



**ADDIS ABABA UNIVERSITY**  
**COLLEGE OF BUSINESS AND ECONOMICS**  
**SCHOOL OF COMMERCE**

**ASSESSMENT OF QUALITY MANAGEMENT SYSTEM: THE CASE**  
**OF ADDIS CAPITAL GOODS HEADQUARTERS DESIGN AND**  
**CONSTRUCTION PROJECT**

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**June, 2024**

**Addis Ababa, Ethiopia**

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DEPARTMENT OF PROJECT MANAGEMENT**

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CONSTRUCTION PROJECT**

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**ID: GSE/0511/14**

A Project Work Submitted to Addis Ababa University College of Business and Economics, School of Commerce in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Project Management (MAPM)

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**June, 2024**

**Addis Ababa, Ethiopia**

**ADDIS ABABA UNIVERSITY**  
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The undersigned have examined the research paper entitled ‘Assessment of Quality Management System: The Case of Addis Capital Goods Headquarter Design and Construction Project presented by Kaleab Abay Tessema a candidate for the degree of Master of Arts in Project Management and complies with the regulations of the University and meets the accepted standards for originality and quality.

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## DECLARATION

I, Kaleab Abay Tessema, declare that this final project work entitled “Assessment of Quality Management System: The Case of Addis Capital Goods Head Quarter Design and Construction Project” represents my work with the guidance of my advisor. It has not been previously included in any project work, dissertation, or report submitted to any university for a degree, diploma, or other qualification. It is conducted for the partial fulfillment of the requirement for the Degree of Masters of Arts in Project Management and submitted to the School of Commerce, AAU.

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Date: \_\_\_\_\_

## CERTIFICATIONS

This is to certify that this final project work prepared by Kaleab Abay Tessema entitled “Assessment of Quality Management System: The Case of Addis Capital Goods Head Quarter Design and Construction Project” submitted in partial fulfillment of the requirement for the Degree of Masters of Arts in Project Management complies with the regulations of the university and meets the accepted standards concerning originality and quality.

Advisor: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

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## Abstract

*This study examines the implementation of quality management systems (QMS) within the Addis Capital Goods Headquarters (ACGHQ) design and construction project, undertaken by the Ethiopian Engineering and Investment Group (EEIG). The overarching objective is to assess the QMS in achieving project success and identify factors contributing to any discrepancies between intended and actual implementation. The research utilizes a descriptive research design with a quantitative approach to data collection techniques. This study adopts the Census sampling method and utilizes complete data collection, with the use of data from the entire population of 55 respondents within the project implementation team at ACGHQ, representing a 100% response rate. Data was collected through a structured questionnaire, covering dimensions such as QMS awareness, quality planning, quality assurance mechanisms, quality control implementation, QMS implementation challenges, and quality management practices. Descriptive analysis was conducted using SPSS version 27. The study found that while EEIG has implemented various QMS tools, including quality planning, assurance, and control, challenges persist. These include a lack of a fully integrated QMS, employee training deficiencies, particularly in areas such as non-destructive testing and statistical process control, and the need for enhanced communication and collaboration between departments and stakeholders. While the organization has a formalized quality policy, a defined structure for quality planning, and a dedicated QA/QC team, knowledge gaps exist among team members regarding specialized techniques, and there is a need for a more integrated and holistic quality management system. The study recommends enhancing training programs to address knowledge gaps, improving communication protocols between departments and stakeholders, implementing a robust supplier selection and onboarding process, and fostering a culture of continuous improvement. By addressing these gaps, EEIG can enhance project performance, achieve higher-quality outcomes, and maintain a competitive edge in the Ethiopian construction industry.*

**Keywords:** *Quality Management System, Construction Project, Quality Assurance, Quality Control, Training, Communication, Ethiopia, Addis Capital Goods Headquarter*

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## Abbreviation and Acronyms

ACGHQ.....	Addis Capital Goods Headquarters
ASQ.....	American Society for Quality
CAPA .....	Corrective and Preventive Action
DOE.....	Design of Experiment
DPU.....	Defects Per Unit
ECDSWCo.....	Engineering, Construction, Design, and Supply Work Corporation
EEIG.....	Ethiopian Engineering and Investment Group
ECIF.....	Engineering Change Implementation Form
IPMA.....	International Project Management Association
ISO.....	International Organization for Standardization
NDT.....	Non-destructive testing
PMBOK.....	Project Management Body of Knowledge
PMI.....	Project Management Institute
QA.....	Quality Assurance
QC.....	Quality Control
QFD.....	Quality Function Deployment
QM.....	Quality Management
QMS.....	Quality Management System
SPC.....	Statistical Process Control
SPSS.....	Statistical Package for the Social Science
TQM.....	Total Quality Management
WIR.....	Work Inspection Requests

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

Project management and implementation revolve around three fundamental parameters: quality, cost, and time. It is crucial to prioritize delivering the best quality within the allocated time and budget to ensure successful project management (Larson, E.W. and Gray, C.F, 2018). To achieve this, projects must establish clear quality requirements and define processes for various work tasks. These processes encompass several elements such as defining the project scope, outlining quality requirements, conducting quality inspections and tests, providing work instructions, reviewing and approving submittals, documenting requirements, and establishing comprehensive procedures for identifying and resolving non-conformance issues (Gunduz, M. and Naser, A.F, 2017).

Organizations have acknowledged the significance of adopting efficient quality management practices to meet customer demands and maintain a competitive edge, due to the growing need for high-quality products and services (Yusr, 2016). However, a 2017 report titled "Pulse of the Profession: Quality Management Benchmarking Study," found that organizations that invest in quality management practices reported a 22% increase in customer satisfaction and a 20% reduction in costs on average. The report highlights the importance of adopting a "quality-centric" approach to project management, which involves integrating quality management principles and practices into every stage of the project lifecycle.

Additionally, the significance of employee involvement and continuous improvement in quality management practices was emphasized even more with the introduction of quality control circles and total quality management (TQM) methodologies (Yusr, 2016). These developments emphasized the significance of involving every level of a company in recognizing and solving quality-related problems, while consistently aiming to improve quality standards through continuous improvement and innovation. (Salehi & Fayyaz, 2018).

To stay competitive in today's tough market, businesses must constantly enhance the quality of their products, services, and operations (Ismayrlis and Moschidis, 2015). However, to achieve client goals within the allocated time and budget, the project manager needs to employ robust quality management methods. The project manager's focus extends to two key areas: ensuring the quality

of the project's delivered product, service, or process, as well as maintaining a high standard in the project management process itself (Wysock, 2014).

According to Abdul Karim (2005), construction projects in many developing countries account for 10% of their Gross Domestic Product (GDP) and approximately half of the wealth invested in fixed assets. Still, the goal of all construction projects is to finish tasks on time, within budget, and meeting quality standards, while ensuring a safe work environment (Autodesk, 2023). Research has shown that poor quality management is a significant contributor to construction project failures. A study by the Construction Industry Institute (2007) found that inadequate project planning and control, including quality management, was a major factor in 50% of all construction project failures.

In recent years, there has been a noticeable growth in the construction industry in Ethiopia, particularly in the number of buildings, roads, dams, and infrastructure projects (Taye, 2020). However, according to Tamiru (2018), the construction industry has encountered difficulties like poor efficiency and unsatisfactory outcomes, with customers demanding projects to be completed promptly and within financial limits. To monitor and uphold quality in this expanding industry, the Ethiopian government has implemented several quality management standards and regulations (Zewdu & Assefa, 2018).

Such as the International Organization for Standardization (ISO) 9001:2015 standards that are widely adopted in Ethiopia's construction sector (Mamo, 2022), the Ethiopian Quality Award (EQA) self-assessment model, which is used to assess the quality management practices of construction companies, Quality Management Systems certification that many construction companies in Ethiopia have obtained QMS certification, Quality Assurance and Quality Control, these practices are widely adopted in Ethiopian construction to ensure the quality of construction materials, workmanship, and finished products, and Total Quality Management principles in the Ethiopian construction industry is still at an infant stage, but aims to ensure customer satisfaction, continuous improvement and employee involvement (Wubishet, 2017).

However, despite the adoption of these standards, the construction industry in Ethiopia still faces challenges in implementing effective quality management practices (Azeb, 2021). Factors such as lack of management commitment, inadequate resources, and insufficient training of personnel contribute to the gap between the intended and actual implementation of quality management

systems (Ababaw, 2021). To address these challenges, a study by Zebiba (2021), suggested construction companies in Ethiopia need to focus on strategies such as top management support, provision of resources, establishment of multidisciplinary teams, and adequate knowledge of quality management tools and techniques. Additionally, the government should play a more active role in enforcing quality standards and providing support to construction companies in implementing effective quality management practices.

In addition, different research has shown that the effective implementation of quality management practices can lead to numerous benefits in the construction industry, including reduced rework, improved project efficiency, enhanced customer satisfaction, and better financial performance (Alinaitwe, Mwakali, & Hansson, 2021). However, these sources highlight that while Ethiopian construction companies are familiar with quality management concepts, the actual implementation and adoption of comprehensive, systematic quality practices is relatively low. Lack of formal QMS, inadequate quality control processes, poor documentation, and limited alignment with modern quality principles are cited as common challenges faced, the successful adoption and implementation of quality management practices in construction are also often hindered by various organizational, technical, and cultural factors (Mosly, 2015).

Therefore, this study aims to assess the implementation of quality management systems in the design and construction activities of the Addis Capital Goods Headquarters construction project and identify the specific measures taken by the firm to ensure quality within the organization. The Corporation is emerging as an Engineering and Investment Group. The proposed name of the Group is "Ethiopian Engineering and Investment Group (EEIG)". It operates as a leading construction and engineering company, undertaking a wide range of projects (Mulu & Worku, 2021). The Group comprises three main operational business units, which are Consultancy, Construction, and Investment. EEIG-Construction business unit's key activities are high-end complex construction projects, predominately high-rise commercial and residential buildings, real estate, infrastructure (roads, railways, and airports) & water and energy sector construction.

The study also seeks to uncover the existing factors that contribute to discrepancies between the intended practice of quality management systems and the actual implementation that results in project success in building construction projects. By examining these realities, the study aims to

shed light on the challenges and areas for improvement in ensuring quality throughout the construction process.

## 1.2 Statement of the Problem

Quality can be defined as the level of conformance of the final deliverable to the customer's requirements. One cause of usual project failure is that quality is overlooked or sacrificed so that a tight deadline can be met (PMI, 2017). Several factors can contribute to projects not meeting expectations in terms of quality. Some of the key arguments are that ineffective planning of project control methods, a lack of capable professionals involved in the process, insufficient focus on constant process improvement, and financial constraints all play a significant role (Mekonnen & Mengiste, 2018). Moreover, the increasing technical complexity and logistical challenges of today's projects make the construction industry particularly susceptible to setbacks when it comes to ensuring quality (Kang & Liu, 2019). Therefore, it becomes crucial to develop and implement new quality management practices to address these issues effectively.

From the perspective of a construction company, quality management in construction projects should mean maintaining the quality of construction works at the required standard to obtain customers' satisfaction which would bring long-term competitiveness and business survival for the companies (Abdul-Rahman, 2005). The construction industry encounters challenges in effectively implementing quality management practices and meeting stakeholder expectations, which are critical for ensuring project success (Smith et al., 2018). Although existing literature offers insights into quality management practices, there is a dearth of empirical evidence and a limited understanding of their effectiveness and the challenges they pose in construction projects (Yousra, Samira, & Ouafa, 2023).

Research conducted by the American Society for Quality (2017), revealed that businesses implementing quality management techniques achieve a 22% boost in customer satisfaction and a 20% decrease in expenses on average. Another research conducted by the International Organization for Standardization (ISO) revealed that companies that adopt ISO 9001, a commonly utilized quality management standard, observe a 12% rise in productivity on average and a 10% decrease in defects.

A survey by the Ethiopian Construction Industry Federation (ECIF) found that only 20% of construction firms in Ethiopia have a quality management system meeting the ISO 9001:2015 standard. The Ethiopian construction sector is encountering various difficulties, such as inadequate management practices, which are impacting project completion (Kifulu, 2017). Moreover, the research pointed out that the lack of strong quality management practices plays a major role in the widespread presence of construction defects and failures in the country. These results emphasize the urgent requirement for enhanced quality management systems and practices in the Ethiopian construction sector. Inadequate resources, such as financial and human resources, frequently hinder the adoption of quality management practices in the construction industry in Ethiopia (Melesse, 2015).

A study by Gebre-Egziabher and Tadesse (2017) examined the quality management practices of the EEIG. The researchers found that the company had implemented various quality management systems and tools, such as quality planning, quality assurance, and quality control. However, the study also identified several challenges that the EEIG faced in effectively implementing these practices, one of the key challenges was the lack of a comprehensive quality management system that was fully integrated throughout the organization (Gebre-Egziabher & Tadesse, 2017). The researchers highlighted the need for the EEIG to develop a more holistic and systematic approach to quality management, addressing all aspects of the construction process.

Additionally, the study found that the EEIG faced challenges in terms of employee training and development in quality management. The researchers emphasized the importance of providing continuous training and education to enhance the skills and knowledge of the company's personnel in quality management techniques (Gebre-Egziabher & Tadesse, 2017). In terms of organizational culture, the study revealed that EEIG had a relatively strong quality-oriented culture, with a high level of management commitment and employee engagement in quality improvement efforts. However, the researchers also identified areas for improvement, such as enhancing communication and collaboration among different departments and project teams.

Therefore, this study focuses on researching the Addis capital goods headquarters design and construction project that is constructed by EEIG as a contractor and assessing the current quality management practice of the organization on the project to fill these empirical gaps, provide novel

insights, and enhance the comprehension of quality management practices in construction projects to enable stakeholders to heighten project success and drive industry-wide improvements.

### 1.3 Research Questions

The study will seek to answer the following questions.

- 1 What are the quality management awareness, policies, processes, tools, and techniques frequently practiced in the ACGHQ project?
- 2 What factors contribute to the gap in the expected and desired outcomes of quality management practices in the ACGHQ project?
- 3 How do top managers at EEIG perceive a comprehensive Quality Management System for achieving project success and organizational goals in the ACGHQ project?
- 4 What are the major challenges the ACGHQ project faces in implementing project quality management practices?

### 1.4 Objectives of the Study

The general and specific objectives of this study are as follows:

#### 1.4.1 General Objective

The main objective of this study is to assess quality management practices in the Addis Capital Goods Headquarters Design and Construction Project by examining the gap between desired outcomes and actual results while exploring top management perceptions of a comprehensive quality management system and identifying key challenges encountered in implementation.

#### 1.4.2 Specific Objectives

- To analyze the quality management awareness, processes, policies, tools, and techniques frequently applied in the ACGHQ design and construction project.
- To investigate the key determinants that contribute to the disparity in the expected and actual outcomes of quality management practices in the ACGHQ project.
- To analyze how top managers at EEIG perceive a comprehensive Quality Management System as a tool for achieving project success and organizational goals within the ACGHQ project.

- To identify the specific challenges encountered during the implementation of project quality management practices, with a focus on the ACGHQ design and construction project.

## 1.5 Significance of the Study

Ensuring that quality management practices are effectively implemented and meet stakeholder expectations is important for achieving project success. Hence, this research is highly important for all parties involved in guaranteeing the accomplishment of the project. This research aims to enhance the current knowledge by providing new perspectives, real-world data, and a more profound comprehension of the benefits and obstacles related to quality management practices in the field. This research project could be used as a helpful resource for professionals and organizations working on similar projects, encouraging ongoing development and making it easier to share knowledge in the industry. Moreover, this study could spark future research by pinpointing gaps in existing research and areas where empirical evidence is lacking.

## 1.6 Scope of the Study

The study centers on assessing quality management practices of the design and construction project of the Addis Capital Goods headquarters within the Construction industry. This project involves multiple sectors specializing in various aspects of building, infrastructure development, and related services. The study's methodological scope, involves a descriptive design, quantitative data collection through questionnaires, and analysis using descriptive statistics. Where census ensures the use of all populations from the project. The study's methodological approach is appropriate for the research question and aims to provide valuable insights into the QMS implementation within the specific context of the ACGHQ project.

Only one of the ten project management knowledge areas quality management will be the subject of this study, which will gather data at a single point in time rather than analyzing trends over time. The study specifically looks into how quality management is applied in Addis Capital Goods HQ design and construction projects. Furthermore, this research is limited to a snapshot of quality management practices at a specific point in time. It does not explore historical trends or the evolution of the quality management system within the EEIG construction at the ACGHQ project. Thus, the research scope is limited to the current construction stage of the project.

## 1.7 Potential Limitations of the Study

The study will be conducted on a specific project called ACGHQ design and construction within the organization of EEIG and may not be fully representative of the broader country industry or other geographical locations. The study's sample frame will be limited to active projects that would be under development at the time, which would have obscured data on earlier construction methods. The primary determinant of product or service quality is customer satisfaction. However, this study will only try to assess quality management practices from the implementer's perspective which is the contractors' side, that would obscure the quality component from the customer's perspective. Moreover, this study is also limited to project contractors while actors in project implementation and management are also owners and consultants.

## 1.8 Definition of Key Terms

**Project:** "A project is a temporary endeavor undertaken to create a unique product, service, or result." (PMI, 2013).

**Project management:** is the technique and discipline of turning an endeavor (Turner, 2009).

**Quality:** It is a measure of how well something meets or exceeds the expectations, requirements, or specifications set by customers, stakeholders, or industry standards, the reduction of errors and refinements, and project alignment to ISO 9000 quality criteria. (Adapted from ISO 9000:2015, "Quality Management Systems")

**Project quality management:** is the system and activities of the performing organization that assess quality policies, goals, and accountabilities for the project to fulfill the demands for which it was achieved. (PMI, 2017)

**Quality Assurance (QA):** The planned and systematic actions established to ensure that a course or program is designed, conducted, and reported in compliance with applicable standards and regulations. (Hoyle, 2007)

**Quality Control (QC):** The real-time observation and documentation of work processes to ensure that accepted procedures are followed, including detecting and measuring variability, characteristics of data generated, and corrective responses to discrepancies. (Hoyle, 2007)

**ISO 9001:2015** is defined as the international standard that specifies requirements for a quality management system (QMS). Organizations use the standard to demonstrate the ability to

consistently provide products and services that meet customer and applicable statutory and regulatory requirements. (Adapted from ISO 9000:2015, "Quality Management Systems")

## 1.9 Organization of the Study

The research will be organized into five main chapters, beginning with an introduction that includes the background of the study, statement of the problem, research questions, objectives, definition of terms, significance of the study, scope, potential limitations, and a description of the study area. The second chapter will provide a literature review, outlining the theoretical foundation, empirical research, and conceptual framework. The third chapter will detail the research methodology, explaining the methods used to achieve the research objectives and answer the research questions. The fourth chapter will present the research results, including descriptions and discussions of the findings. The final chapter will offer conclusions and recommendations based on the research findings.

# CHAPTER TWO: REVIEW OF RELATED LITERATURE

## Introduction

This section encompasses a literature review of diverse scholars and authors who have extensively examined the field of quality management. It delves into both theoretical and practical findings, presenting a comprehensive analysis of researchers' concepts about projects, project quality management processes, quality assurance, as well as the factors that impact quality management practices.

This section is composed of three frameworks:

- Theoretical Literature Review: This section aims to provide a comprehensive understanding of the concept of quality, particularly in the context of the construction industry, by drawing upon various scholarly works. It will also explore the integral role of quality assurance and control within project quality management. Definitions and key aspects of quality management, including quality planning, quality assurance, quality control, and quality improvement, are briefly discussed.
- Empirical literature review: An empirical review of similar research will be assessed to form a conceptual framework for the research.
- Additionally, at the end of this section, the conceptual framework of this study is presented.

## 2.1 Theoretical Literature Review

### 2.1.1 Project and Project Management

#### 2.1.1.1 Concept of Project

A project is described as a temporary initiative aimed at producing something distinct, like a product or service, within a specific timeframe and involving specific resources, constraints, and goals (PMI, 2017). Projects are characterized by their temporary nature, unlike continuous business activities, projects have a set duration, starting with a clear beginning and ending with a specific deliverable (Attia, 2018). One more important feature is the distinctiveness of a project, projects are not regular tasks they strive to accomplish something different, fulfill a particular requirement, or take advantage of an opportunity that would not be addressed through daily activities (Shenhar&Dvir, 2007).

As per the PMBOK Guide (2000), projects are carried out at various levels within the organization and may range from involving only one individual to involving thousands of people. Projects can last anywhere from a few weeks to over five years, involving either one organization or multiple organizations through joint ventures and partnerships. In addition, a widely acknowledged definition of a project is a series of distinct, intricate, and interrelated tasks with a single objective that needs to be finished within a designated timeframe, without exceeding the budget, and meeting specific requirements (Wysock, 2014). Nevertheless, projects frequently require constant modifications due to changing market conditions or new information in today's fast-paced world. This emphasizes the importance of project management methods that can easily adjust to unexpected obstacles and changing environments.

