked whether their firm applies proven quality improvement methodologies. The mean score of their responses is 2.28, which indicates that a majority of participants refuted the claim that proven quality improvement methodologies are applied in their companies. This finding is consistent with Hernandez and Aspinwall (2008), who found that although several quality improvement methods have emerged under the total quality management umbrella; these methods have limitations in terms of their applicability in the construction sector. Construction firms also need an infrastructure for facilitating the transfer of knowledge from one project to another. As the mean of 3.99 suggests, a majority of the participants reported that their organization has systems for documenting quality improvement initiatives. A majority of the participants (mean= 4.18) also reported that their organization had the infrastructure for facilitating transfer of knowledge and experience from one project to another. As indicated by a mean of 4.23, a majority of the study participants reported that their companies encourage employees to learn and improve themselves. This finding is consistent with Wells (2014), who found that many construction companies develop and implement training and development schemes.

Descriptive Analysis of Project Completion Success

The descriptive findings on the dependent variable, successful completion of projects are shown in Table 5.

Table 4.9: Descriptive Analysis of Project Completion Success

Statement	Mean	S. D.
Over 60% of our projects are completed in time	3.90	1.246
Over 60% of our projects are completed within budget estimates	3.92	1.259
Over 60% of our projects meet technical expectations	4.22	1.106
Over 60% of our clients are satisfied with our work	4.23	1.120

The company makes returns in over 60% of the projects that it undertakes	3.99	1.245
The company has learnt valuable lessons from projects completed in the past	4.27	1.163

The first statement sought to determine the extent to which the contractors completed their project in time. As shown in Table 5, the mean response to the first statement is 3.90, which implies that a majority of respondents agreed with the claim that over 60% of project undertaken by their firms are completed on time. This finding is consistent with Kihoro (2015), who found that 63% of gated community construction projects in Nairobi were completed within stipulated time. The second statement sought to establish the extent to which projects undertaken by building contractors in Nakuru are completed within budget estimates. Majority of the participants (mean = 3.92) supported the claim that that over 60% of projects undertaken by their firm are completed within budget estimates. The finding is congruent with the study by Kihoro (2015), where it was found that 63% of gated community construction projects were completed within stipulated budget. As indicated by a mean of 4.22, a majority of study participants reported that over 60% of projects undertaken by their firms meet technical specifications. The finding is not consistent with Githenya and Ngugi (2014), who found that a majority of construction projects in Kenya urban areas do not always meet key performance goals. A majority of the study participants (mean= 4.23) reported that over 60% of the clients are satisfied with the projects that they undertake. The finding is congruent with Kihoro (2015), who found that 63% of clients gated community construction project were satisfied with project outcomes. As indicated by a mean of 3.99, a majority of the participants reported that their firm makes financial returns in over 60% of the implemented projects. This finding is consistent with Makori and Jagongo (2013), who found that a majority of listed construction and manufacturing companies in Kenya were profitable with the mean value of return on assets being 15.7% and sales growth rate being 16.1% per annum. Therefore, the ability to learn from high performance projects and taking lesson from failures of previous project was critical for construction improvement. As indicated by a mean of 4.27, a majority of the participants reported that their firms have learnt valuable lessons from projects completed in the past.

Regression Analysis

Table 6 present a summary of the model.

Table 6: Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.927 ^a	.860	.853	.42528

As the table shows, the adjusted r-square is 0.853, which indicates that the model explain 85.3% of changes in project completion success. According to Toole (2013), a model that yield an R square of above 0.25 is considered to be of good fit in social science research. Table 7 present the ANOVA for the model.

Table 7: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	82.325	4	20.581	113.792	.000 ^b
	Residual	13.384	74	.181		
	Total	95.709	78			

As the Table 7 shows, the ANOVA test suggests the existence of a statistically significant relationship between project completion success, and the four quality management practices (quality planning, quality assurance, quality control, and quality improvement practices). The regression coefficients were as shown in Table 8.

Table 8: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.375	.091		4.121	.001
	Quality Planning	.252	.116	.235	2.163	.034
	Quality Assurance	.310	.112	.291	2.768	.027
	Quality Control	.377	.086	.354	4.361	.000
	Quality Improvement	.366	.075	.399	4.877	.000

From the findings in Table 8, the t-statistic for quality planning practices ($p=0.034<.05$) implying that there is statistically significant relationship between quality planning practices and successful completion of building construction projects. Similarly, the t-statistic for quality assurance practices ($p=0.027<.05$) which suggests that there is a statistically significant relationship between quality assurance practices and successful completion of building construction projects. Furthermore, the t-statistic for quality control practices ($p=0.00<.05$) implying that that there is a statistically significant relationship between quality control practices and successful completion of building construction projects. Finally, the t-statistic for quality improvement practices ($p=0.00<.05$) implying that there is a statistically significant relationship between quality improvement practices and the successful completion of building construction projects.

VIII. CONCLUSION

The study concluded that all the four components of quality management (quality planning, assurance, control, and improvement) have a statistically significant and positive relationship with successful completion of building construction projects in Nakuru town. Quality improvement practices were found to have the most significant influence on successful completion of projects followed by quality control practices. Of the four quality management variables, Quality planning was found to have the weakest relationship with successful completion of project, but the relationship was nonetheless statistically significant. The study has established that quality management practices have a significant influence on successful completion of projects. Consequently, building construction companies should enhance their quality management practices in order to increase their rate of project completion success. The firms should particularly invest in quality improvement activities since quality improvement was found to have the most significant influence of project success. A specific deficiency that construction firms need to address with regard to quality improvement practices is the application of proven quality improvement methodologies such as Lean and Six Sigma. This deficiency can be address by training their workforce on how to apply these improvement approaches in construction projects. Firms also need to invest in program aimed at improving supplier capacity and relationship in order to enhance their quality assurance practices. They should also ensure active involvement of low level employees in the development of quality plan so as to enhance their commitment to quality goals. At the policy level, stakeholders should introduce quality management course in the training curriculums of key staff in the construction industry such as engineers and project manager in order to improve the implementation of construction projects. Regulatory bodies in the building construction field should also enhance the monitoring activities so as to ensure all contractors adhere to quality standards.

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