#### 2.1.1.2 Project Management

Project management is defined as the process of planning, organizing, and controlling resources to achieve specific goals and objectives (PMI, 2017). Project management applies to various types of projects, including construction, software development, and research projects. It involves coordinating and managing various aspects of a project, including scope, time, cost, quality, and human resources. It is accomplished through the planning, organizing, directing, and controlling of company resources (Kerzner H. , 2009). However, managing a project is a challenging and time-consuming method that demands the identification and allocation of resources to ensure the completion of the project and, as a result, fulfillment of organizational objectives (Gupta, 2023).

Project management has become a scientific field with its professional associations, the Project Management Institute (PMI) and the International Project Management Association (IPMA). These associations are known as promoters of the standardization of project management and certification programs for project managers (Clarke, 2018). A Guide to the Project Management Body of Knowledge published by PMI, presents a set of standard terminology and guidelines for project management. The PMBOK Guide is process-based, describing project management as being accomplished through the application and integration of the project management processes of initiating, planning, executing, monitoring and controlling, and closing. Further, it assumes that all project management practices fall into ten knowledge areas, which are project integration management, project scope management, project time management, project cost management,

project quality management, project resource management, project communications management, project risk management, project stakeholder management, and project procurement management.

### 2.1.2 Overview of Quality

Quality has been defined from various perspectives, starting with the dictionary meanings, the Oxford Dictionary defines quality as “the standard of something as measured against other things of a similar kind with the degree of excellence of something”, and the Swedish Academy Dictionary defines quality as type, grade, state and character in a positive aspect. Both approaches show that it’s something's standard as judged against other objects of a comparable type something's level of excellence.

According to Shen Quality is satisfying or exceeding customers’ requirements and expectations, and consequently, to some extent, it is the customer who eventually judges the quality of a product (Shen, B & Chow, P, 2017). However, Gitlow, argues that quality has evolved beyond just meeting customer expectations to a phenomenon in which a product or service may be delivered at a cheap cost while preserving reliability and consistency (Gitlow, 2005). Additionally, the ISO 9000 defines quality as “the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs.

According to Barbara J. Jackson (2010), the quality of a project is defined by the standards outlined in the specifications. Quality has a direct impact on project cost. The specifications outline the materials and equipment to be used, and different grades of performance, durability, and aesthetics are associated with each construction product. A project that specifies minimum standards for products and equipment will generally cost less than a project that incorporates high-end materials and installations.

In addition, Wysocki (2003) discusses the two types of quality that are important for every project: product quality and process quality.

- Product quality refers to the degree to which the project's deliverables meet the requirements and expectations of the stakeholders.
- process quality refers to the degree to which the project management process itself is effective and efficient.

### 2.1.2.1 Quality in Construction

Quality is a crucial key performance indicator in construction projects and has the potential to lead to extra costs and delays in completion. According to Günaydn (2015), the construction industry defines quality as addressing the requirements of various stakeholders such as the owner, design professionals, contractors, and regulatory authorities. Construction quality is the level of excellence or goodness of a building or structure, considering factors like materials, workmanship, design, and functionality (Kerres, 2017). As per Kerres (2017), it is harder to define quality in construction compared to manufacturing due to the unique characteristics of a construction project as opposed to a mechanical product. As an illustration, a structure consists of various elements that form the complete entity, and each element possesses unique characteristics and attributes that are assessed based on the techniques and substances utilized in creating it.

Furthermore, according to Crosby (2015), ensuring quality in construction involves more than just meeting stakeholders' expectations, it also involves delivering the project on time and within budget. This indicates that the planning and execution of the building's design, detailed specifications, and results must be meticulously carried out to guarantee that the project achieves the expected quality standards.

As stated by Dale Bester Field (2004), quality is defined as  $Q = P / E$ , where Q represents Quality, P represents Performance, and E represents Expectation. If Q exceeds 1.0, the customer experiences high levels of satisfaction with the product or service provided. Q is determined based on perception, with performance determined by the contractor and expectations determined by the customer meanwhile, customer demands are constantly increasing.

Hence, construction quality is a complex idea that includes different elements such as materials, procedures, design, engineering, and project management. Construction professionals can ensure they meet client's needs and expectations by prioritizing quality throughout every stage of the project. However high-quality construction projects have been found to have numerous benefits, including increased durability, reduced maintenance costs, improved safety, and enhanced aesthetic appeal (Khurana, 2017). On the other hand, poor-quality construction projects can lead to a range of problems, including structural failures, water intrusion, and mold growth, which can result in costly repairs, legal disputes, and reputational damage (Kelsey, 2017).

### 2.1.2.2 Theoretical Perspectives on Construction Quality

Several theoretical perspectives have been proposed to understand the concept of construction quality. One of the most widely used frameworks is the "Quality Management" approach, which emphasizes the importance of planning, organizing, and controlling the building process to ensure that quality standards are met (Chan & Yeung J, 2009). This approach focuses on the processes and procedures that are put in place to ensure quality, rather than the quality of the final product itself.

Another theoretical perspective is the "Total Quality Management" approach, which emphasizes the importance of continuous improvement and customer satisfaction. This approach focuses on the involvement of all stakeholders in the building process, including designers, contractors, and clients, to ensure that quality standards are met and continuously improved upon (Kumar, 2017). However, the dynamic and complex nature of modern construction projects necessitates a re-examination of TQM's application. Recent research (Al-Ghamdi & El-Sayegh, 2018) has focused on adapting TQM principles to complex projects, highlighting the critical role of strong leadership, employee empowerment, and continuous improvement initiatives.

- **Strong Leadership:** Effective leadership is crucial in driving TQM initiatives, fostering a culture of quality, and ensuring alignment among all stakeholders.
- **Employee Empowerment:** Empowering employees to actively participate in quality management processes is vital, as they are often on the frontlines of project execution and possess valuable insights.
- **Continuous Improvement Initiatives:** TQM necessitates a culture of continuous learning and improvement, encouraging the identification of areas for enhancement and the implementation of corrective actions.

A third perspective is the "Lean Construction" approach, with its emphasis on minimizing waste and maximizing value, which has gained significant traction in the industry. Research by Ballantyne and Kaka (2016) demonstrates how Lean principles, such as value stream mapping and pull planning, can contribute to improved quality by streamlining processes and eliminating non-value-adding activities. This focus on value creation aligns with TQM's customer-centric approach, ensuring that quality improvements are aligned with the project's ultimate goals. This

approach focuses on the reduction of defects, variability, and waste in the construction process, to deliver high-quality projects at lower costs and in shorter timeframes.

The fourth perspective Integrated Project Delivery (IPD) emphasizes collaboration and shared responsibility among all project stakeholders, promoting a holistic approach to quality. Research by O'Brien and Harris (2017) reveals that integrated project delivery can lead to enhanced quality outcomes by fostering open communication, shared decision-making, and a collective focus on achieving project goals. Integrated project delivery complements TQM by emphasizing the importance of shared ownership and continuous improvement across all project phases.

The fifth perspective, Building Information Modelling (BIM), a technology-driven approach to design, construction, and facility management, has revolutionized quality control processes. Studies by Azhar (2016) and Park, Kim, and Jeong (2019) illustrate how BIM can facilitate early detection of potential quality issues, improve coordination between stakeholders, and enhance visualization and analysis for quality assurance. However, BIM offers a powerful technological framework that transcends traditional construction methodologies, significantly impacting quality control processes, it enables early detection of potential quality issues through clash detection, interference analysis, and simulations conducted within the virtual model. This proactive approach allows for timely identification and mitigation of problems before they manifest on-site, significantly reducing rework, delays, and costly errors. BIM further supports TQM by promoting a data-driven approach to quality management and enabling continuous monitoring and analysis.

### 2.1.3 Quality Management Systems (QMS)

The project model looks at quality management as a set of activities or tasks that are required to ensure the project satisfies all the needs for which it was undertaken based on documented in the state of work and includes a focus on quality management from the perspective of product, and processes. The people needed to make quality an effective and efficient aspect of successful project completion (Crawford, 2002). However, the PMBOK Guide explains that “Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken. It implements the quality management system through policy and procedures with continuous process improvement activities conducted throughout, as appropriate” (PMI, 2013).

QMS comprises various interrelated components that collectively contribute to organizational excellence. One of the central components is the establishment of quality policies and objectives, which provide a clear direction for quality efforts and serve as a basis for measurement and evaluation. Another critical element is the documentation of processes, procedures, and work instructions, ensuring consistency and standardization across operations (Kraynova, 2018). Implementing robust quality planning, including risk management and resource allocation, is essential to proactively anticipate and address potential challenges. Additionally, QMS necessitates thorough training and competency development initiatives to empower employees with the necessary skills and knowledge to contribute effectively to quality objectives. Monitoring, measuring, and analyzing performance metrics enable organizations to assess the effectiveness of their quality initiatives and identify areas for improvement (PMI, 2013).

The International Organization for Standardization (ISO) 9000 family of standards, particularly ISO 9001:2015, is widely recognized as a prominent reference for Quality Management Systems (QMS). This specific standard serves as a comprehensive guideline for organizations aiming to establish, implement, maintain, and continually improve their QMS. ISO 9001:2015 outlines the requirements that organizations need to fulfill to enhance customer satisfaction, achieve operational efficiency, and ensure compliance with regulatory obligations. By adhering to these requirements, organizations across diverse industries can effectively streamline their processes, minimize waste, identify and address risks, and consistently deliver products and services that meet established quality standards.

#### 2.1.4 Project Quality Management Processes

Hoyle (2007) proposed a classification of quality management comprising four major aspects referred to as "the four pillars" of quality management. Hoyle's classification of quality management is widely recognized and accepted in the field of quality management. It provides a comprehensive framework for managing quality in organizations and has been used in various industries, including manufacturing, service, and healthcare.



Figure 1 Project Quality Management

These pillars are quality planning, quality control, quality assurance, and quality improvement. Together, they form the foundation for managing quality throughout the entire duration of a construction project (Hoyle, 2007).

Project quality management processes apply different tools and techniques to enhance the output of the process using the specific inputs that are to be taken as a baseline to prepare and deliver the expected output however, the figure shows the detail of the project management overview and the necessary inputs, tools and techniques and the final output of the processes (PMI, 2013).

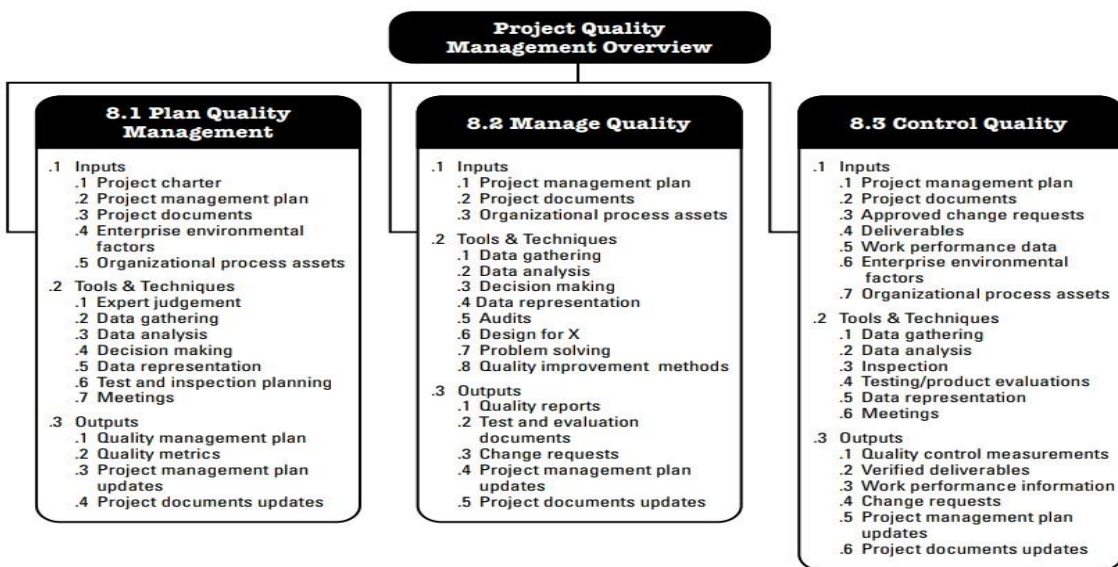


Figure 2 Project Quality Management Overview

Source: Adopted from PMI (2013)

#### 2.1.4.1 Quality Planning

The PMBOK Guide outlines quality planning as the procedure of determining quality requirements or standards for the project and its deliverables and recording how the project will show adherence to quality requirements or standards. Quality planning involves establishing and executing quality policies, procedures, and standards to reach project goals and objectives (Kerres, 2017). It includes defining quality needs, setting quality benchmarks, and creating a quality control strategy to make sure the project achieves its quality goals (Goetsch & Davis, 2014). Quality planning is crucial for the success of a project, as it ensures the project achieves its goals and meets stakeholder expectations (Hillson, 2015).

In the framework of ISO 9001:2015, while planning quality, the following principles must be followed:

- Customer satisfaction is prioritized,
- Prevention is preferable to inspection: It is best to prevent mistakes rather than find and remedy them after they have occurred.
- Management responsibility: Quality costs must be authorized by management.
- Continuous improvement: is an iteratively organized method of becoming better.

Project Management Institute (2017), also states that Quality planning should take place concurrently with all the other planning procedures.

##### 2.1.4.1.1 Quality Planning Process

The quality planning process typically involves several steps, including:

**Quality objective setting:** This involves the identification of quality objectives and the establishment of quality standards and metrics to measure progress (Kerres, 2017). Quality objectives should be derived from and aligned with the organization's quality policy. The quality policy outlines the overall quality intentions and direction, while the objectives specify the measurable targets to be achieved.

**Quality planning:** This involves the development of a quality management plan, which includes the identification of quality tasks, responsibilities, and timelines (Goetsch & Davis, 2014). Where the quality management plan is a formal document that defines the quality policies, objectives,

responsibilities, and processes that will govern the project. It serves as a roadmap for achieving the desired level of quality and ensuring consistency throughout the project lifecycle

**Quality control and monitoring:** This involves the implementation of quality control procedures to ensure that the project meets its quality objectives, and the monitoring of progress to identify any issues or deviations from the plan (Hillson, 2015). Quality control procedures are the specific activities and techniques employed to verify that the project deliverables meet the defined quality standards and requirements.

**Quality improvement:** This involves the identification of opportunities for improvement and the implementation of corrective actions to address any issues or defects (Kerres, 2017). Quality improvement is an essential aspect of project management that focuses on identifying and addressing opportunities for enhancing the quality of processes, products, or services.

#### 2.1.4.1.2 Quality Planning Techniques

Several quality planning techniques are commonly employed in project management. These methods, often interlinked, offer a systematic approach to defining quality objectives, identifying critical quality factors, and establishing quality control mechanisms.

**Quality Function Deployment (QFD):** QFD, a structured approach to translating customer needs into technical requirements, plays a crucial role in quality planning. It uses a "house of quality" matrix to systematically connect customer expectations with design features, engineering specifications, and production processes. This technique involves the identification of customer requirements and the development of a quality plan to ensure that these requirements are met (Kerres, 2017).

**Failure Mode and Effects Analysis (FMEA):** FMEA is a proactive risk management technique that identifies potential failures in a process or product, evaluates their severity and likelihood, and establishes preventative actions (Hillson, 2015). By addressing potential failures during the planning stage, FMEA enhances project quality and reduces the risk of defects.

**Design of Experiments (DOE):** DOE, a statistically-driven approach, is particularly relevant for projects involving complex product designs or manufacturing processes (Montgomery, 2019). It helps optimize product characteristics by systematically varying input parameters and analyzing the resulting output. DOE contributes to product quality and process efficiency.

**Statistical Process Control (SPC):** SPC is a powerful quality control technique that uses statistical methods to monitor and control processes over time (Goetsch & Davis, 2014). By analyzing data collected from a process, SPC identifies variations and trends, enabling timely adjustments to maintain desired quality levels.

**Process Mapping and Flowcharting:** These visual tools provide a clear representation of the sequence of activities and decision points in a project (Heher, Y & Chen, Y, 2017). They facilitate process understanding, identify potential bottlenecks, and enable systematic quality improvements by highlighting areas for optimization.

**SWOT Analysis:** SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is a strategic planning tool used to identify internal strengths and weaknesses, as well as external opportunities and threats. By understanding these factors, organizations can develop quality plans that leverage strengths, address weaknesses, capitalize on opportunities, and mitigate threats effectively (Fred & David, 2013).

**Quality Management Software (QMS):** QMS software provides integrated platforms for managing various aspects of quality planning, including document control, corrective and preventive actions (CAPA), risk management, and performance monitoring. By leveraging QMS solutions, organizations can streamline quality planning processes, enhance collaboration, and ensure compliance with quality standards (John S &Oakland, 2014).

#### 2.1.4.1.3 Challenges and Limitations of Quality Planning

Despite its importance, quality planning faces several challenges and limitations. These include **Lack of stakeholder buy-in:** Quality planning requires the active participation of all stakeholders, including project team members, sponsors, and customers. However, securing stakeholder buy-in can be challenging, particularly in organizations where quality is not a core value (Hillson, 2015).

**Limited resources:** Quality planning requires significant resources, including time, money, and personnel. However, these resources may not always be available, particularly in organizations with limited budgets or competing priorities (Goetsch & Davis, 2014).

**Complexity:** Quality planning can be a complex and time-consuming process, particularly in projects with multiple stakeholders and complex requirements (Kerres, 2017).

**Resistance to Change:** Quality planning often requires changes to existing processes, procedures, and mindsets, which can face resistance from individuals or groups within the organization. This resistance can stem from various factors, such as fear of the unknown, perceived threats to job security, or a lack of understanding of the benefits of quality planning. Overcoming this resistance through effective change management strategies, communication, and training is essential for successful quality planning adoption (Ricky & Griffin, 2013).

**Inadequate Training and Expertise:** Quality planning requires specialized knowledge and skills, which may be lacking within the project team or organization. Insufficient training or expertise in quality planning methodologies, tools, and techniques can lead to ineffective implementation and suboptimal results. Investing in training and developing internal expertise or leveraging external consultants can help address this limitation (David L, Goetsch & Stanley, 2014).

**Lack of Integration with Project Management Processes:** Quality planning should be an integral part of the overall project management process, but it is often treated as a separate or isolated activity. Failure to integrate quality planning with other project management processes, such as risk management, scope management, and stakeholder management, can lead to inconsistencies, redundancies, and inefficiencies (Harold Kerzner, 2013). Ensuring seamless integration and alignment between quality planning and other project management processes is crucial for achieving project success.

**Difficulty in Measuring Quality:** Defining and measuring quality can be challenging, particularly for projects involving intangible or subjective deliverables. Without clear and measurable quality criteria, it becomes difficult to establish effective quality planning processes and monitor progress. Developing appropriate quality metrics and measurement techniques tailored to the project's specific context is essential for effective quality planning and control (John & Oakland, 2014).

#### 2.1.4.2 Quality Assurance

Quality Assurance is a more modern approach to quality achievement in production. It is a shift from the old inspection and quality control systems where a lasting and continuous improvement in quality is achieved by directing organizational efforts towards planning and preventing problems occurring at the source. Quality assurance is defined as the process of auditing, reviewing, and monitoring project activities to ensure that they are executed according to the quality plan and the project's quality objectives (Kerres, 2017).

Harris and McCaffer (2001) describe quality assurance as a set of actions to show that an entity meets quality standards. These activities aim to build confidence in customers and managers by ensuring that all quality standards are being upheld. The main objective of quality assurance methods is to reach the intended quality level. By utilizing tools like probabilistic models and cause-and-effect diagrams, it is feasible to assess current processes and pinpoint any quality deficiencies they may have (Roads, 2006). These methods enable a comprehensive evaluation of procedures and aid in identifying areas where quality standards are not being fulfilled. Quality assurance is also responsible for developing the technical and managerial skills necessary to achieve the desired results. It all comes down to the attitudes, both of management and of individuals they are responsible for.

#### 2.1.4.2.1 Importance of Quality Assurance in Construction

Quality assurance is a crucial aspect of construction projects as it ensures that the final product meets the required standards, is safe, and meets the needs of stakeholders. In the construction industry, QA involves a systematic process of monitoring, controlling, and improving the various aspects of construction projects, including materials, workmanship, and construction methods (Hillson, 2015).

The importance of quality assurance in construction cannot be overstated. According to a study by the National Institute of Building Sciences, the cost of poor quality in construction projects can be as high as 10% to 20% of the total project cost (NIBS, 2017). This highlights the need for effective quality assurance processes to minimize the risk of defects and errors.

However, quality assurance in construction projects can be achieved through various methods, including quality control and quality management. Quality control refers to the process of monitoring and inspecting construction materials, workmanship, and methods to ensure they meet the required standards (Kam, 2016). Quality management, on the other hand, is a more comprehensive approach that involves the systematic management of all aspects of the construction process, including planning, design, procurement, and construction (Hillson, 2015).

#### 2.1.4.3 Quality Control

Quality control is defined as "a systematic process for ensuring that a product or service meets specified requirements" (Dale, 2017). It involves the implementation of policies, procedures, and protocols that aim to prevent defects, errors, and variations in the production process. Quality

control is essential for any organization that wants to maintain customer satisfaction, build trust, and ensure compliance with regulatory requirements (Hillson, 2015). It is the method of monitoring specific project results to determine if they convey relevant standards and identify different methods to eliminate the causes of unsatisfactory performance. According to ISO 21500 (2020), quality control must be used throughout a project. It entails monitoring whether the standards for deliverables and processes are being met and finding errors using recognized tools, procedures, and techniques.

#### 2.1.4.3.1 Importance of Quality Control

The importance of quality control can be seen in various aspects, including:

**Customer Satisfaction:** Quality control helps ensure that products or services meet customer requirements and expectations, leading to higher customer satisfaction and loyalty (John & Oakland, 2014)

**Cost Reduction:** Quality control can identify and eliminate defects early in the production process, reducing the costs associated with rework, repair, and replacement (John & Oakland, 2014).

**Compliance:** Quality control helps organizations comply with regulatory requirements, avoiding legal and financial penalties associated with non-compliance (De Bruijn & Defaults, R, 2015).

**Process Improvement:** Quality control can identify areas for process improvement, leading to increased efficiency, reduced waste, and improved productivity.

By ensuring that products and services meet customer expectations, quality control directly contributes to increased customer satisfaction and loyalty. This focus on quality also translates to cost reduction by identifying and eliminating defects early in production, minimizing the need for rework, repair, and replacement. Furthermore, quality control helps organizations adhere to regulations set by governing bodies, avoiding costly legal and financial penalties associated with non-compliance (De Bruijn & Defaults, R, 2015). Finally, the data gathered through quality control processes can pinpoint areas for improvement within production itself leading to increased efficiency, reduced waste, and ultimately, greater overall productivity (Deming, 1986). In essence, quality control creates a positive ripple effect throughout an organization.

#### 2.1.4.3.2 Approaches to Quality Control

There are several approaches to quality control, including:

##### 2.1.4.3.2.1 Inspection

Inspection involves visually examining the project deliverables to identify any defects or deviations from the quality standards (Dale, 2017). However, inspections can be performed at various stages of the project, including during the development process, before delivery, and after delivery. The purpose of inspections is to detect and correct defects early, reducing the likelihood of defects reaching the end-users. It can be performed by quality control teams, project managers, or external auditors.

According to Bhatt (2019), inspections are an effective method for monitoring and controlling quality during project execution. However, inspections can be time-consuming and resource-intensive, and they may not detect all defects, particularly if they are hidden or not easily visible. Therefore, inspections should be combined with other quality control methods, such as testing and statistical process control.

##### 2.1.4.3.2.2 Testing

Testing encompasses the assessment of products or services to gauge their quality, performance, and dependability (Hillson, 2015). This process incorporates diverse methods like functional testing, durability testing, and safety testing. Its primary objective is to scrutinize project deliverables to guarantee compliance with specified requirements and quality benchmarks. Testing can be conducted at different stages of a project, spanning from the developmental phase to post-delivery. Its significance lies in its ability to uncover defects that might remain unnoticed during inspections, especially those concealed or not readily apparent.

According to IEEE (2019), testing is an essential aspect of quality control during project execution. Testing can help ensure that the project deliverables meet the required functional and performance specifications, and they can help identify defects early, reducing the likelihood of defects reaching the end-users.

##### 2.1.4.3.2.3 Quality Audits

According to ISO (2019), quality audits are an essential aspect of quality control during project execution. Quality audits can help ensure that the project deliverables and processes meet the

required quality standards, and they can provide recommendations for improving the project processes and deliverables. These systematic examinations are designed to evaluate the project deliverables and processes and ensure they meet the necessary quality standards. Quality audits can be performed by either internal or external auditors, and they can be conducted at various stages of the project.

The primary objective of quality audits is to identify any defects or deviations from the quality standards and provide recommendations for improving the project processes and deliverables (Kitukale, 2024). By doing so, quality audits help ensure that the project is of high quality and meets the requirements of stakeholders. Quality audits usually consist of a comprehensive review of the project's quality management system, which includes its policies, procedures, and processes. This involves examining paperwork, talking to staff, and watching procedures being carried out. The audit might also include examining and evaluating the project outcomes to verify they meet the necessary benchmarks.

Quality audits also provide advantages that go beyond just finding flaws and variations. They can assist companies in finding areas for enhancement, streamlining processes, and improving customer satisfaction (Russel, 2024). Additionally, quality audits allow organizations to showcase their dedication to quality standards and regulations, which can positively impact their reputation and contribute to business expansion.

#### 2.1.4.3.2.4 Statistical Process Control

Statistical process control (SPC) uses statistical methods to monitor and control production processes, detecting and correcting deviations from the mean. SPC is a method for monitoring and controlling quality during project execution. SPC involves using statistical methods to monitor and analyze the project processes to ensure they are operating within the specified limits. SPC can help identify variations in the project processes, which can indicate defects or deviations from the quality standards. According to Deming (2012), SPC is a critical aspect of quality control during project execution. SPC can help ensure that the project processes are operating within the specified limits, reducing the likelihood of defects and variations. SPC can also help identify opportunities for process improvement, leading to increased efficiency and effectiveness.

#### 2.1.4.3.2.5 Total Quality Management

Total quality management (TQM) is a philosophy that focuses on continuous improvement, customer satisfaction, and employee involvement to achieve organizational excellence (Kaoru, 1985). Total quality management itself is a strategy for combining many organizational factors within design and production operations to provide cost-effective goods or services that are acceptable to the end user. It is more consumer-focused and generates more significant consumer pleasure. Internally, TQM lowers bottlenecks in production lines and operational expenses, hence boosting product quality while raising organizational morale (Kerzner, 2015).

#### 2.1.4.3.2.6 Six Sigma

Six Sigma is a data-driven methodology widely adopted in various industries for improving process efficiency, reducing defects, and enhancing overall quality performance. Six Sigma originated from statistical quality control principles and was popularized by Motorola in the 1980s and later by General Electric under the leadership of Jack Welch. The term "Six Sigma" refers to the statistical concept of six standard deviations between the mean and the nearest specification limit, implying a very low defect rate of 3.4 defects per million opportunities (Pyzdek, T., & Keller, P. A., 2014). Six Sigma employs a structured approach known as DMAIC (Define, Measure, Analyze, Improve, Control) for process improvement:

- **Define:** Clearly define project goals, scope, and deliverables aligned with customer requirements.
- **Measure:** Quantify process performance using relevant metrics and establish a baseline for comparison.
- **Analyze:** Identify root causes of defects and variations through data analysis and statistical tools.
- **Improve:** Implement solutions to address identified issues and optimize process performance.
- **Control:** Establish control mechanisms to sustain improvements and prevent regression.

#### 2.1.4.4 Quality Improvement

Quality improvement involves using techniques and resources to bridge the difference between the present and desired quality levels by identifying and fixing system weaknesses and strengths to enhance, or possibly revamp project procedures. There are different methods for improving

quality, from enhancing individual performance to reorganizing whole project processes. The PDCA (Plan-Do-Check-Act) cycle is a successful method for achieving ongoing improvement. This commonly utilized four-step management approach also referred to as the Deming Cycle or Shewhart Cycle, is employed in multiple industries to enhance processes, products, and services.

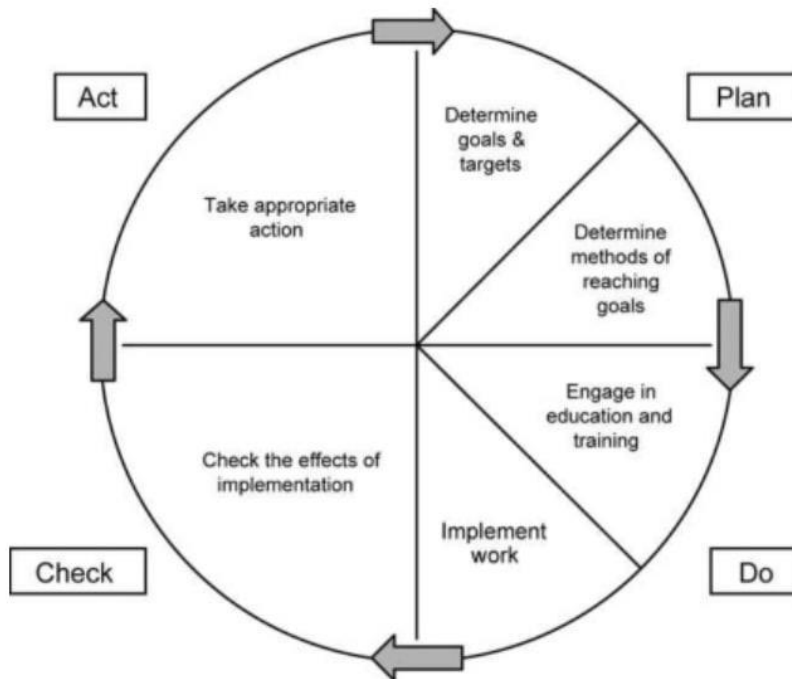


Figure 3 The Deming cycle for improvement

Source: Huemann, M, Improving Quality in Projects and Programs, Chapter 37 in Morris P.W. and Pinto. J.K. (eds), The Wiley Guide to Managing Projects, Wiley & Sons, 2004

These approaches differ in terms of time, resources, and complexity, but share the same four steps in quality improvement:

- **Plan:** The initial stage of the PDCA cycle involves determining the project areas for improvement by analyzing data obtained during the quality control process. In this stage, it is important to collect pertinent information, evaluate the present circumstances, and establish specific goals. Creating a clear plan with achievable objectives, schedules, and necessary resources is essential for the improvement process to succeed.
- **Do:** In step two, you will carry out the suggested modifications on a limited basis. This may require changing procedures, adopting additional tools or machinery, or establishing fresh training initiatives. At this phase, it is crucial to closely oversee the process to make

sure the planned changes are implemented correctly and to pinpoint any unforeseen problems that might occur.

- **Check:** The next phase includes evaluating the outcomes of the applied modifications to assess their efficiency. To meet the goals, set during the planning stage, you must gather and assess data, then compare the findings. If the outcomes are not adequate, you might have to go back to the planning stage and modify your strategy as needed.
- **Act:** In the last phase, it is important to incorporate the successful enhancements into your usual operating protocols. This could include revising the documentation, offering more training, and informing the relevant stakeholders about the changes. Once the enhancements are completely incorporated, the PDCA cycle can restart, continually pushing for more improvements. During the last stage, it will incorporate the successful enhancements into regular operating protocols. This could include revising documentation, offering extra training, and informing relevant stakeholders of the changes. After the enhancements are completely incorporated, the PDCA cycle can restart, constantly pushing for more enhancements.

(Source: The Deming Cycle, Shewhart)

### 2.1.5 Factors that Influence the Quality of Construction Projects

The construction quality is based on the organization's characteristics, and procedure of working, and the contractor follows the drawings and specifications under defined budgets, skill of labor, quality of materials, and applied equipment. Several studies have been conducted on factors affecting the quality of any kind of construction project. The management issues were the most important factors that affected construction quality for developed economies of countries (Azeb, 2021). The most important factors affecting the quality of building construction projects during the construction in developing countries are the characteristics of site layout, skill and experience of site staff, characteristics of design documents and using equipment, materials, quality and labor management systems, and the owner's quick response in making decisions (Al-Ghamdi & El-Sayegh, 2018).

**Effective project management** is essential for upholding quality in construction projects. According to Kerres (2017), project management involves coordinating resources to achieve specific goals through planning, organizing, and controlling. Utilizing efficient project

management strategies can help reduce errors, guarantee compliance with quality standards, and minimize the likelihood of defects.

**The quality of employees** is crucial in determining the quality of construction projects. Doloi and Sawhney (2017) indicate that aspects such as training, experience, and motivation play a role in determining the caliber of the workforce. An adept and driven staff is more inclined to create top-notch output.

**Materials and equipment:** The quality of materials and tools used in construction projects is also very important. Kim and Lee (2018) emphasized that the overall quality of the project could be significantly impacted by the quality of materials and equipment employed. Using high-quality materials and tools can minimize mistakes and ensure the project meets quality standards.

**Effective communication** is crucial for guaranteeing quality in construction projects by stakeholders. Communication breakdowns can result in errors, misunderstandings, and delays, potentially affecting the quality, as stated by Ozorovich and Zhang (2018).

**Quality Control** Procedures for quality control are crucial to ensure that construction projects adhere to quality standards. quality control entails overseeing and managing work procedures to guarantee their proper execution. Quality control measures can aid in detecting and fixing flaws at an early stage of construction, thereby decreasing the chances of mistakes and additional work (Gebre-Egziabher & Tadesse, 2017).

**Quality of design** is crucial in determining the final result of construction projects. According to Ashworth and Pounds (2017), a properly designed project is more likely to meet quality standards and decrease defects.

Furthermore, factors like weather, soil conditions, and environmental elements at the site can impact the quality of construction projects. Carrasquillo and Perdomo (2017) suggest that when planning and executing a project, it is important to take into account how site conditions can affect the quality of materials, equipment, and workmanship.

## 2.1.6 Effective Project Quality Management Practices

### 2.1.6.1 Top Management Commitment

Press (2019), defines commitment as a willingness to give your time and energy to something that you believe in, or a promise or firm decision to do something, which means project implements must commit to implement the project for the full project lifecycle to meet the project requirements.

Top management commitment is widely recognized as a critical factor in ensuring the effectiveness of quality management practices. Numerous studies have consistently demonstrated that organizations with dedicated and committed top management achieve superior quality management outcomes. The active involvement of top management is indispensable for quality management. This involvement encompasses establishing quality objectives, providing necessary resources, and diligently monitoring progress. Hackman and Wageman's (2005) research further supports this viewpoint, emphasizing that the success of quality management initiatives heavily relies on the active engagement and commitment of top management. In addition, top management can take several specific actions to promote quality management practices within an organization:

**Setting Clear Quality Objectives:** top management must set specific and quantifiable quality goals that are in line with the strategic objectives of the organization. This guarantees an emphasis on enhancing the quality (PMI, 2017).

**Allocating Resources:** senior management needs to assign enough resources, such as funding, staff, and technology, to back quality management efforts. This allows for effective quality practices to be put into action (Oakland, 2014).

**Setting an example:** it is crucial for top management to actively engage in quality initiatives and show their dedication to quality management. This motivates for employees to adopt quality practices (Hackman, J & Wageman, R, 2005). And also, according to Oakland (2014) giving employees decision-making authority and responsibility is essential for empowering them to contribute to quality improvement efforts.

**Setting up Communication Networks:** Senior management must create efficient communication channels to assist in the flow of information regarding quality management techniques. This guarantees openness and allows for successful teamwork (Dale & McQuater, 2007).

**Empowering Employees:** recognizing and rewarding quality achievements is important for top management to acknowledge individuals and teams that contribute to quality management practices and achieve exceptional results. This helps to strengthen a quality-oriented culture and inspire employees (Oakland, 2014).

**Monitoring and Reviewing Progress:** top executives must consistently oversee and assess the advancement of quality management strategies by conducting performance appraisals, internal audits, and receiving feedback. This allows for ongoing enhancement and guarantees the success of quality efforts (Mekonnen & Mengiste, 2018).

#### 2.1.6.2 Employee Involvement

Employee involvement is when organizational members at various levels actively participate in making decisions. Workers are an essential resource for every company, playing a vital part in reaching its goals and objectives (Psomas, 2014). Numerous studies consistently show that companies with active employee participation in quality management procedures produce better quality management results. Hackman and Wageman (2005) discovered in their research that teams with high levels of employee participation in quality management practices tend to experience superior quality management results. In the same way, research by Danicia Backotich (2015) found that employee participation was a key factor in determining the implementation of quality management tactics. These results highlight the significance of involving employees at different levels to promote successful quality management in a company (Bakotic, 2015).

#### 2.1.6.3 Client or Customer Focus and Feedback

Quality management is targeted towards a customer-oriented approach ( Verma. A and Sharma. R, 2019). Knowing and understanding the customer's and client's necessities, being responsive to the demands of the client, and additionally, ensuring the satisfaction of the customer have led to growth in revenue, profitability, cash flow, and market share (Mulu & Worku, 2021). Therefore, organizations should actively seek and incorporate customer feedback to understand their needs, expectations, and satisfaction levels. This includes implementing mechanisms such as surveys, focus groups, and complaint management systems to drive continuous improvement efforts.

#### 2.1.6.4 Continuous Improvement

Quality management is being termed “a journey, not a destination”. It is about adopting an improvement-centered culture, understanding customer requirements, and improving the

processes to satisfy customers (Al-Najjar & Al-Hosni, 2016). Embracing a culture of continuous improvement is fundamental to effective quality management, which involves encouraging employees to seek opportunities for improvement, fostering innovation, and implementing systematic approaches to address identified areas of improvement.

#### 2.1.6.5 Employee Training

Training involves enhancing an individual's performance by educating them, developing their skills and concepts, fostering a change in attitude, and increasing their knowledge. As stated by MbaSkool(2019), employee training was established to enhance the technical skills, expertise, productivity, and added value required to carry out any job more efficiently. Shen and Chai's (2017) research focused on how employee training affects quality performance in Chinese manufacturing companies. It was discovered that quality performance improved with employee training, especially when the training programs were customized to meet the organization's specific needs.

Sun (2019) conducted a meta-analysis that revealed that employee training positively affected quality management results, such as quality performance, employee motivation, and job satisfaction. He discovered that the success of employee training was impacted by elements like the kind of training, the length of training, and the degree of employee involvement. In general, various sources of literature indicate that training employees is an efficient method for enhancing quality management within organizations (Mekuria, 2023). Well-crafted training programs can assist staff in acquiring the essential competencies and information needed to implement quality management practices, boost their enthusiasm for engaging in quality management activities, and foster a quality-driven culture within the company.

#### 2.1.7 Quality Performance Metrics in Construction Projects

Performance metrics for quality in construction projects are measurable indicators that evaluate different aspects such as materials, workmanship, safety, and adherence to specifications and standards (Abdul-Rahman, H & Wang C, 2010). These measurements offer useful information on how well quality management processes are working and pinpoint areas that can be enhanced. It assists contractors, project managers, and clients in evaluating the quality achieved in a project, pinpointing areas for enhancement, and tracking progress. Different performance metrics and indicators utilized for evaluating the quality of construction projects include:

#### 2.1.7.1 Defects per Unit (DPU)

Defects per unit is a widely used metric that measures the number of defects per unit of production or construction. DPU is calculated by dividing the total number of defects by the total number of units produced or constructed. DPU is a useful metric for evaluating the effectiveness of quality control procedures, as it provides a quantitative measure of the number of defects present in a project (Kumar & van Dijk, 2016).

#### 2.1.7.2 Customer Satisfaction Ratings

Flanagan and Norman (2016) suggest that customer satisfaction ratings offer valuable insights into how well quality management practices are working by showing the perceived quality of the project from the customer's point of view. Assessment of construction projects' quality is heavily reliant on customer satisfaction ratings. These ratings are usually gathered by surveys or feedback forms that ask customers to evaluate their satisfaction level with different aspects of the project, like work quality, materials, and communication.

#### 2.1.7.3 Rework Rates

According to Xu and Mao (2018), rework rates are a critical indicator of quality performance, as they provide a quantitative measure of the efficiency of quality control processes. Rework rates are a metric that measures the percentage of work that requires rework or correction. This metric is calculated by dividing the total number of rework hours by the total number of hours worked.

#### 2.1.7.4 On-time Delivery Performance

On-time delivery performance is a metric that measures the percentage of projects that are completed on time. This metric is calculated by dividing the number of projects completed on time by the total number of projects. According to Azhar (2019), on-time delivery performance is a critical indicator of quality performance, as it reflects the ability of the project team to manage time and resources effectively.

#### 2.1.8 Challenges in Quality Management Implementation

Resistance to change poses a major obstacle when it comes to incorporating quality management practices in construction projects. Kumar and van Dissel (2016) identified that resistance to change may arise from a variety of sources such as employees, management, and stakeholders. This reluctance can stem from a range of reasons, such as fear of the unfamiliar, insufficient

comprehension of the advantages of quality management methods, and worries about the effects on work procedures and customs. To tackle this obstacle, it is crucial to effectively convey the advantages of quality management methods and engage stakeholders in the implementation process.

Another obstacle to implementing quality management practices in construction projects is a lack of awareness. Shen and Chai (2017) suggest that a large number of construction professionals do not have a good understanding of quality management practices, which can impede the effective adoption of these practices. To overcome this challenge, it is crucial to offer instruction and education to construction experts regarding quality management procedures and the advantages they bring.

Cultural influences may also impede the adoption of quality management techniques in construction projects. Zhang and Zhao (2018) suggested that cultural influences, like a limited emphasis on quality awareness and an emphasis on cost and time, may impact the integration of quality management strategies. To address this challenge, it is crucial to foster a culture of quality within the organization and with stakeholders.

Limited resources are also a major obstacle when it comes to implementing quality management practices in construction projects. Li (2018) suggests that limitations in resources, such as a restricted budget, time constraints, and personnel shortage, may impede the effective execution of quality management techniques. To tackle this issue, it is crucial to give importance to quality management techniques and dedicate enough resources for their implementation and upkeep.

## 2.2 Empirical Review

Quality management practices are considered crucial to the success of organizations in today's business climate. Businesses are feeling pressure to provide exceptional products and services that go above and beyond customer expectations as they continue to rise. To address these requirements, a range of quality management approaches, such as Total Quality Management (TQM), Six Sigma, and Lean methodologies, have been extensively implemented in various sectors. These methods concentrate on boosting performance and increasing levels of customer satisfaction. Nevertheless, there are discussions regarding their effectiveness and the overall influence on organizational performance despite their utilization. The construction sector has

widely adopted quality management to address quality concerns and effectively fulfill customer demands. This section will explore research from various disciplines to gain further understanding of this subject.

Quality management practices in construction projects have been proven to bring various advantages, such as enhancing quality, lowering expenses, and boosting customer approval. For instance, a study carried out by Jaafar, Ali, and Ismael (2019) indicated that implementing quality assurance procedures in construction projects in Malaysia resulted in a 25% drop in defects and a 15% cut in project expenses. This research offers robust proof of the success of quality management practices in the construction sector.

Quality assurance processes when implemented, can greatly decrease the number of defects and expenses related to rectifying them in construction projects. As a result, construction companies can gain a competitive edge and enhance customer satisfaction. The research conducted by Jaafar (2019) also underscores the significance of implementing a methodical method for quality control. The researchers discovered that combining quality assurance processes with a systematic quality management approach was especially successful in lowering defects and costs. This suggests that simply having quality management practices in place is not enough it is also important to have a systematic approach to implementing and monitoring those practices.

As per a case study done by the Journal of Engineering, Design and Technology (2018). This case study analyzed the quality management methods implemented in a major construction project in the Middle East. The research concluded that integrating quality management strategies enhanced the project's outcome quality, minimized defects, and boosted stakeholder contentment. The research also found various obstacles to adopting quality management techniques, such as diverse cultures and communication barriers.

Additionally, Solomon, J, Obodoh, E, and Onoh, J (2016). conducted research to assess the impact of quality management on building construction projects in Nigeria. The study employed a survey research design and gathered data from 100 building construction projects in Nigeria. The findings of the study indicated that quality management practices had a positive influence on the quality of building construction work. By implementing quality management practices, the study suggested that construction projects could experience a reduction in defects and an improvement in customer satisfaction. However, the study identified several commonly employed quality management

practices in building construction projects in Nigeria, namely quality planning, quality control, and quality assurance. These practices were frequently utilized to enhance the overall quality of construction work. The researchers also highlighted various challenges that hindered the effective implementation of quality management practices in these projects. These challenges included a lack of awareness and training, inadequate resources, and poor communication among project team members. The findings of this study align with previous research that has demonstrated the positive impact of quality management practices on construction projects. For instance, a study by Kumar and Van der Wiele in 2016 concluded that quality management practices can enhance the quality of construction work by reducing defects and enhancing customer satisfaction.

According to a study conducted by Birhanu (2011) on quality management and engineering practice challenges in Ethiopia, it was discovered that the overall quality management practices in the country were deficient across various dimensions, including leadership, policy and strategy, resource management, process management, customer satisfaction, business performance, and societal impact. Notably, the service industries exhibited weaker quality management compared to the manufacturing industries, as indicated by the various quality parameters assessed. The study findings suggested that the primary reasons for the subpar quality practices were a lack of awareness regarding fundamental quality concepts and insufficient customer knowledge about quality. Significantly, the research revealed a lack of planned interventions to enhance customer knowledge, which could potentially contribute to quality improvements within the industry.

In the study conducted by Rahel Dinku (2017), it was observed that the Ethiopian Construction Design and Supervision Works Corporation (ECDSWCo.) has implemented a quality management system. The findings indicate that the management of ECDSWCo. demonstrates a strong commitment to the implementation of project quality management. However, the study revealed that the focus of management is primarily on the project quality planning process, rather than on quality assurance and control. The analysis further highlights that there is effective communication of project quality information within the project team, but communication between different sections and with customers' needs improvement. The study identifies specific communication factors that have an impact on project quality management and emphasizes the importance of effective communication, particularly in larger and more complex projects. Furthermore, the

research findings indicate that employees receive training in quality management, but their active involvement in project quality programs was found to be limited.

According to (Mulu & Worku, 2021) paper, the study investigates the implementation of the Quality Management System (QMS) in the Ethiopian construction industry. The authors conducted a case study of the Ethiopian Engineers and Investment Group (EEIG) to examine the extent of QMS implementation and its impact on the company's performance. The study found that the implementation of the QMS in EEIG was not comprehensive, and there were several challenges that the company faced in implementing the system. The authors identified the lack of top management commitment, inadequate training and resources, and resistance to change as the major challenges that hindered the effective implementation of the QMS in EEIG. However, the study also found that the implementation of the QMS had a positive impact on the company's performance. The authors reported that the company's customer satisfaction, employee motivation, and overall performance improved as a result of the QMS implementation.

### 2.3 Research Gap

While quality management systems have been around for decades, there remain gaps in understanding of how they function in the modern business landscape. A significant portion of existing research focuses on established quality principles and their implementation. While different researchers acknowledge the importance of adopting a systematic approach to quality management implementation, a lack of in-depth investigation into specific frameworks, methodologies, and best practices exists. The focus often lies on the positive outcomes of quality management without delving into practical implementation strategies. A research gap exists in developing and testing practical frameworks that incorporate relevant tools and metrics for effective monitoring and evaluation, providing valuable insights for practitioners seeking to improve their QMS implementation strategies.

Secondly, the literature highlights cultural diversity and communication barriers as significant obstacles to effective quality management implementation, particularly in international projects. However, a detailed analysis of how these barriers manifest and strategies for overcoming them is lacking. Further research could explore specific cultural and communication challenges faced by construction projects, develop strategies for effective cross-cultural communication and

collaboration, and propose culturally sensitive quality management practices to mitigate these barriers.

Furthermore, different research suggests that companies often prioritize quality planning while struggling with the implementation of effective quality assurance and control measures. This indicates a gap in understanding the practical challenges associated with these processes. A focus on investigating the practical challenges of implementing quality assurance and control processes in real-world construction projects is needed.

Lastly, researchers identify a lack of awareness of quality management principles and insufficient customer knowledge about quality as significant barriers in some regions. This gap hinders the adoption and successful implementation of quality management practices. Research could focus on developing targeted awareness campaigns and training programs to enhance the understanding of quality management principles among construction professionals and customers.

Therefore, further research is needed to explore how QMS can be adapted to leverage the knowledge and skills of employees at all levels, fostering a culture of quality that extends beyond leadership directives. By investigating these underexplored areas, researchers can contribute to the advancement of QMS practices, ensuring their continued effectiveness in today's dynamic and evolving business environment. However, this study aims to assess the quality management practices of the AGCHQ project in the hopes that the findings and recommendations could close such a gap and contribute to the very limited literature in the area.

## 2.4 Conceptual Framework

This section presented the distinct dimensions related to QMS as presented in literature dealing with the topic. This has formed the basis for a comprehensive framework that encompasses the different features of QMS. The dimensions of QMS defined in this section have all been thoroughly recognized by many authors and experts on the subject. This is also captured in the conceptual framework, which shows a list of management responsibilities in the project and assesses the practice and implementation of QMS. The framework proposes that the independent variables (organizational characteristics and quality management practices) exert a direct influence on the dependent variables (project quality and management system success). This indicates that the successful implementation of effective quality management practices within a supportive

organizational environment is critical for achieving high project quality and an overall successful quality management system.

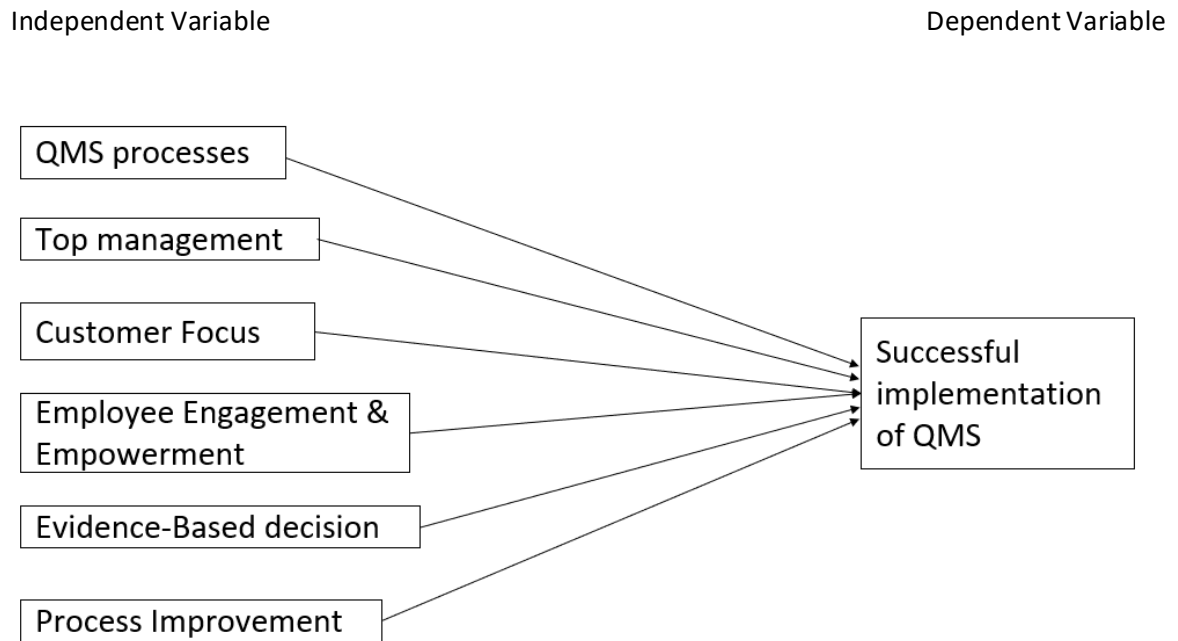


Figure 4 Conceptual framework

Source: DocXellent. (2021). Implementing a Quality Management System (QMS): A Step-by-Step Guide

The study was guided by the formulated conceptual framework as described in the figure, these frameworks emphasize the importance of customer focus, continuous improvement, employee engagement, and process optimization for achieving high-quality outcomes and organizational success. This conceptual framework serves as a roadmap for investigating quality management practices on project quality and management system success. It suggests that effective implementation of quality management practices within a conducive organizational context is crucial for achieving positive outcomes in terms of project quality, customer satisfaction, and overall organizational effectiveness.

## CHAPTER THREE: RESEARCH METHODOLOGY

### Introduction

This chapter presents the activities and processes that have been undertaken to gather data for the research work. It provides comprehensive details on how data will be collected and the processes involved in this research. The chapter outlines the research design, the sampling techniques employed, and the determination of the sample size. It also describes the data sources that have been utilized, the data collection tools employed, and how the collected data is analyzed. Furthermore, ethical considerations in conducting the research are addressed.

### 3.1 Background of the study company

The project aims to build the headquarters building (2B+G+10+Terrace) in Addis Ababa for Addis Capital Goods Finance Business Share Company, a prominent company established in 2014 under the Capital Goods Proclamation No. 103/1998 & amended no. 807/2013 by the federal government of Ethiopia, with Addis Ababa city administration as the main shareholder. The business offers leasing services for capital goods to micro, small, and medium enterprises, primarily in the manufacturing industry. The office structure will have a maximum of ten stories with two basements and a ground floor, situated on a leased land area of 1,733.26 square meters. The office building will have a total area of 1,300 m<sup>2</sup> up to the third floor (G+3), with the remaining stories covering 1000-1,300 m<sup>2</sup> each. The total cost of the project is estimated to be 1,170,054,733.25 birr Including VAT and the project is expected to be completed within a 35-month duration (3 months for Design and 32 Months for construction).

Construction will be held by Ethiopian Engineering and Investment Group (EEIG), which is transforming and diversifying from the current consultancy business operations, taking advantage of the existing ECDSWCo.'s strength and maximizing on the newly emerging external opportunities that are being prevalent with the shifts in Ethiopian Economic Policy, the Corporation is aiming to play a significant role in the success of the Ethiopian Construction Industry by creating a vibrant business institution that will not only fill the gap that is in the current construction industry but also replace the need for having international construction companies that are dominating the government mega-scale projects.

### 3.2 Research design

The general map of how research is going to be performed would be structured in its research design. Research design illustrates almost the basic activities that are essential to carry out research. It is the logic that links the data to be collected with the conclusion to be drawn from the initial questions of the study (Yin, 2018). It's also a template highlighting the research methods to guide data collection where there are three categories of research design; exploratory research, descriptive research, and causal or experimental research (Babin&Zikmund, 2016).

Descriptive research often serves as an initial research method to explore the background, intricate details, and existing patterns of a problem to gain a comprehensive understanding. The objective of descriptive research is to provide accurate and systematic descriptions of a population, situation, or phenomenon, and it can effectively address what, where, when, and how questions, but not why questions, Thus, this study has employed descriptive research design to assess project quality management practices that are in practice at ACGHQ design and construction project.

Whereas, the research design for this study utilizes a cross-sectional field survey method. This approach involves collecting data at a single point in time to assess the quality management practices. By adopting a cross-sectional design, the study aims to provide a snapshot of the current state of quality management practices in the context of the research objective.

### 3.3 Research Approach

For this research, a quantitative research approach has been used. Quantitative research is often used in social science research, where the research question requires both in-depth understanding and numerical analysis (Creswell, 2017). The selection of a quantitative method is based on its effectiveness in gathering substantial amounts of data and addressing comprehensive issues within a specific timeframe.

### 3.4 Types and Sources of Data

The study used primary data to ensure the acquisition of adequate and pertinent information to address the research questions and achieve the research objectives. quantitative data have been collected from various primary sources. To gather quantitative data, a survey questionnaire was administered to project stakeholders, including the project manager, project team members, QA/QC team members, contractors of EEIG representatives at the ACGHQ project.

## 3.5 Population and Sampling

### 3.5.1 Target Population

According to Babbie, (2016), the target population refers to the specific group of individuals or entities that the researcher intends to study and make conclusions about. It represents the larger group from which the research sample is drawn, and the findings are generalized to this population.

Therefore, the target population for this study was all of the permanent employees and additional members of the project implementation team at ACGHQ design and construction project, which is 55 personnel that are workers involved in the construction project, who directly carry out various tasks and activities, professionals responsible for monitoring and evaluating the quality of construction work, conducting inspections, and ensuring compliance with quality standards, workers of the contractor EEIG, and any subcontractors involved in the project who are responsible for executing specific tasks.

### 3.5.2 Sampling Method

The study adopts the Census sampling method. According to Kothari (2004), Census inquiry needs to be emphasized that when the universe is a small one, it is no use resorting to a sample survey. Census is a complete enumeration of all items in the 'population'. It can be presumed that in such an inquiry, when all items are covered, no element of chance is left and the highest accuracy is obtained. Using the Census was appropriate because there was a small number of employees participating in the project. In addition, it enabled the highest accuracy in the findings of the study. Therefore, all of the target population was addressed for information inquiry on the subject under study.

### 3.5.3 Sample Size

This study utilized complete data collection, with the use of data from the entire population by gathering information from all 55 members of the project implementation team members at the Addis Capital Goods Headquarters (ACGHQ) design and construction project. Due to the limited size of the project implementation team at ACGHQ (55 individuals), it was feasible and practical to conduct a complete data collection, gathering information from every member of the target population.

### 3.6 Data Collection Method

In this study, the researcher used primary sources for collecting data. The primary sources of data for this study include semi-structured questionnaires. A review of the organization's quality plan, method statement, and work instruction was held to collect data on organization quality management, quality issues, and factors impacting construction quality, which has been used to enhance questionnaire content. Creating questions based on the variables that have been identified, the survey was developed to collect information from professionals who were part of the construction team for the ACGHQ project. This survey has included closed-ended questions. The questions primarily address the company's endeavors in implementing quality management system principles comprehensively. In addition to primary data, sources including annual reports and organizational profiles of focused organizations, different books and related research, journals, and articles from internet websites and magazines were used for this study.

**Questionnaire:** It is the simplest and time-saving method to collect data effectively from a huge number of respondents. By formulating questions from the identified variables, the questions related to quality management system awareness, project quality planning, and quality assurance mechanisms dimensions questions were adopted from Chen L, & Chan, AP (2012). For questions related to quality control implementation, quality management system implementation problems, and challenges dimensions questions were adopted from Al-Hosni, & Al-Mamari, (2012) However, the questionnaire for the quality management practices dimension was adapted from Hrit (2020), and Tsion (2023), where their Cronbach alfa was founded to be 0.764 and 0.769 respectively, which included items on top management and leadership, customer focus, engagement with people, and evidence-based decision-making.

This questionnaire was designed to gather data from professionals within in EEIG contractor side who were involved in the design and building ACGHQ project in Addis Ababa, piassa. However, questions in this survey questionnaire are closed-ended questions.

### 3.7 Data Collection Procedure

The effectiveness of data collection procedures hinges on a well-defined research question and the appropriate selection of methods (Kaliyadan, F & Kulkarni, V, 2020). By carefully choosing the methods and ensuring data quality, researchers can gather valuable insights into the quality management system practices, ultimately contributing to organizational improvement.

The development of the questionnaire for the study aims to demonstrate the objective of the research study to the target population through individual-level discussions with identified respondents from the concerned body. The researcher clarifies the study objective to all participants when the questionnaire is first given, to prevent any confusion. An immediate follow-up has taken place soon to address any issues that come up during the questionnaire filling process.

The questionnaire was divided into three sections. **Section one** includes questions about the general background of respondent information. **Section two** includes questions related to quality management system awareness, processes, tools and techniques used, and major challenges and problems encountered. **Section three** covered questions related to quality management practices like top management involvement, customer focus, engagement with people, evidence-based decision-making, and continuous improvement of projects. Rating scales have been used, where the evaluation scale was a five-point Likert scale, (Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)) will be used to express the level of agreement by the respondent.

### 3.8 Data Analysis Methods

This research utilizes descriptive analysis approaches to analyze the data with the help of statistical software like SPSS version 27. Descriptive statistics encompasses the gathering, arranging, showcasing, and condensing of data using techniques like frequency distribution, charts, tables, and diagrams for uncovering patterns and structures in the data and detecting any inconsistencies (Kaliyadan, F & Kulkarni, V, 2020). Hence, the process of analyzing the data includes cleansing, encoding, and converting the data when required. After employing a questionnaire to obtain the data, the information was thoroughly analyzed, and the findings were then interpreted to reach a reasonable conclusion. The demographic features of the respondents and their assessment of the dependent and independent variables were described using descriptive statistics, including frequency, percent, mean, and standard deviation. Finally, tables with explanations were used to present the findings. All descriptive analyses were performed using SPSS statistical software version 27. The descriptive statistics, including summary measures and visualizations, were reported for each variable in the results section.

## 3.9 Validity and Reliability

### 3.9.1 Validity

Validity refers to the degree to which a measure accurately captures the construct or concept of interest (Devellis, 2017). The researcher checked the validity of the questionnaires developed for this study before distributing the final questionnaires to the respondents, it was checked and commented on by friends and project team members and the advisor of the researcher and pilots to check the validity. The final version of the questionnaires was distributed after incorporating all the comments and feedback obtained from different professionals.

### 3.9.2 Reliability

Reliability is concerned with the consistency, stability, and repeatability of the informant's accounts as well as the investigators' ability to collect and record information accurately (Oso & Onen, D, 2016). The reliability of this research study was ensured through rigorous methodological practices and adherence to established standards of data collection, analysis, and interpretation.

The Cronbach's Alpha value evaluates the level of agreement of internal consistency of measures on a standardized scale from 0 to 1, where values above 0.7 are generally considered acceptable, and values above 0.8 are considered good levels of agreement between variables. A pilot test of the obtained replies from 15 distributed questionnaires was examined using a reliability test of Cronbach's Alpha using SPSS.

Table 1 Result of Reliability statistics

	Scale: Variable	Cronbach's Alpha	No of Items
1	QMS awareness	0.949	5
2	Project quality planning	0.852	12
3	Project quality Assurance mechanism	0.783	11
4	Project quality control implementation	0.781	10
5	QMS implementation problems/challenges	0.888	8
6	QMS implementation practices	0.913	22
	Valid	0.861	68

Source: own survey May-2024

The reliability statistics indicate a Cronbach's Alpha value to be 0.861, indicating this is considered a good level of agreement between variables. By implementing these strategies, the researcher aims to maximize the reliability of this study's outcomes and contribute to the validity and credibility of the research findings.

### 3.10 Ethical Considerations

Ethical considerations in research are a set of principles that guide your research designs and practices (Archibald & Thomas, 2012). Scientists and researchers must always adhere to a certain code of conduct when collecting data from people, this study was conducted with strict adherence to ethical principles and precautions. Before participating, respondents have received clear and comprehensive information about the purpose of the data collection. The introductory part of the questionnaire explicitly states the purpose of the study. Throughout the questionnaire, the researcher had taken great care to avoid any misleading or deceptive statements. Respondents were assured that their privacy and identity would be fully protected, and their responses would be treated with the utmost confidentiality and would only be used for academic study purposes.

# CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

## Introduction

This chapter presents the findings from the data collected during the research study. The purpose of this chapter is to systematically organize, analyze, and interpret the data to address the research questions and objectives. The data was gathered using quantitative methods, including surveys and document analysis. The chapter begins with an overview of the response rates, demographic profile of respondents, descriptive statistics, and inferential analysis.

This is followed by a detailed presentation of the quantitative data, displayed using tables to illustrate the key findings. The existing literature on the topic is analyzed, with similarities and differences highlighted. Finally, this chapter concludes with a discussion of the key findings. The data presented in this chapter provides the foundation for the discussion and conclusions in the following chapters.

### 4.1 Data Analysis and Interpretation

#### 4.1.1 Response Rate

Out of the 55 questionnaires that were sent in total, the researcher was able to gather 55 responses that were adequate for the study, the questionnaire's response rates are organized as shown in Table 2 below. A high response rate indicates that a larger proportion of the study sample participated in the research, which can increase the representativeness of the study sample and the generalizability of the study findings.

Table 2 Result of Response Rate

Questioner distributed	Questioner returned	Percent of response
55	55	100%

Source: own survey May-2024

#### 4.1.2 Demographic Profile

The demographic profile section typically includes information on the age, gender, education, job position, and experience of the participants. By presenting this information, researchers can

provide a clear and concise overview of the study sample and highlight any notable trends or patterns that may be relevant to the research question (Pallant J. , 2016).

Table 3 below shows the general characteristics of the respondents in terms of sex, age, education level, current position, and years of experience in this field, of respondents in the company.

Table 3 General Demographic Information about Respondent

	Characteristics	Frequency	%	Valid Percent	Cumulative Percent
Gender	Male	38	69.1	69.1	69.1
	Female	17	30.9	30.9	100
	Total	55	100	100	
Age	20-30	44	80.0	80.0	80.0
	31-40	9	16.4	16.4	96.4
	41-50	2	3.6	3.6	100
	Total	55	100	100	
Educational level	MA(MSc)	5	9.1	9.1	9.1
	BA/BSc	17	30.9	30.9	40.0
	Diploma	30	54.5	54.5	94.5
	Certificate level and other	3	5.5	6.3	100
	Total	55	100	100	
Job Position	project manager	2	3.6	3.6	3.6
	project engineer	9	16.4	16.4	20.0
	Member of project implementation team	38	69.1	69.1	89.1
	Quality assurance	3	5.5	5.5	94.5
	Quality control	2	3.6	3.6	98.2
	Other	1	1.8	1.8	100
	Total	55	100	100	
Work Experience	Below 5 years	31	56.4	56.4	56.4
	6-10 years	21	38.2	38.2	94.5
	11-15 years	3	5.5	5.5	100
	Total	55	100	100	

Source: SPSS output May-2024

#### 4.1.2.1 Distribution of Respondent by Gender

The demographic statistics shown in Table 3 above show the distribution of respondents by gender. Participants were asked to indicate their gender by selecting the appropriate option provided (male

or female). Accordingly, 69.1% of the participants identified as male, and 30.9% identified as female. This indicates that the majority of the participants were male, which is consistent with what is typically seen in the construction industry.

It is also important to note that the construction industry has been traditionally male-dominated, and there have been efforts to increase gender diversity in the field. The underrepresentation of women in the Ethiopian construction industry is due to several factors, including cultural norms and stereotypes, lack of education and training opportunities, and limited access to resources and networks (Gebrehiwot, M & Gebremedhin, 2017). However, efforts have been made to increase gender diversity in the Ethiopian construction industry, including the implementation of affirmative action policies and the establishment of women's networks and support groups (Tadesse, 2018).

#### 4.1.2.2 Distribution of Respondent by Age

The provided demographic data presents information on the distribution of individuals based on age groups, table 3 above displays the frequency, percentage, valid percentage, and cumulative percentage for each age category. This shows the seniority of respondents based on age, Majority (80.0%) of the respondents are between 20-30 years, while (16.4%) are between 31-40 years and the remaining 3.6% represents between 41-50 years age group. The concentration of a certain age group could impact projects in terms of knowledge transferred in return impacting the quality management system.

First, the concentration of a majority of the respondents in the 20-30 years age group implies that the construction industry is attracting a significant number of young workers, which could be a positive sign for the future of the industry. However, it is also important to consider the potential impact of this age distribution on the industry, one implication is that the industry may be losing valuable knowledge and experience from older workers. This could impact the quality of construction projects, as well as the transfer of knowledge and skills to the next generation of workers. Additionally, the age distribution of the respondents could also have implications for the industry's capacity to adapt to new technologies and practices. Younger workers may be more familiar with new technologies and have a greater willingness to adopt new practices, but they may also lack the experience and knowledge to effectively implement these changes.

#### 4.1.2.3 Distribution of Respondents by Education Level

Table 3 above displays the frequency, percentage, valid percentage, and cumulative percentage for each education level category. The data indicates that the majority of the respondents (54.5%) in the sample comprises individuals with education at the diploma level, while (30.9%) of the respondents have completed a bachelor's degree, respondents that have completed MA(MSc) degree comprise for (9.1%), while a smaller proportion of the respondents (5.5%) hold certificate.

However, the concentration of respondents with a diploma may also suggest a potential knowledge gap between these workers and those with higher levels of education. This could lead to challenges in the transfer of knowledge and skills, particularly in the context of new and emerging technologies. The second largest group of respondents (30.9%) in the sample have completed a bachelor's degree, indicating a significant proportion of the workforce has a higher level of education. This could have a positive impact on the project, as these individuals are likely to have a greater understanding of technical and theoretical concepts, and may be better equipped to handle complex tasks. Meanwhile, the smaller proportion of respondents (9.1%) with a master's degree (MA or MSc) may bring additional expertise and knowledge to the project, particularly in specialized areas of construction.

#### 4.1.2.4 Distribution of Respondents by Job Position

Table 3 above displays the frequency, percentage, valid percentage, and cumulative percentage for each job position category. The data indicates that the majority of the respondents (69.1%) hold the position of a member of the project implementation team, while (16.4%) are project engineers, (5.5%) are quality assurance team, (3.6%) work as quality control, (3.6%) of the respondent from sample frame are project managers and 1.8% in other.

The majority of the respondents (69.1%) being members of the project implementation team suggests that the team plays a significant role in the project and its success. This implies that teams must have a clear understanding of the project's goals and objectives, and they must have the necessary skills and resources to execute the project (Akintoye & Fitzgerald, 2016).

The second largest group of respondents (16.4%) project engineers highlight the importance of technical expertise and problem-solving abilities in the construction project. These individuals are responsible for the design and planning of the project, and their expertise can have a significant impact on the project's success.

The presence of a smaller proportion of respondents (5.5%) in the quality assurance team and (3.6%) in the quality control team also suggests a strong emphasis on quality control and assurance in the ACGHQ design and construction project. This is a positive implication, as it indicates that the project has a system in place to ensure that the final product meets the required standards.

The presence of (3.6%) of respondents in the sample frame as project managers suggests a strong emphasis on leadership and strategic planning in the construction project. Project managers play a critical role in ensuring that the construction project is completed on time and within budget, and their expertise can have a significant impact on the project's success (Turner J. R., 2017).

#### 4.1.2.5 Distribution of Respondent by Years of Experience

Table 3 above displays the frequency, percentage, valid percentage, and cumulative percentage for each category of years of experience. The data indicates that the majority of the respondents (56.4%) have 1-5 years of experience, while (38.2%) have 6-10 years of experience. A smaller proportion of the respondents (5.5%) have 11-15 years of experience.

The majority of the respondents having 1-5 years of experience suggests that the project has a relatively inexperienced workforce, which could impact the project's success. Inexperienced team members may require more training and support, and they may be more likely to make mistakes or encounter unforeseen challenges (Brown & Bowen, 2016). The second largest group of respondents (38.2%) having 6-10 years of experience suggests that the project has a moderate level of experience, which can be beneficial for the project. These individuals have a good understanding of the construction process and can contribute to the project's success.

## 4.2 Descriptive Results and Analysis

As mentioned above in the literature review and conceptual framework of the researcher considered project quality management process (quality planning, quality assurance, quality control), project quality management practices (top management and leadership commitment, customer focus, engagement with people, evidence-based decision making and improvement with project), quality management challenges/problems faced and the quality management tools and techniques applied as variables for success of quality management in the project.

Respondents were asked to rate the quality management system at the ACG headquarters design and construction project on all of the variables used to assess the project quality management of

the ACGHQ design and construction project. By using a 5-point Likert scale, respondents were asked to rate each question on the variable as listed as 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree. A mean score closer to 1 signifies a lower level of agreement with the statement, indicating a need for improvement in that area. Conversely, a mean score approaching 5 suggests a higher level of agreement, indicating a more robust and common use of the system. By examining the mean values, we can identify areas where practices are well-established and those that require further attention and development.

Table 4 Likert Scale Interpretation and Mean Values Distribution

Likert Scale	Likert Description(interpretation)	Value Allocation (Range of mean Value)
1	Very Low	1.0 – 1.8
2	Low	1.81 - 2.60
3	Average	2.61 - 3.20
4	High	3.21 - 4.20
5	Very High	4.21 – 5.00

Source: Moidunny, K. (2009). The effectiveness of the National Professional Qualifications: The National University of Malaysia.

According to Moidunny (2009), mean scores were interpreted as follows: scores ranging from 1.00 to 1.80 are considered very low, 1.81 to 2.60 are considered low, 2.61 to 3.20 are considered medium, 3.21 to 4.20 are considered high, and 4.21 to 5.00 are considered very high. This interpretation provided a framework for understanding the relative magnitude of mean scores within the study.

#### 4.2.1 Quality Management System Awareness

A key aspect of a successful QMS is ensuring that all team members within an organization are aware of its purpose and their role in maintaining it. This is often achieved through training and awareness programs that help employees understand the importance of quality management and their role in ensuring it. However, several studies have shown that team members' awareness of a QMS can significantly impact a project's success.

As shown in Table 4 below 55 respondents gave responses to all 5 questions regarding quality management system awareness among employees on the project. The responses are

Table 5 Quality Management System Awareness

Descriptive Statistics									
		N	Frequency					Mean	Std. Dev
			1	2	3	4	5		
I.	The importance of quality in the project is well understood by all members of the project team.	55	0	18(32.7%)	18(32.7%)	19(34.5%)	0	3.02	0.828
II.	Responsible person or department assigned to quality management.	55	0	0	8(14.5%)	37(67.3%)	10(18.2%)	4.04	0.576
III.	A quality management system has been part of corporate policy.	55	0	0	0	33(60.0%)	22(40.0)	4.40	0.494
IV.	The project team is proactive in identifying and addressing potential quality issues.	55	0	25(45.5%)	13(23.6%)	17(30.9%)	0	2.85	0.870
V.	The quality management department is involved in regular training and development programs.	55			7(12.7%)	42(76.4%)	6(10.9%)	3.98	0.490
Overall mean								3.65	
Valid N (listwise)		55							

(Source own survey- May 2024)

- I. On the question trying to assess the level of understanding of team members about the importance of quality in a project, based on the response 18(32.7%) of respondents disagreed, while 19(34.5%) agreed, and 18(32.7%) of respondents gave a neutral response, which results in a mean score of 3.02, which indicates an average level of agreement with the statement. which implies that a significant proportion of team members may not fully comprehend the value of quality in project management, and there may be room for further education and training to ensure that all team members fully understand the importance of quality in a project.
- II. The data collected indicates that 8(14.5%) gave a neutral response which suggests that there is a consensus among team members regarding the assignment of a responsible person or department for quality management, 37(67.3%) agreed, and 10(18.2%) strongly agreed

that there is responsible person or department assigned to quality management resulting in mean score of 4.04, which suggests a high level of agreement with the statement. This is a positive sign, as it indicates that there is a designated person or department responsible for ensuring that quality standards are met.

- III. Based on the responses 33(60.0%) respondents agree and 22(40.0%) strongly agree that quality management system has been part of corporate policy in the organization, the fact that 43.8% of respondents strongly agree with the statement suggests that there is a strong commitment to quality management within the organization, resulting in a mean score of 4.40. Which indicates a strong level of agreement with the statement. This is an encouraging sign, as it suggests that the organization has taken steps to formalize its approach to quality management.
- IV. The response data indicates that there is a relatively low level of agreement among respondents regarding the proactivity of the project team in identifying and addressing potential quality issues, resulting in a mean score of 2.85. Specifically, 25(45.5%) of respondents disagree, 13(23.6%) gave a neutral response, and 17(30.9%) agreed with the statement. This suggests that there may be room for improvement in the project team's approach to quality management. According to a study by Kerzner (2017), proactive identification and addressing of potential quality issues can lead to improved project outcomes, reduced risks, and increased customer satisfaction. The fact that most of the respondents disagree with the statement indicates that there may be a lack of awareness or prioritization of quality management within the project team which can lead to a reactive approach to quality management, where issues are only addressed after they have become problems.
- V. The response data provided indicates that 7(12.7%) of respondents gave a neutral response, 42(76.4%) agreed and 6(10.9%) strongly agreed that the quality management department is involved in regular training and development programs giving a mean score of 3.98 indicate high level of agreement, which indicates that the organization recognizes the importance of ongoing training and development for the quality management department and is taking steps to ensure that they have the necessary skills and knowledge to effectively manage quality. However, the fact that 12.7% of respondents gave a neutral response indicates that there may be some room for improvement in this area.

Overall, respondents demonstrated a strong commitment to quality management within the ACGHQ project, with designated responsibilities and integration into corporate policy. This finding aligns with research by Abera et al. (2021) who identified a lack of management commitment and inadequate training as major barriers to effective quality management system (QMS) implementation. This finding also suggests that having a formal QMS is not enough it requires widespread awareness and understanding. While the ACGHQ project appears to have a formal system in place, it faces challenges in implementation, the company needs to strengthen its training and development initiatives. This highlights a need to move beyond simply establishing a system and focus on ensuring its effective implementation through employee education. Further education and training are crucial to ensure all team members understand the importance of quality and can proactively address issues.

#### 4.2.2 Quality Planning.

Quality planning serves as the cornerstone for successful quality management system implementation, acting as a roadmap that guides the entire process toward achieving desired quality outcomes. It establishes a clear framework for defining quality objectives, identifying critical quality factors, and outlining the necessary processes and resources to ensure adherence to standards. This proactive approach minimizes the risk of defects and rework by identifying potential issues early on, enabling timely adjustments and preventative measures. Furthermore, quality planning fosters a shared understanding of quality expectations among all stakeholders, from top management to project teams and suppliers. By aligning quality goals with the overall strategic objectives of the organization, it ensures that quality efforts are integrated and consistent across all phases of the project lifecycle, ultimately contributing to project success, customer satisfaction, and organizational excellence

As shown in Table 5 below 55 respondents gave responses to all 12 questions regarding quality planning on the project. The responses are

Table 6 Description of Quality Planning

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Involvement and participation of all relevant stakeholders	55	0	0	9(18.8%)	22(45.8%)	17(35.4%)	4.11	0.737
II. The necessary skills and knowledge.	55	0	0	6(12.5%)	24(50%)	18(37.5%)	4.20	0.678
III. Aligns with international QMS standards.	55	4(8.3%)	0	8(16.7%)	23(47.9%)	13(27.1%)	3.84	1.05
IV. Brief description of the project scope.	55	0	0	0	34(70.8%)	14(29.2%)	4.27	0.449
V. Project quality objectives.	55	0	4(8.3%)	3(6.3%)	28(58.3%)	13(27.1%)	4.04	0.793
VI. List of contract documents and drawings.	55	0	0	4(8.3%)	24(50%)	20(41.7%)	4.31	0.635
VII. Specific responsibilities and authorities of project staff.	55	0	4(8.3%)	3(6.3%)	22(45.8%)	19(39.6%)	4.16	0.834
VIII. List of materials and appliances	55	4(8.3%)	0	16(33.3)	12(25%)	16(33.3%)	3.78	1.15
IX. List of quality procedures and work instructions.	55	0	0	9(18.8%)	24(50%)	15(31.3%)	4.07	0.716
X. List of quality records to be kept, including appropriate quality records from subcontractors.	55	0	1(2.1%)	0	29(60.4%)	18(37.5%)	4.33	0.579
XI. Frequency (or provisional dates if possible) of internal quality audits.	55	0	5(10.4%)	7(14.6%)	18(37.5%)	18(37.5%)	4.02	0.972
XII. Frequency of updating the quality plan.	55	0	0	12(25%)	15(31.3%)	21(43.8%)	4.16	0.834
Overall mean							4.1	
Valid N (listwise)	55							

(Source own survey May-20254)

- I. From the response above 9(18.8%) of respondents gave a neutral response while 22(45.8%) agreed and 17(35.4%) strongly agreed indicating the involvement and participation of all relevant stakeholders in the quality planning process received a mean score of 4.11, which implies a relatively high level of agreement among respondents. This suggests that the organization values the input of all stakeholders in the quality planning process and that stakeholders feel involved and informed.
- II. Based on the response 6(12.5%) respondents gave a neutral response, 24(50%) which is half of the respondents agreed and 18(37.5%) strongly agreed which suggests the majority

of respondents agreed that the personnel involved in the quality planning process have the necessary skills and knowledge resulting in the mean value of 4.20. This is a positive sign, as it suggests that the organization has competent personnel who can effectively plan and manage quality. Moreover, it is not only important to ensure that personnel have the necessary skills and knowledge, but also that these skills are kept up-to-date with the latest industry standards and practices.

- III. Based on the response 23(47.9%) agreed and 13(27.1%) of respondents strongly agreed respectively that the quality planning process aligns with international QMS standards, but the mean score of 3.84 suggests that there is room for improvement. Specifically, 4(8.3%) of respondents disagreed that the quality planning process aligns with international QMS standards.
- IV. The majority of respondents 34(70.8%) agreed that the project scope was clearly described in the quality planning process. This is a positive sign, as it suggests that the organization has a clear understanding of the project's goals and objectives.
- V. The mean score of 4.04 for project quality objectives indicates that there is a relatively high level of agreement among respondents. This suggests that the organization has clear objectives for quality and that personnel are aware of these objectives.
- VI. Accordingly, 4(8.3%) of respondents gave neutral responses, while 24(50%) agreed and 20(41.7%) strongly agreed that the list of contract documents and drawings was included in the quality planning process. while resulting in a mean score of 4.31, this is a positive sign, as it suggests that the organization has a clear understanding of the project's requirements and constraints. The inclusion of contract documents and drawings in the quality planning process is crucial to ensuring that all parties involved in the project have a clear understanding of the project's scope and requirements (Kerzner, 2017). This can help to prevent misunderstandings and errors, and can ultimately contribute to the success of the project.
- VII. The mean score of 4.16 for specific responsibilities and authorities of project staff suggests that there is a relatively high level of agreement among respondents. This is a positive sign, as it suggests that the organization has clearly defined roles and responsibilities for personnel involved in the project.

- VIII. The mean score of 3.78 for the list of materials and appliances used for the project indicates that there is room for improvement. Specifically, 4(8.3%) of respondents disagreed that the verification requirement of each was included in the quality planning process could imply that there may be a lack of attention to detail in the quality planning process regarding the verification of materials and appliances used in the project. This could potentially lead to issues down the line, as it is essential to ensure that all materials and appliances used meet the necessary quality standards.
- IX. Based on the response 9(18.8%) of respondents gave a neutral response while 24(50%) and 15(31.3%) for respondent agreed and strongly agreed respectively resulting in a mean score of 4.07 for the list of quality procedures and work instructions applicable to the project, suggesting that there is a relatively high level of agreement among respondents. However, the fact that nearly 18.8% of respondents gave a neutral response indicates that there may still be some uncertainty or lack of clarity around the specific procedures and work instructions that apply to the project.
- X. The majority of respondents 29(60.4%) agreed that the list of quality records to be kept, including appropriate quality records from subcontractors, was included in the quality planning process. This is a positive sign, as it suggests that the organization is committed to maintaining accurate and complete records.
- XI. The mean score of 4.02 for the frequency of internal quality audits suggests that there is a relatively high level of agreement among respondents. This is a positive sign, as it suggests that the organization is committed to regularly auditing its quality management system.
- XII. Based on the responses 12(25%) of respondents gave neutral responses while 15(31.3%) and 21(43.8%) of respondents agreed and strongly agreed that the frequency of updating the quality plan was appropriate, giving a mean score of 4.16. This is a positive sign, as it suggests that the organization is committed to regularly reviewing and updating its quality planning process.

However, there are also areas for improvement, such as the alignment of the quality planning process with international QMS standards and the verification requirements of materials and appliances. Overall, the data suggest that the organization is committed to quality planning, but there is room for improvement in certain areas.

Although, several studies like Mekuria (2023) found that the performance of quality management components, including quality planning, was low across selected construction companies in Ethiopia, suggesting that there is room for improvement in this area, in addition, the study by Getahun (2017) also highlighted the challenges faced by Ethiopian construction firms in delivering satisfactory products while meeting customer expectations, which could be attributed to gaps in quality planning processes. The ACGHQ project's challenges in aligning with international standards, verifying materials, and clarifying procedures reveal practical hurdles in implementing a comprehensive quality planning process. It highlights the need to address these specific challenges to improve planning effectiveness.

#### 4.2.3 Quality Assurance Mechanisms

As shown in Table 6 below 55 respondents gave a response to all 11 questions regarding quality planning on the project. The responses are

Table 7 Description of Quality Assurance Mechanisms

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Appropriate quality management system requirements	55	0	0	3(6.3%)	23(47.9%)	22(45.8%)	4.42	0.599
II. specified quality management system requirements.	55	0	0	11(22.9%)	12(25%)	25(52.1%)	4.27	0.849
III. Evaluate and select subcontractors on their ability	55	0	0	10(20.8%)	29(60.4%)	9(18.8%)	3.91	0.646
IV. Appropriate checking, measurement, or testing	55	0	0	4(8.3%)	26(54.2%)	18(37.5%)	4.24	0.637
V. Quality assurance processes and tools are in place	55	0	1(2.1%)	3(6.3%)	23(47.9%)	21(43.8%)	4.33	0.721
VI. Inspection and Testing Procedures.	55	0	0	10(20.8%)	21(43.8%)	17(35.4%)	4.07	0.742
VII. Non-Destructive Testing.	55	10(20.8%)	5(10.4%)	11(22.9%)	15(31.3%)	7(14.6%)	2.91	1.378
VIII. Statistical Process Control	55	0	13(27.1%)	12(25%)	16(33.3%)	7(14.6%)	3.27	1.062
IX. Quality Audits and Reviews.	55	0	8(16.7%)	7(14.6%)	15(31.3%)	18(37.5%)	3.76	1.105
X. Risk Management Techniques.	55	0	1(2.1%)	11(22.9%)	22(45.8%)	14(29.2%)	4.98	0.782
XI. Customer Satisfaction Surveys.	55	1(2.1%)	0	2(4.2%)	15(31.3%)	30(62.5%)	4.51	0.742
Overall mean							4.06	
Valid N (listwise)	55							

(Source own survey May-2024)

- I. Based on the response (47.9%) and 22(45.8%) of respondents agree or strongly agree that the organization selects appropriate QMS requirements for each contract, giving a high mean of 4.42 and a low standard deviation of 0.59 indicating strong consensus among

respondents. This could imply the strong consensus among respondents and the high level of satisfaction regarding the organization's ability to select appropriate QMS requirements for each contract are positive indicators of the organization's commitment to quality management and its ability to meet the specific needs and requirements of each contract.

- II. Accordingly, 11(22.9%) of respondents gave neutral responses while 12(25%) and 25(52.1%) of respondents agree and strongly agree respectively that QMS requirements are specified in tender and contract documents, giving a mean of 4.27 suggests a high level of agreement, but the standard deviation of 0.849 indicates some variability in responses. This implies while QMS requirements are generally well-defined in contracts, there may be room for improvement in ensuring consistent clarity across all tender and contract documents.
- III. Based on the response 10(20.8%) of respondents gave a neutral response while 29(60.4%) and (18.8%) respondents agree and strongly agree respectively that the organization evaluates and selects subcontractors based on their ability to meet specified requirements, which results in a mean value of 3.91. which indicates a moderate to high level of agreement, and the standard deviation of 0.646 suggests some variability in responses. This implies the organization has a process for assessing subcontractor capabilities, but there may be opportunities to strengthen this process or ensure more consistent application across all subcontractor selections.
- IV. Accordingly, 26(54.2%) and 18(37.5%) of respondents agree and strongly agree respectively while 4(8.3%) respondents give neutral responses that appropriate product checking, measurement, testing, and record-keeping are in place. While a high mean of 4.24 and a low standard deviation of 0.637 indicate strong consensus among respondents, this Implies the organization has effective processes for ensuring product quality through appropriate testing and record-keeping, which is a critical aspect of QMS implementation.
- V. 91.7% of respondents agree or strongly agree that quality assurance processes and tools are in place to maintain quality levels. The high mean of 4.33 and standard deviation of 0.721 suggest a high level of agreement with some variability in responses. This could imply the organization has a strong foundation of quality assurance processes and tools, but there may be opportunities to further optimize or standardize their application across all areas of the organization.

- VI. Based on the responses, 10(20.8%) of respondents gave neutral responses while 21(43.8%) and 17(35.4%) agree and strongly agree respectively which could imply the majority of employees in the organization are familiar with inspection and testing procedures, with a mean score of 4.07 and a standard deviation of 0.742, indicating a moderate to high level of familiarity. However, there is a need for a more consistent understanding and application of these procedures, with some variability in knowledge levels.
- VII. Regarding Non-Destructive Testing (NDT) techniques, there is a significant knowledge gap, where the mean score is low at 2.91, and the standard deviation is high at 1.378, indicating a wide range of knowledge levels among employees. However, this suggests that while some employees have a basic understanding of NDT techniques, others have very limited or no knowledge of these techniques, the fact that 20.8% of respondents strongly disagree, and 10.4% disagree, coupled with 22.9% of respondents giving neutral responses, indicating a lack of confidence and familiarity with NDT techniques. This is concerning, as NDT techniques are crucial in ensuring the quality and safety of products and services, particularly in industries such as manufacturing, and construction.
- VIII. A similar pattern is seen in Statistical Process Control (SPC), with only 47.9% of respondents agreeing or strongly agreeing that they are familiar with SPC. The mean score is 3.27, and the standard deviation is 1.062, indicating a wide range of knowledge levels.
- IX. Employees have a moderate to high level of familiarity with quality audits and reviews, with a mean score of 3.75 and a standard deviation of 1.105, indicating some variability in knowledge levels.
- X. Regarding risk management techniques, the organization has a good foundation of knowledge among employees, with 75% of respondents agreeing or strongly agreeing that they are familiar with these techniques. The mean score is 4.98, and the standard deviation is 0.782, indicating some variability in knowledge levels.
- XI. Finally, employees have a strong understanding of customer satisfaction surveys, with 93.8% of respondents agreeing or strongly agreeing that they are familiar with customer satisfaction surveys. The mean score is high at 4.51, and the standard deviation is 0.742, indicating a strong consensus among respondents.

Overall, this finding supports research by Jaafar (2019) which argues that simply having QMS practices in place isn't enough a systematic approach to implementing and monitoring these

practices is critical. The ACGHQ project needs to prioritize training to address the identified knowledge gaps. While the project shows a commitment to QA, the knowledge gaps contradict the argument that Ethiopian companies are adept at implementing quality assurance mechanisms (Mulu & Worku, 2021). However, there are some areas where there may be room for improvement, such as familiarity with NDT techniques, SPC, and risk management techniques.

#### 4.2.4 Quality Control Implementation

As shown in Table 7 below 55 respondents gave responses to all 10 questions regarding quality control implementation among employees on the project. The responses are given as,

Table 8 Description of Quality control implementation

	N	Frequency					Mean	Std. Dev
		1	2	3	4	5		
I. Select what to control and set standards that provide the basis for decisions regarding possible corrective action.	55	0	0	11(22.9%)	21(43.8%)	16(33.3%)	4.04	0.769
II. Establishes measurements, and methods used	55	0	0	11(22.9%)	17(35.4%)	20(41.7%)	4.15	0.803
III. Appropriate actions to take when non-conforming processes or materials are identified.	55	0	0	2(4.2%)	19(39.6%)	27(56.3%)	4.53	0.573
IV. Monitor and standardize measuring devices	55	0	0	3(6.3%)	13(27.1%)	32(66.7%)	4.62	0.593
V. The project is closely monitored and controlled using data-driven metrics	55	0	0	2(4.2%)	23(47.9%)	23(47.9%)	4.42	0.599
VI. Improved product and service quality.	55	0	0	2(4.2%)	14(29.2%)	32(66.7%)	4.64	0.557
VII. Reduced defects and rework.	55	0	0	1(2.1%)	22(45.8%)	25(52.1%)	4.53	0.539
VIII. Increased cost savings and efficiency.	55	0	0	1(2.1%)	32(66.7%)	15(31.3%)	4.27	0.489
IX. Improved project schedule adherence,	55	0	1(2.1%)	1(2.1%)	32(66.7%)	14(29.2%)	4.18	0.580
X. Enhanced customer satisfaction.	55	0	1(2.1%)	1(2.1%)	14(29.2%)	32(66.7%)	4.62	0.623
Overall mean							4.4	
valid N listwise	55							

(Source own survey May-2024)

- I. Based on the data provided for the statement stating organization selects what to control and set standards that provide the basis for decisions regarding possible corrective action, the mean score was found to be 4.04 which indicates that the respondents generally agree that the organization selects what to control and sets standards that provide a basis for decisions regarding possible corrective action. however, the standard deviation of 0.769 suggests that there is some variation in the responses, but it is relatively low, indicating that there is a consensus among the respondents.

- II. The second statement, "Establishes measurements, methods used, and compare the actual results to the quality standards" received a mean score of 4.15, indicating that a majority of respondents (76.9%) either agreed or strongly agreed with the statement. This suggests that the organization has established measurements and methods for comparing actual results to quality standards.
- III. The third statement, "Determines the appropriate actions to take when non-conforming processes or materials are identified" received a mean score of 4.53, indicating that a majority of respondents (85.4%) either agreed or strongly agreed with the statement. This suggests that the organization has a clear process in place for addressing non-conforming processes or materials.
- IV. The fourth statement, "Monitor and standardize measuring devices, include detailed documentation for all processes" received a mean score of 4.62, indicating that a majority of respondents (93.8%) either agreed or strongly agreed with the statement. This suggests that the organization places a high priority on monitoring and standardizing measuring devices, and that detailed documentation is in place for all processes.
- V. The fifth statement, "Project is closely monitored and controlled using data-driven metrics and tools" received a mean score of 4.42, indicating that a majority of respondents (81.3%) either agreed or strongly agreed with the statement. This suggests that the organization utilizes data-driven metrics and tools to closely monitor and control projects.
- VI. The sixth statement, "Improved product and service quality" received a mean score of 4.64, indicating that a majority of respondents (93.8%) either agreed or strongly agreed with the statement. This suggests that the organization has seen an improvement in product and service quality as a result of quality planning.
- VII. The seventh statement, "Reduced defects and rework" received a mean score of 4.53, indicating that a majority of respondents (85.4%) either agreed or strongly agreed with the statement. This suggests that the organization has seen a reduction in defects and rework as a result of quality planning.
- VIII. The eighth statement, "Increased cost savings and efficiency" received a mean score of 4.27, indicating that a majority of respondents (70.8%) either agreed or strongly agreed with the statement. This suggests that the organization has seen an increase in cost savings and efficiency as a result of quality planning.

- IX. The ninth statement, "Improved project schedule adherence" received a mean score of 4.18, indicating that a majority of respondents (68.8%) either agreed or strongly agreed with the statement. This suggests that the organization has seen an improvement in project schedule adherence as a result of quality planning.
- X. The tenth statement, "Enhanced customer satisfaction" received a mean score of 4.62, indicating that a majority of respondents (93.8%) either agreed or strongly agreed with the statement. This suggests that the organization has seen an enhancement in customer satisfaction as a result of quality planning

Overall, the response data suggests that respondents generally agree on the positive implications of quality control implementation in project management, with mean scores ranging from 4.10 to 4.62 out of 5. This indicates a high level of agreement on the benefits such as improved product and service quality, reduced defects and rework, increased cost savings and efficiency, enhanced customer satisfaction, and improved project schedule adherence. The consistency in responses, as indicated by relatively low standard deviations and variances, further supports the notion that quality control measures play a significant role in ensuring the success of projects by enhancing quality, efficiency, and customer satisfaction.

This finding aligns with research emphasizing the importance of a systematic approach to quality control (Hillson, 2015). The ACGHQ project's approach suggests an understanding of the value of control processes. However, findings about the use of data-driven metrics contradict previous research that suggests a lack of effective data management in Ethiopian construction (Birhanu, 2011). It appears the ACGHQ project is making progress in data utilization. The challenges encountered in raw material shortage, and difficulties in understanding the system reveal that even with a well-structured quality control system, external and internal factors can significantly impact its implementation effectiveness.

#### 4.2.5 Quality Management System Challenges/Problem

Quality issues can lead to significant costs, including rework, scrap, warranty claims, and lost customer satisfaction. Effective cost management requires robust quality control processes and proactive identification of potential issues.

As shown in table 8 below 55 respondents gave responses to all 8 questions regarding quality management system challenges and problems among employees on the project. The responses are given as,

Table 9 Description of QMS challenges and problems

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Insufficient management support.	55	25(45.5%)	9(16.4%)	12(21.8%)	5(9.1%)	4(8.3%)	2.16	1.30
II. Unwillingness of project staff to admit the quality system.	55	14(25.5%)	18(32.7%)	14(25.5%)	3(5.5%)	6(10.9%)	2.44	1.24
III. Difficulties in understanding the quality system.	55	7(12.7%)	24(43.6%)	10(18.2%)	13(23.6%)	1(1.8%)	2.58	1.04
IV. Lack of standardized quality management guidelines.	55	14(25.5%)	22(40.0%)	14(25.5%)	5(9.1%)	0	2.18	0.92
V. Face problems with raw materials shortage due to inflation.	55	4(7.3%)	6(10.9%)	6(10.9%)	23(41.8%)	16(29.1%)	3.75	1.20
VI. Face problems with Government bureaucracy.	55	7(12.7%)	13(23.6%)	22(40.0%)	11(20.0%)	2(3.6%)	2.78	1.03
VII. Inadequate information and inadequate technical expertise/skills.	55	7(12.7%)	23(41.8%)	15(27.3%)	6(10.9%)	4(7.3%)	2.58	1.08
VIII. Face communication problems among project teams.	55	25(45.5%)	11(20.0%)	7(12.7%)	10(18.2%)	2(3.6%)	2.15	1.28
Overall mean							2.57	
Valid N (listwise)	55							

(Source own survey May-2024)

- I. Based on the response above regarding insufficient management support, 61.9% of respondents disagree or strongly disagree with this being a problem. Which results in the mean score of 2.16 indicating a relatively low level of agreement. The standard deviation of 1.30 suggests some variability in responses. This implies insufficient management support does not appear to be a major barrier to quality management implementation in the organization.
- II. Regarding responses on the unwillingness of project staff to admit the quality system, it has been found that 58.2% of respondents disagree or strongly disagree with this being a problem. Which results in the mean score of 2.44 indicating a relatively low level of agreement. The standard deviation of 1.24 suggests some variability in responses. This implies Staff's unwillingness to accept the quality system is not a significant obstacle.

III. Based on responses regarding difficulties in understanding the quality system, 56.3% of respondents disagree or strongly disagree with this being a problem. While the mean score of 2.58 indicates a relatively low level of agreement. The standard deviation of 1.04 suggests some variability in responses. This implies difficulties in understanding the quality system are not a major barrier.

However, a study by Abera et al. (2021) on the challenges of quality management implementation in the Ethiopian construction industry found that lack of management commitment, inadequate training, and poor communication were among the top barriers. While the current data suggests these factors were not identified as major obstacles for the ACGHQ design and construction project, the study highlights the importance of addressing these issues to ensure successful quality management implementation.

Another study by Tesfaye et al. (2019) on the challenges of quality management in Ethiopian manufacturing firms identified raw materials shortage and government bureaucracy as significant challenges, which aligns with the findings of the current data. The study emphasizes the need for firms to develop strategies to mitigate the impact of these challenges on product quality. However, the current data suggests that the main challenges to quality management implementation on ACGHQ design and construction projects were found to be raw materials shortage due to inflation, difficulties in understanding the quality system, and, to some extent government bureaucracy. Other factors, such as insufficient management support, staff unwillingness, lack of standardized guidelines, inadequate information and expertise, and communication problems, do not appear to be major obstacles to the project.

#### 4.2.6 Quality Management System Practices

##### 4.2.6.1 Top Management and Leadership

Top management and leadership are the driving forces behind a successful quality management system (QMS). Their commitment to quality sets the tone, while clear policies, defined roles, and regular reviews ensure its effectiveness. Top management creates a QMS that drives customer satisfaction, reduces costs, enhances reputation, and improves project efficiency, ultimately, their involvement is crucial for achieving quality excellence and project success.

As shown in Table 9 below 55 respondents gave responses to all 6 questions regarding top management and leadership on the project. The responses are given as,

Table 10 Description of Top management and leadership

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Top management establishes a clear vision and direction for the project.	55	18(32.7)	2(3.6%)	5(9.1%)	14(25.5%)	16(29.1%)	3.15	1.671
II. Top management can establish trust among team members.	55	0	0	2(3.6%)	13(23.6%)	40(72.7%)	4.69	0.540
III. Top management sets high standards expecting others to do the same.	55	0	0	2(3.6%)	22(40.0%)	31(56.4%)	4.53	0.573
IV. Top management works on facilitating a conducive work environment for employees	55	0	0	9(16.4%)	20(36.4%)	26(47.3%)	4.31	0.742
V. Top management demonstrates personal commitment to quality principles.	55	0	0	2(3.6%)	27(49.1%)	26(47.3%)	4.44	0.570
VI. Top management supplies all the required resources demanded by the project.	55	0	0	1(1.8%)	37(67.3%)	17(30.9%)	4.29	0.497
Overall mean							4.23	
Valid N (listwise)	55							

(Source own survey May-2024)

- I. Based on the data presented, it can be inferred that the top management's ability to establish a clear vision and direction for the project is not being effectively communicated or perceived by a significant portion of the respondents. Specifically, 18(32.7%) of respondents strongly disagree, and 2(3.6%) disagree with the statement which is a relatively high percentage. On the other hand, only 14(25.5%) of respondents agree and 16(29.1%) strongly agree, resulting in a low mean score of 3.15. This wide range of perceptions among the respondents, as indicated by the standard deviation of 1.67, further highlights the lack of consensus on this aspect. This indicates that there is a need for improvement in the way top management communicates and establishes a clear vision and direction for the project.
- II. Based on the data provided, it can be inferred that the respondents have a relatively consistent perception of top management's ability to establish trust among team members. With a high mean score of 4.69, and a low standard deviation of 0.540, the majority of the respondents (72.7%) strongly agree that top management can establish trust among team members. This is a positive sign for the project, as trust is a crucial element for successful teamwork and collaboration. Resulting in a high level of trust among team members can lead to increased communication, collaboration, and a positive work environment. This

can, in turn, lead to increased productivity, improved job satisfaction, and a higher likelihood of project success. However, it is important to note that there is still a small percentage of respondents (3.6%) who gave a neutral response, indicating that they may not have a strong opinion on this aspect.

- III. The third aspect, "Top management set high standards expecting others to do the same," has a mean score of 4.53, with a standard deviation of 0.573. This indicates that respondents generally agree that top management sets high standards, but there is still some variation in perceptions.
- IV. The fourth aspect, "Top management work on facilitating conducive work environment to employees to accomplish their duties and responsibilities smoothly," has a mean score of 4.31, with a standard deviation of 0.742. This indicates that respondents generally agree that top management facilitates a conducive work environment, but there is still some variation in perceptions.
- V. The fifth aspect, "Top management demonstrates personal commitment to quality principles," has a mean score of 4.44, with a standard deviation of 0.570. This suggests that respondents generally agree that top management demonstrates a personal commitment to quality principles, but there is still some variation in perceptions.
- VI. The sixth aspect, "Top management supplies all the required resources demanded by the project," has a mean score of 4.29, with a standard deviation of 0.497. This suggests that respondents generally agree that top management supplies all the required resources, but there is still some variation in perceptions.

Overall, the data shows that there is a relatively consistent perception of top management's ability to establish trust among team members and set high standards, but there is a wider range of perceptions regarding their ability to establish a clear vision and direction for the project, facilitate a conducive work environment, demonstrate a personal commitment to quality principles, and supply all the required resources. This indicates that top management may need to improve their communication and resource allocation strategies to increase the likelihood of project success.

However, a study by Gebrehiwot et al. (2018) on the factors affecting the implementation of quality management systems also found that top management commitment and leadership were critical success factors. This aligns with the findings from the data, which suggest that respondents generally agree that top management establishes trust among team members, sets high standards,

facilitates a conducive work environment, and demonstrates personal commitment to quality principles. The lack of clarity in vision contradicts research suggesting that strong top management commitment is associated with clearer goals and direction (Oakland, 2014).

#### 4.2.6.2 Customer Focus

As shown in Table 10 below 55 respondents gave a response to all 5 questions regarding customer focus on the project. The responses are given as,

Table 11 Description of Customer Focus

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Focused on meeting the needs and expectations of the client or customer.	55	0	0	10(18.2%)	19(34.5%)	26(47.3%)	4.29	0.762
II. Gather and analyze client/customer feedback throughout the project, and use it to inform decision-making and continuous improvement.	55	0	0	8(14.5%)	12(21.8%)	35(63.6%)	4.49	0.742
III. Translates client/customer needs into concrete quality goals and specifications.	55	0	0	7(12.7%)	22(40.0%)	26(47.3%)	4.35	0.70
IV. Regular Communication with clients/customers about project progress and quality decisions.	55	0	0	1(1.8%)	30(54.5%)	24(43.6%)	4.42	0.534
V. Clients/customers are involved in quality review and improvement processes.	55	0	0	3(5.5%)	19(34.5%)	33(60.0%)	4.55	0.603
Overall mean							4.42	
Valid N (listwise)	55							

(Source own survey May-2024)

- I. Based on the data provided 19(34.5%) and 26(47.3%) of respondents agree and strongly agree respectively with this statement that the project team focused on meeting the needs and expectations of the client or customer, while 10(18.2%) of respondent gave neutral response resulting in a mean score of 4.29 which indicates a high level of agreement. Where the standard deviation of 0.762 suggests some variability in responses, but the majority aligns with the mean, this suggests that the project team is generally focused on meeting the needs and expectations of the client or customer and that this is a shared priority among the team members.

- II. Based on the data provided, it can be inferred that the organization actively collects and utilizes client/customer feedback to drive decision-making and continuous improvement efforts throughout the project lifecycle. With a very high mean score of 4.49, 21.8% of respondents agree and 63.6% strongly agree with the statement. The fact that 14.5% of respondents gave a neutral response also suggests that there may be some areas for improvement. Meanwhile, the standard deviation of 0.742 indicates a relatively strong consensus among respondents, this suggests that the organization's approach to collecting and utilizing client/customer feedback is well-established and widely accepted among team members.
- III. The response data indicates that the majority of respondents (89.6%) which is 22(40.0%) and 26(47.3%) agree and strongly agree respectively that the organization effectively translates client/customer needs into concrete quality goals and specifications. This is reflected in the high mean score of 4.35 and relatively low standard deviation of 0.70, suggesting a relatively strong consensus among respondents. However, this high level of agreement suggests that the organization has a strong understanding of customer needs and can effectively translate them into specific quality goals and specifications. This is a positive sign for the project, as it ensures that the project deliverables align with customer expectations and that the project is focused on delivering value to the customer. It is worth noting that a small percentage of respondents (12.7%) gave a neutral response, indicating that they may not have a strong opinion on this aspect.
- IV. The response data indicates that the majority of respondents (98.2%) which is 30(54.5%) and 24(43.6%) agree or strongly agree respectively that the organization maintains regular communication with clients/customers, keeping them informed about project progress and quality-related decisions. This is reflected in the very high mean score of 4.42 and low standard deviation of 0.534, indicating a strong consensus among respondents. The high level of agreement suggests that the organization places a strong emphasis on maintaining regular communication with clients/customers, which is a positive sign for the project. Regular communication can help to ensure that the client/customer remains informed and engaged in the project and that their needs and expectations are being met. However, the fact that only 1.8% of respondents gave a neutral response suggests that there is a strong consensus among respondents regarding the organization's communication practices. This

is a positive sign for the project, as it indicates that the organization's communication practices are well-established and widely accepted among team members.

- V. The data suggests that the organization places a high value on involving clients/customers in quality review and improvement processes. With a mean score of 4.56 and a standard deviation of 0.603, the majority of respondents (94.5%) which is 19(34.5%), and 33(60.0%) agree or strongly agree respectively that the organization actively involves clients/customers in these processes. The high level of agreement indicates a strong consensus among respondents, with only 5.5% giving a neutral response. This implies that the organization has a culture of collaboration and customer-centricity.

Overall, the data indicates a strong emphasis on client/customer focus and involvement throughout the project lifecycle. The high mean scores and relatively low standard deviations across all statements suggest a consensus among respondents regarding the organization's commitment to understanding and meeting client/customer needs, gathering and utilizing feedback, translating needs into quality goals, maintaining regular communication, and involving clients/customers in quality processes. This client-centric approach is likely to contribute to increased customer satisfaction and project success (Rivera, 2017).

However, Studies such as the one by Mekuria (2023) on the performance of quality management components in Ethiopian manufacturing firms and the study by Shemsu (2021) on building construction quality management practices in Ethiopia also highlight the importance of client/customer focus and feedback in ensuring project success and quality outcomes. The data provided in the query reflects a positive perception of client/customer involvement and satisfaction in construction projects, which is in line with the principles of effective QMS.

#### 4.2.6.3 Engagement with People

Engaging people effectively in the QMS is not just about ticking boxes, it's a critical driver of project success. It fosters a culture of quality, improves performance, and ultimately helps organizations achieve their business objectives.

As shown in Table 11 below 55 respondents gave responses to all 4 questions regarding engagement with people on the project. The responses are given as,

Table 12 Description of Engagement with People

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Evaluation of individual performance in the project activities.	55	1(1.8%)	0	1(1.8%)	19(34.5%)	34(61.8%)	4.55	0.715
II. The Project ensures that people’s abilities are used and valued.	55	0	1(1.8%)	1(1.8%)	24(43.6%)	29(52.7%)	4.47	0.634
III. Facilitates learning and knowledge sharing among the project team members.	55	0	0	1(1.8%)	21(38.2%)	33(60.0%)	4.58	0.534
IV. Appropriate training guidance procedures in place that align with the requirements of the QMS standard.	55	0	0	0	20(36.4%)	35(63.6%)	4.64	0.485
Overall mean							4.56	
Valid N (listwise)	55							

(Source own survey May-2024)

- I. The response data indicates a high level of agreement among respondents regarding the evaluation of individual performance in the project activities. Specifically, 95.9% which is 19(34.5%), and 34(61.8%) of respondents agree or strongly agree respectively with the statement. Resulting in a mean score of 4.55 which can further highlight this strong agreement. However, there is some variability in responses, as indicated by the standard deviation of 0.715. Despite this variability, the majority of respondents align with the mean, suggesting a positive view of the organization's approach to individual performance evaluation.
- II. The response data indicates a high level of agreement among respondents regarding the organization's valuing and utilization of team members' abilities. Specifically, 95.8% which is 24(43.6%) and 29(52.7%) of respondents either agree or strongly agree respectively with the statement. The mean score of 4.47 and the standard deviation of 0.634 suggest a relatively strong consensus among respondents. This is an encouraging sign, as it indicates that the organization recognizes and appreciates the talents and skills of its team members.
- III. The data indicates a very high level of agreement among respondents regarding the organization's facilitation of learning and knowledge sharing within project teams. With 98.2% of respondents agreeing or strongly agreeing with the statement, it is clear that the

organization prioritizes creating a culture of continuous learning and knowledge sharing. The mean score of 4.58 and a standard deviation of 0.534 suggest a strong consensus among respondents, indicating a high level of satisfaction with the current mechanisms in place to promote learning and knowledge sharing.

The high level of agreement on this statement has several implications. First, the organization's focus on learning and knowledge sharing can enhance team collaboration and skill development. This, in turn, can lead to improved project outcomes, increased job satisfaction, and reduced turnover. Second, the organization's emphasis on learning and knowledge sharing can contribute to a culture of continuous improvement.

- IV. The results of the survey indicate that there is a strong consensus among the respondents regarding the organization's implementation of appropriate training and guidance procedures that align with the requirements of the QMS standard. With a mean score of 4.64, a standard deviation of 0.485, and 100% which is 20(36.4%) agreeing and 35(63.6%) indicating strong agreement among the respondents, it can be inferred that the organization has a well-established and effective system for providing training and guidance to its team members.

Overall, the data indicates a strong emphasis on individual performance evaluation, valuing team members' abilities, promoting learning and knowledge sharing, and aligning training procedures with QMS standards. It highlights that even with a young and inexperienced workforce, the organization is focused on employee engagement, skills development, and knowledge sharing, which can be a strength for future success. These practices contribute to a positive and supportive project environment, fostering continuous improvement, skill development, and adherence to quality standards. However, the organization should continue to reinforce and enhance these practices to maintain a high-performing and collaborative project team culture.

#### 4.2.6.4 Evidence-Based Decision Making

Evidence-based decision-making is a critical component of successful QMS projects. By leveraging data and evidence, organizations can make informed decisions, prioritize improvement efforts, and achieve sustainable quality improvements.

As shown in table 12 below 55 respondents gave responses to all 4 questions regarding evidence-based decision making on the project. The responses are given as,

Table 13 Description of Evidence-based decision making

	N	Frequency					Mean	Std. Dev
		1	2	3	4	5		
I. Organization ensures the accessibility of accurate and reliable data.	55	0	0	2(3.6%)	31(56.4%)	22(40.0%)	4.36	0.557
II. Decisions taken by the project are made based on the analysis of data.	55	0	0	5(9.1%)	19(34.5%)	31(56.4%)	4.47	0.663
III. The project balances data analysis with practical experience.	55	0	0	7(12.7%)	37(67.3%)	11(20.0%)	4.07	0.573
IV. The standard/quality requirement of the project is achieved as planned.	55	0	0	7(12.7%)	17(30.9%)	31(56.4%)	4.44	0.714
Overall mean							4.33	
Valid N (listwise)	55							

(Source own survey may-2024)

- I. The response data suggests that the organization prioritizes ensuring the accessibility of accurate and reliable data, with 96.4% which is 31(56.4%), and 22(40.0%) of respondents indicating agreement or strong agreement respectively. The high mean score of 4.36 and relatively low standard deviation of 0.557 indicate a strong consensus among respondents. This is an important finding, as access to accurate and reliable data is crucial for effective decision-making and project success. To maintain these high standards, a study by Verma and R. K. Sharma (2019) suggests that the organization continuously reviews and improves its data management processes, including data collection, storage, and retrieval mechanisms. This will help ensure that data remains accurate, reliable, and accessible to those who need it. By prioritizing data quality and accessibility, the organization can continue to make informed decisions and drive project success ( Verma. A and Sharma. R, 2019).
- II. The response data indicates a strong agreement among respondents regarding the use of data in decision-making for projects, with 90.9% indicating agreement or strong agreement. The high mean score of 4.47 and relatively low standard deviation of 0.663 suggest a positive view of the organization's approach to data-driven decision-making. This emphasis on data-driven decision-making can lead to more informed and effective project decisions. However, it is important to ensure that the data analysis skills of project team members are sufficient to support rigorous data analysis, to improve data analysis skills, it is suggested by Sivaramakrishnan & Bauer, C (2016) that the organization provides

training and resources to enhance the skills of project team members. This will ensure that decisions are consistently based on rigorous data analysis and will help to maintain the organization's data-driven decision-making culture.

- III. The response data regarding the project balances data analysis with practical experience and indicates that 87.3% of respondents agree or strongly agree with this statement, which results in a mean score of 4.07 indicating a high level of agreement. The standard deviation of 0.573 also suggests a relatively strong consensus among respondents. This result could imply the organization recognizes the importance of balancing data analysis with practical experience, which can lead to more well-rounded and effective project decisions.
- IV. The response data indicates that the majority of respondents have a positive view of the organization's ability to achieve the planned standard/quality requirements for the project. Specifically, 87.3% of respondents agree or strongly agree with the statement, and the mean score of 4.44 indicates a high level of agreement. However, there is some variability in responses, as suggested by the standard deviation of 0.714. The high level of agreement with this statement indicates that the organization's focus on data analysis and practical experience contributes to achieving the planned standard/quality requirements for projects. To maintain and build upon this strength, it is recommended by Kerzner, H. (2017) that the organization continuously monitor and evaluate project performance against established quality standards. By using data analysis and practical insights to identify areas for improvement and implementing corrective actions as needed, the organization can ensure that it is consistently meeting quality standards and delivering high-quality projects.

Overall, the data suggests that the organization places a strong emphasis on data accessibility, data-driven decision-making, and balancing data analysis with practical experience. These practices contribute to achieving project quality standards and support effective project management. However, there is room for improvement in terms of further enhancing data analysis skills and fostering knowledge sharing among team members.

#### 4.2.6.5 Improvement with the Project

Improvement can be defined as the process of making changes to a project to enhance its overall performance, efficiency, and effectiveness. This can include making changes to processes, procedures, and systems, as well as to the project team's skills and knowledge.

As shown in Table 13 below 55 respondents gave responses to all 3 questions regarding improvement with the project. The responses are given as,

Table 14 Description Improvement of the project

	N	Frequency					Mean	Std. Deviation
		1	2	3	4	5		
I. Project activities are performed to improve project performance and capabilities.	55	0	0	0	30(54.5%)	25(45.5%)	4.45	0.503
II. Organization empowers people to make improvements.	55	0	0	1(1.8%)	28(50.9%)	26(47.3%)	4.44	0.601
III. Project teams are committed to continuously improving the processes and outcomes of project quality.	55	0	0	0	25(45.5%)	30(54.5%)	4.55	0.503
Overall mean							4.48	
Valid N (listwise)	55							

(Source own survey May-2024)

- I. Project activities are performed to improve project performance and capabilities, with 100% which is 30(54.5%) and 25(45.5%) of respondents agree or strongly agree respectively with this statement. With a mean score of 4.45 indicates a very high level of agreement. The standard deviation of 0.503 suggests a strong consensus among respondents, this implies the organization places a strong emphasis on using project activities to drive continuous improvement in project performance and capabilities.
- II. Organization empowers people to make improvements, where 98.2% of respondents agree or strongly agree with this statement, resulting in a mean score of 4.44 indicating a high level of agreement. The standard deviation of 0.601 suggests some variability in responses, but the majority aligns with the mean. This could imply organization fosters an environment that empowers team members to contribute to improvement efforts, promoting a culture of continuous improvement.
- III. Project teams are committed to continuously improving the processes and outcomes of project quality, with 25(45.5%) and 30(54.5%) of respondents agreeing or strongly agreeing with this statement. The mean score of 4.55 indicates a very high level of agreement. The standard deviation of 0.503 suggests a strong consensus among respondents. This could imply project teams within the organization are dedicated to continuously improving project quality processes and outcomes, reflecting a strong commitment to quality and continuous improvement.

Overall, the data indicates a strong organizational focus on continuous improvement, with project activities aimed at enhancing performance and capabilities, an empowering environment that encourages improvement efforts, and a commitment from project teams to continuously improve quality processes and outcomes.

#### 4.3 Discussion of ACGHQ Project Quality Management System

In the construction industry, the implementation of a Process-Based Quality Management System (PBQMS) is essential for ensuring that projects are completed efficiently, effectively, and to a high standard. At EEIG on a specific project selected for this study which is the ACGHQ design and construction project, the use of such a system is a key component of their approach to project quality management.

However, this aligns with widely accepted QMS frameworks such as ISO 9001 Quality Management System standards, which emphasize a process approach, customer focus, and continual improvement, the Project Management Body of Knowledge (PMBOK) Guide which outlines quality management processes like quality planning, assurance, and control as part of project management, and the conceptual framework proposed by Kumar et al. (2011) which includes stages like strategic planning, model/tool selection, implementation, and evaluation of QMS and processes for effective implementation. And differs from Zeng et al. (2005) who developed a process-based QMS model specifically for construction, with a stronger emphasis on integrating quality with safety management, and Rumane's (2016) QMS framework focused on the project lifecycle, with quality teams involved from initiation through commissioning phases.

The business processes and criteria for effective operation, monitoring, and control at EEIG construction are outlined in their company standard procedures. The CSP includes a variety of tools and techniques for ensuring quality, including quality planning, quality assurance, quality control, and quality improvement. In the quality planning stage of a project, several key documents and processes are employed. These include a Project Quality Plan, Inspection and Test Plan, Material Submittals, Method Statements, Subcontractor Pre-qualification, Supplier Pre-qualification, Test Reports, and Project Closeout Plan. These documents assist in outlining the specific requirements and criteria for the project, and ensure that all stakeholders are aware of their responsibilities and the standards that must be met.

Quality control is also a critical aspect of the process-based quality management system at EEIG construction. Material inspection requests, work inspection requests, site surveillance, deficiency tracking, requests/sampling/witnessing, closing/follow up NCRs, QA/QC daily reports, training, product quality reports, QA/QC weekly/monthly reports, client meetings, and subcontractor meetings are all used to monitor and control the quality of work being carried out.

However, these findings are consistent with recommendations from other studies including Jha and Mishra (2007) highlighted the importance of quality planning documents like Quality Manuals, Procedures, and Work Instructions in construction projects, Love et al. (2015) who emphasized the role of quality assurance and control processes like inspections and non-conformance reporting in reducing rework in construction, and the conceptual framework by Khalfan et al. (2020) who also identified quality planning, quality assurance, and quality control as key quality management practices impacting operational performance in ISO 9001 certified construction firms. Despite, some studies highlighting the importance of other tools like Shamasur-Rehman Toor and Ogunlana (2010) found that advanced quality tools like QFD, FMEA, and DOE were underutilized in construction projects.

**Project Quality Objectives and Policy:** The ACGHQ project quality policy is inspired by EEIG Construction's quality policy itself and is issued by the project manager, as proof of his commitment towards quality, However, it has been identified that EEIG Construction's Quality Policy is achieved through the implementation of various quality processes. These include setting and monitoring quality objectives, the creation of a Project Quality Plan, the development of Method Statements, Inspection and Test Plans, and the provision of on-site training. The company also places a strong emphasis on continuous improvement and benchmarking, as well as ensuring that all work is completed to budget and project time, checked if it meets the requirements of the contract and specifications, and ensures work activity is monitored to ensure performance and compliance with project quality requirement.

While the ACGHQ approach covers quality policy, objectives, and the QA/QC team's role, other research stresses the criticality of quality culture and top management commitment, like Arditi and Gunaydin (1997) identified lack of quality culture and top management commitment as major

barriers to TQM implementation in construction, and Zeng et al. (2005) proposed integrating quality culture and leadership into their QMS model for construction firms.

**QA/QC Team:** The Quality Assurance/Quality Control (QA/QC) team at EEIG Construction plays a crucial role in ensuring the successful delivery of projects. At the ACGHQ design and construction project, the QA/QC team is responsible for various activities, including surveillance, monitoring, inspection, and reporting.

During the project execution phase, the QA/QC team conducts continuous site surveillance to identify any deficiencies and implement corrections or improvements as required. This helps to ensure that the work is being carried out according to the project requirements and reduces the need for rework. The goal set by the organization is to achieve a 95% inspection approval rate on the first attempt.

Monitoring and verification of work execution is also a critical aspect of the QA/QC team's role at the ACGHQ project. The team ensures that the work is being carried out in compliance with the drawings and specifications, including workmanship tolerances, approved materials, and the correct sequence of activities following the approved method statements. This helps to ensure that the work is done right the first time, reducing the need for costly and time-consuming rework.

Inspections are conducted as per the inspection and test plan, and the results are recorded. These inspections are a formal process, and the results are used to obtain the client's approval. The QA/QC team also prepares daily reports, including surveillance observations, inspection status, identified deficiencies, and the responsible team, as well as a schedule of upcoming inspections.

### **Role and Responsibilities of the QA/QC team at ACGHQ**

However, the QA/QC team at ACGHQ is expected to be involved in the project from the beginning, including the design, tendering, project mobilization, project execution, and project closeout stages. During the project mobilization stage, the team is responsible for preparing the project quality plan, submittal schedules and submittals, resource mobilization, resource identification, identification of testing requirements, identification of materials for direct works, and technical evaluation of key subcontract packages.

During the project execution stage, the QA/QC team handles submittals, field/lab testing, site surveillances, deficiency tracking, inspections, technical solutions/assistance, training, and product quality assessments. The team also coordinates and liaises with the client, consultant, subcontractors, and EEIG team.

In Addition, the QA/QC Team will report the surveillance observations, and inspection status daily to the execution team to ensure timely corrective action. QA/QC reports include daily Activities, work locations, field tests, inspections with remarks (daily report), identified deficiencies including the location/work details and the responsible team (deficiency log), Completed inspections/comments, and the coming inspections (WIR schedule/Log).

However, these findings align with other studies, Rumane (2016) highlighted the importance of dedicated quality teams for inspection, testing, and monitoring quality compliance in construction projects, Zondo and Harinarain (2023) identified benefits like constructability reviews, meticulous planning, and seamless organization when skilled construction managers focus on quality, and the framework by Wibowo et al. (2022) who proposed integrating quality and safety management systems, with quality teams involved from design to closeout stages for inspections, testing, and quality assessments, which are similar to the ACGHQ QA/QC team's responsibilities.

# CHAPTER FIVE: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

## Introduction

This chapter presents a comprehensive synthesis of the research study, encapsulating the key findings, conclusions drawn from the analysis, and recommendations stemming from the insights gained. The findings section provides a concise yet thorough summary of the empirical data collected and the patterns that emerged. Building upon these findings, the conclusion section offers an overarching interpretation of the results, situating them within the broader context of the research problem and existing literature. Furthermore, this chapter puts forth actionable recommendations based on the study's outcomes, addressing both theoretical and practical implications.

### 5.1 Summary of Major Findings

The study explored the implementation of quality management practices at the Addis Capital Goods Headquarters design and construction project, which is being constructed by Ethiopian Engineering and Investment Group. The findings revealed several strengths, including a high level of management commitment to quality, a quality-oriented organizational culture, and the implementation of effective quality assurance mechanisms. However, areas for improvement were also identified, particularly regarding knowledge gaps among employees in specialized techniques, the need for a more integrated and holistic quality management system, and the necessity for continuous improvement in specific areas of the quality management process.

- The findings regarding quality management system awareness reveal a positive commitment to quality management within the ACGHQ project, with designated responsibilities and integration into corporate policy. However, there is a need for further education and training to ensure all team members involved in the project understand the importance of quality, as well as improvements in proactively addressing quality issues before problems happen and consistent training for the quality management department
- Management Commitment and Quality Culture: The project demonstrates a high level of management commitment to quality, with a quality-oriented organizational culture and the use of considerably good quality assurance mechanisms.

- Quality Planning and Control: While the project has a strong quality planning process, there are areas for improvement in aligning the quality management system with international standards and optimizing quality assurance processes.
- Quality Assurance and Control: The project has established processes for ensuring product quality, but there are knowledge gaps among project team members in specific techniques and a need for standardizing quality assurance processes.
- Quality Control and Non-Conformities: The project has considerably good quality control measures, but there are challenges related to external and internal challenges including raw material shortages and government bureaucracy.
- Top Management Support: While top management demonstrates very good involvement in certain areas, there is a need for improvement in communication of their vision to team members, consistency, and resource allocation.
- Client Focus and Engagement: The project emphasizes client/customer focus, with high levels of agreement on meeting needs and expectations.
- Employee Engagement and Development: The project engages people through performance evaluation, valuing abilities, and facilitating learning and knowledge sharing.
- Continuous Improvement: The project has a strong emphasis on continuous improvement, with a focus on data accessibility and data-driven decisions.

These findings highlight the importance of top management support, employee engagement, and continuous improvement in ensuring the success of the project and the organization. Overall, the findings highlight the organization's strong emphasis on continuous improvement, with project activities, an empowering environment, and a dedicated commitment from project teams to enhance performance, capabilities, and quality outcomes. This focus on continuous improvement can contribute to the overall success of the project and the organization.

## 5.2 Conclusion

Based on the analysis and findings presented in this study, it is evident that the ACGHQ design and construction project demonstrates a strong commitment to quality management principles, with established processes and tools that align with common practices within the construction industry. The organization has a formalized quality policy, a defined structure for quality planning, and a dedicated QA/QC team. Key processes include project quality planning, quality assurance

mechanisms, and quality control implementation, all of which are actively utilized to ensure adherence to project requirements and standards. The findings suggest that the project team is generally aware of quality management concepts and their importance in achieving project success. However, further investigation into the specific tools and techniques employed and their effectiveness in addressing unique project challenges is warranted.

The research also highlights several factors contributing to the disparity between intended and actual quality management practices. While the project demonstrates a strong commitment to certain aspects of quality assurance, significant knowledge gaps exist within the project team, particularly regarding specialized techniques like NDT and SPC. This points to a need for more comprehensive training and development programs. Furthermore, while communication and collaboration between project teams are generally considered effective, improvements are needed to ensure consistency across departments and tasks.

The study also suggests a positive correlation between the implementation of quality management practices and project performance at ACGHQ, supporting the conceptual framework's assertion that effective QMS implementation leads to positive outcomes. The organization's commitment to quality is reflected in improved product and service quality, reduced defects and rework, increased cost savings and efficiency, enhanced customer satisfaction, and improved project schedule adherence. However, it is important to note that the project has also encountered challenges, particularly related to raw material shortages due to inflation and difficulties by some team members in understanding the quality system. These challenges underscore the need for continuous improvement and adaptation of QMS practices to address dynamic external and internal factors that influence project performance.

Finally, the study identified several challenges associated with quality management implementation at ACGHQ. These include a lack of consistent application of certain processes, and communication and collaboration issues between different departments and project teams. These challenges are consistent with broader trends within the construction industry, particularly in developing countries. The ACGHQ project demonstrates that even with a strong commitment to quality, overcoming these challenges requires continuous improvement efforts and a more integrated approach to QMS implementation.

### 5.3 Recommendation

Based on the findings of a study it is recommended that EEG construction at ACGHQ design and construction project considers the following areas of improvement in the management of its projects in general and quality management system in particular.

- ✓ Quality management of construction projects requires stakeholders' collaboration with clients, contractors, and consultants' sides based on their respective roles and responsibilities defined. Therefore, the EEG construction at ACGHQ project should strongly work on building partnership/collaboration and engagement in every management concern with its stakeholders by:
  - a. Defining clear communication protocols outlining who is responsible for communicating what, how, and to whom. This minimizes misunderstandings and ensures timely dissemination of information.
  - b. Shouldn't wait for quality problems to arise. Communicate proactively with stakeholders on potential risks, changes in scope, and project milestones.
  - c. Involve stakeholders in decision-making processes as much as possible, especially on major project decisions. This demonstrates respect for their input and increases buy-in.
- ✓ Most of the workforce at the ACGHQ project is dominated by young male degree/diploma holders with limited experience, which could present challenges in terms of knowledge transfer, technical expertise, and project success. So, it is recommended
  - a. Pairing Young Employees with Experienced Mentors, establish a formal mentorship program where young and less experienced workers are paired with more experienced and educated individuals, which will facilitate knowledge transfer, provide on-the-job training, and enhance the younger workforce's technical expertise.
  - b. Regular Training Sessions, by implementing regular training sessions focused on both technical skills and soft skills. Include training on the latest construction techniques, safety protocols, quality management practices, and project management.

- c. Using certification programs, by encouraging and supporting employees to pursue professional certifications and further education. This not only increases their skill set but also their confidence and value to the project.
  - d. Pathways for Advancement, by establishing clear pathways for career advancement within the organization. This can motivate young employees to stay with the company long-term and invest in their personal and professional growth.
- ✓ Hence awareness and use of quality management tools are essential for the successful implementation of QMS it is advised for EEIG to implement enhanced training and development programs to address knowledge gaps, particularly in specialized techniques like non-destructive testing and statistical process control by:
- a. Organizing workshops or practical demonstrations where team members can learn and practice NDT methods using equipment and materials relevant to their project.
  - b. Bringing in external experts specialized in NDT and SPC to deliver training. This can provide insights and demonstrate practical techniques effectively.
- ✓ Top management in EEIG is advised to actively engage with the project team to communicate a clear vision for the project, emphasizing its importance for quality outcomes and fostering buy-in from all team members. Therefore, the organization should conduct workshops and establish regular communication channels to ensure alignment and understanding using:
- a. Conduct workshops where top management engages with the entire project team to discuss the vision, the reasoning behind it, and its implications for each team's role. This helps foster understanding and buy-in.
  - b. Establish regular communication channels, like meetings or project updates, where top management can reiterate the project vision, clarify any uncertainties, and address questions from team members.
  - c. Create an open feedback loop where top management actively seeks input and suggestions from team members regarding the vision and its implementation. This demonstrates genuine interest and encourages active participation.
- ✓ To fill any gap that could hinder successful implementation of QMS it is advised for the organization Strengthen Supplier Selection and Onboarding of materials:  
The organization should implement a robust supplier pre-qualification process, including:

- a. Detailed supplier assessments should be conducted through audits of supplier facilities, processes, and quality management systems.
  - b. Quality history review of suppliers by analyzing past performance records and tracking any quality issues reported.
  - c. Reference checks by contacting previous customers to gauge their experience with the supplier.
  - d. Organization should develop and communicate clear and specific quality standards, specifications, and requirements to all suppliers.
  - e. Establish a system to monitor and evaluate supplier performance based on quality metrics, including on-time delivery, defect rate, and responsiveness to quality issues.
- ✓ It is advised for the organization to foster better communication and collaboration among different departments and project teams. This should be achieved by
- a. Implementing daily stand-up meetings for project teams to quickly update each other on their tasks, share any immediate concerns, and ensure alignment on daily goals.
  - b. Form interdepartmental teams for specific projects or tasks that require input from multiple departments. These teams can work together to ensure that all aspects of the project are aligned and integrated.
  - c. Organize joint problem-solving sessions where teams can come together to brainstorm solutions for any challenges they are facing. This encourages collaborative thinking and leverages the diverse expertise within the organization.
  - d. Create an environment where employees feel comfortable sharing their ideas and feedback. Encourage open dialogue and actively seek input from team members at all levels.
  - e. Conduct regular surveys and feedback sessions to assess the effectiveness of communication and collaboration initiatives. Use this feedback to make continuous improvements, by developing metrics to evaluate the effectiveness of communication and collaboration efforts. This could include measuring the frequency and quality of interdepartmental meetings, the speed of issue resolution, and overall team satisfaction.

- ✓ Maintain and enhance the focus on continuous improvement by encouraging a culture of feedback, learning, and development. Regular performance evaluations, knowledge-sharing sessions, and aligning training with quality standards will contribute to a positive project environment and foster continuous improvement in quality management practices.

## 5.4 Future Studies

While this study has shed light on the current state of quality management practices at the Addis Capital Goods Headquarters (ACGHQ) project, it serves as a springboard for further exploration into the complexities of construction quality in Ethiopia. Several areas are ripe for future research, promising deeper insights and more comprehensive solutions for this critical sector.

Firstly, a more expansive investigation into the effectiveness of QMS implementation across the Ethiopian construction landscape is urgently needed. The ACGHQ case study provides a microcosm of current practices, but a wider lens is required to identify common challenges, best practices, and potential regional variations. Comparative studies across different project types, sizes, and geographical locations will reveal valuable trends and inform policy decisions.

Secondly, the burgeoning role of technology in construction quality needs dedicated attention. Building Information Modeling (BIM) and other digital tools offer immense potential for streamlining processes, enhancing communication, and facilitating early detection of quality issues. Further research could explore the practical application of these technologies in the Ethiopian context, investigating their impact on project outcomes, cost-efficiency, and workforce skills development.

Thirdly, the link between organizational culture and QMS implementation deserves further study. While this research touched on the importance of leadership commitment and employee engagement, a more in-depth analysis of organizational factors, such as communication styles, decision-making processes, and risk tolerance, is needed to understand how cultural nuances influence quality management effectiveness.

Finally, exploring the dynamic interplay between external factors and QMS performance is crucial. This study highlighted challenges related to raw material shortages and government bureaucracy. Further research could delve into the impact of economic volatility, infrastructure development,

and changing regulatory environments on construction quality. Understanding these external pressures will be critical for developing adaptive and resilient quality management strategies.

By addressing these research gaps, future studies can contribute to the development of more robust and effective QMS frameworks for the Ethiopian construction industry. Such research will not only enhance project outcomes but also contribute to the overall growth and sustainability of this critical sector

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## Appendix

### Appendix – I Survey Questionnaire

# **SURVEY QUESTIONNAIRES**

**ADDIS ABABA UNIVERSITY**

**COLLEGE OF BUSINESS AND ECONOMICS**

**SCHOOL OF COMMERCE**

**DEPARTMENT OF PROJECT MANAGEMENT**

**POSTGRADUATE PROGRAM**

### **Dear participant**

My name is Kaleab Abay, a student studying project management at the School of Commerce at Addis Ababa University. Currently, I am conducting research titled "Assessment of Quality Management System: The Case of Addis Capital Goods Headquarter Design and Construction Project" as part of my MA in project management.

I believe that your experience and academic qualifications will significantly enhance the outcome of my research. I respectfully request some of your time to complete this questionnaire. Furthermore, I guarantee that all information provided will be kept strictly confidential, and your name will not be included in the questionnaire.

I genuinely urge you to answer the questions based on the specific project's viewpoint, rather than a general viewpoint. You are also required to provide accurate and truthful responses when completing the questionnaire. Your input is very important and contributes significantly to the result of the research.

Thank you!

Best regards!

Kaleab Abay

Tel: +251921294552/+251967408050

Email: kaleababay5@gmail.com

Addis Ababa, Ethiopia

Code No:

## General Instruction and Information

Dear participant, this questionnaire booklet has three sections: section one – includes questions about general information of the respondent, section two - has opinion-related questions regarding basic information about quality management system awareness, quality management processes, and challenges/problems encountered, Section three- contains quality management practices related questions.

### Section One: Demographic Characteristics and General Background of the Respondents.

Please choose and tick (✓) the multiple-choice questions

1. Gender

Male [ ] Female [ ]

2. Age

20-30 [ ] 31-40 [ ] 41-50 [ ] Above 51 [ ]

3. What is your highest level of education (Qualification)?

PHD [ ] MA(MSc.) [ ] BSc. [ ] Diploma [ ] Certificate [ ] Other [ ]

4. What is your position in the organization?

Project Manager [ ]

Project Engineer [ ]

Members of project implementation team [ ]

Quality Assurance [ ]

Quality control [ ]

Other [ ]

5. What is your level of Working experience?

Below 5 years [ ]

Between 5 and 10 years [ ]

Between 11 and 15 years [ ]

Between 16 and 20 years [ ]

Above 20 years [ ]

6. How long have you been working on the ACG headquarters design and construction project?

Below 1 year [ ]

1 – 3 years [ ]

3 – 5 years [ ]

Above 5 years [ ]

**Section Two: This sub-section covers questions related to quality management system awareness, processes, tools and techniques, challenges, and problems encountered.**

Please indicate your level of agreement on the following statements regarding to your project. Please put a tick mark “the one that represents your agreement most appropriately. Using the keys (Where: 5= Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly disagree)

(A) Quality management system Awareness

	Questions	(1)	(2)	(3)	(4)	(5)
1	The importance of quality in the project is well understood by all members of the project team.					
2	Responsible person or department assigned to quality management.					
3	A quality management system has been part of corporate policy.					
4	The project team is proactive in identifying and addressing potential quality issues.					
5	The quality management department is involved in regular training and development programs.					

(B) Project quality planning: Does your quality plan contain the following?

	Questions	(1)	(2)	(3)	(4)	(5)
1	Involvement and participation of all relevant stakeholders is ensured in the quality planning process.					
2	The personnel involved in the quality planning process have the necessary skills and knowledge.					
3	The quality planning process aligns with international QMS standards.					
4	Brief description of the project scope.					
5	Project quality objectives.					
6	List of contract documents and drawings.					
7	Specific responsibilities and authorities of project staff.					
8	List of materials and appliances used for the project, showing the verification requirement of each.					
9	List of quality procedures and work instructions applicable to the project by referring to the company’s quality Manual and Procedures.					
10	List of quality records to be kept, including appropriate quality records from subcontractors.					

11	Frequency (or provisional dates if possible) of internal quality audits.					
12	Frequency of updating the quality plan.					

(C) Quality Assurance mechanisms: Do you consider the following in your quality assurance mechanism?

	Questions	(1)	(2)	(3)	(4)	(5)
1	The organization selects the appropriate quality management system requirements for each contract.					
2	There are specified quality management system requirements in tender and contract documents.					
3	The organization evaluates and selects subcontractors on their ability to satisfy specified requirements.					
4	Appropriate checking, measurement, or testing of products and keeping proper records.					
5	Quality assurance processes and tools are in place to maintain the desired level of quality.					
6	Familiar with Inspection and Testing Procedures.					
7	Familiar with Non-Destructive Testing (NDT) Techniques.					
8	Familiar with Statistical Process Control (SPC).					
9	Familiarity with Quality Audits and Reviews.					
10	Familiarity with Risk Management Techniques.					
11	Familiar with Customer Satisfaction Surveys.					

(D) Quality control implementation: Do you consider the following factors in your quality control mechanism?

	Questions	(1)	(2)	(3)	(4)	(5)
1	Selects what to control and set standards that provide the basis for decisions regarding possible corrective action.					
2	Establishes measurements, and methods used, and compares the actual results to the quality standards.					
3	Determines the appropriate actions to take when non-conforming processes or materials are identified.					
4	Monitor and standardize measuring devices, including detailed documentation for all processes.					
5	The project is closely monitored and controlled using data-driven metrics and tools.					

	Some of the benefits you have observed from using quality control practices in your projects?	(1)	(2)	(3)	(4)	(5)
6	Improved product and service quality.					
7	Reduced defects and rework.					
8	Increased cost savings and efficiency.					
9	Improved project schedule adherence,					
10	Enhanced customer satisfaction.					

**(E) Quality Management System Implementation Problems /challenges**

	List of Quality Management Implementation Problems	(1)	(2)	(3)	(4)	(5)
1	Insufficient management support.					
2	The unwillingness of project staff to admit the quality system.					
3	Difficulties in understanding the quality system.					
4	Lack of standardized quality management guidelines.					
5	Face problems with raw materials shortage due to inflation.					
6	Face problems with Government bureaucracy.					
7	Inadequate information and inadequate technical expertise/skills.					
8	Face communication problems among project teams.					

**Section Three: Quality Management Practice**

	Questions	(1)	(2)	(3)	(4)	(5)
(F)	Top Management/ leadership					
1	Top management establishes a clear vision and direction for the project.					
2	Top management can establish trust among team members.					
3	Top management sets high standards expecting others to do the same.					
4	Top management works on facilitating a conducive work environment for employees to accomplish their duties and responsibilities smoothly.					
5	Top management demonstrates personal commitment to quality principles.					
6	Top management supplies all the required resources demanded by the project.					
(G)	Customer Focus					

1	The project team focused on meeting the needs and expectations of the client or customer.					
2	The organization gathers and analyzes client/customer feedback throughout the project, and uses it to inform decision-making and continuous improvement.					
3	Organization translates client/customer needs into concrete quality goals and specifications.					
4	Regular Communication with clients/customers about project progress and quality decisions.					
5	Clients/customers are involved in quality review and improvement processes.					
(H)	Engagement with peoples					
1	Evaluation of individual performance in the project activities.					
2	The project ensures that people's abilities are used and valued.					
3	Facilitates learning and knowledge sharing among the project team members.					
4	Appropriate training guidance procedures in place that align with the requirements of the QMS standard.					
(I)	Evidence-based decision making					
1	The organization ensures the accessibility of accurate and reliable data.					
2	Decisions taken by the project are made based on analysis of data.					
3	The project balances data analysis with practical experience.					
4	The standard/quality requirement of the project is achieved as planned.					
(J)	Improvement in the project					
1	Project activities are performed to improve project performance and capabilities.					
2	The organization empowers people to make improvements.					
3	Project teams are committed to continuously improving the processes and outcomes of project quality.					