Addis Ababa University
College of Business and Economics
School of Commerce
Department of Project Management

Assessment on Project Quality Management Practices: The Case of Edo – Serofta – Warka Road Construction Project

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Approved by Board of Examiners:

Advisor	Signature	Date
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Declaration

I, the undersigned, declare and certify that this project thesis document, "Assessment on Project Quality Management Practices: The Case of Edo – Serofta – Warka Road Construction Project," is my original work. All sources of materials used in this study have been properly identified and acknowledged. This research project has not been previously submitted to meet the requirements for a degree at this or any other recognized educational institution. This work is submitted in partial fulfillment of the requirements for the Master of Arts in Project Management, Distance Program at Addis Ababa University, College of Business and Economics, School of Commerce, Department of Project Management.

Author	Signature	Date

I hereby formally declare that this project thesis work, titled "Assessment on Project Quality Management Practices: The Case of Edo – Serofta – Warka Road Construction Project" is done by Binyam Solomon under my supervision and it is an original work except for references and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at AAU or other institutions.

Advisor	Signature	Date

Dedication

To my beloved family and friends.

Acknowledgement

I would like to express my gratitude to God for providing me with the wisdom, determination, strength, and patience needed to complete this project. I am deeply thankful to my supervisor, Dr. Wubshet Bekalu, for his unwavering support, guidance, and encouragement. It has been an honor to work under his mentorship.

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List of Acronyms

AKGC	Alemayehu Ketema General Contractor
APM	Association for Project Management
BIM	Building Information Modelling
BoQ	Bill of Quantities
CEO	Chief Executive Officer
ERA	Ethiopian Road Authority
FMEA	Failure Mode and Effects Analysis
ISO	International Organization for Standardization
IT	Information Technology
JiT	Just in Time
PM	Project Management
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PQM	Project Quality Management
QC	Quality Control
QFD	Quality Function Deployment
QM	Quality Management
QMS	Quality Management System
RII	Relative Importance Index
SMED	Single Minute Exchange of Die
TQM	Total Quality Management
TVET	Technical and Vocational Education and Training

Abstract

Ethiopia's construction industry particularly the road sector is predicted to flourish even more in the upcoming years after undergoing a significant evolution over the past few decades. It is one of the economic sectors that supports the expansion and modernization of the nation and employs a large number of people. One of the most crucial and significant elements of every road construction project, anywhere in the globe, is quality. Despite having a long history in Ethiopia, the road construction industry has faced and continues to face a number of quality-related challenges and issues. This research project work aims to assess the project quality management practices used in the Edo – Serofta – Warka road construction project work. A questionnaire was used as a data gathering instrument and a total of eighty-six people were chosen to take part in the study using the purposive sampling technique. The study identified that significant number of road project construction practitioners lack quality management related training, and construction firms are not also committed in providing the necessary inductions and training on quality management-related topics as expected. Hence, in order to maintain road construction project's quality, the research suggests that future projects of a similar nature should have to define and formulate quality policies, procedures, and quality management processes (quality planning, assurance and control) clearly and communicate it with all project practitioners. Additionally, the study also recommends for raw material quality enhancement, advanced technology integration, involvement of quality management specialist, careful selection of subcontractors in future similar construction projects, and construction companies should also offer quality management tools, methodologies, and trainings to enhance the skills of their project team members and increase the success of road construction projects in terms of quality.

Key words: Quality, Construction Project Quality, Quality Management, Construction Project Quality Management.

Chapter One

Introduction and Background

1.1 General Overview

As per the Project Management Body of Knowledge Guide (PMBOK) (PMI, 2021), project is defined as "a temporary endeavor undertaken to create a unique product, service, or result". The transient nature of projects denotes that project works or a segment of the project work has a beginning and an end. Projects can exist independently or as part of a larger program or portfolio. Further according to Association for Project Management (APM) body (Murray-Webster & Dalcher, 2019) project is defined as "a unique, transient endeavor, undertaken to achieve planned objectives, which could be defined in terms of outputs, outcomes or benefits". A project is usually considered a success if it meets the goals set out in the acceptance criteria, on schedule, and on budget. Every project has three main components: time, cost, and quality.

As a result, project initiatives are carried out in order to attain certain objectives via delivering different results and usually develop out of problems or opportunities. When project goals are met, a unique product, a unique service or capability to offer a service, a unique outcome, or a unique combination of one or more of these deliverables are delivered.

According to APM (Murray-Webster & Dalcher, 2019), Project Management (PM) is defined as "the application of processes, methods, skills, knowledge and experience to achieve specific project objectives according to the project acceptance criteria within agreed parameters". Final outputs of PM are bound by a finite timeframe and budget in project management. Furthermore, according to PMBOK (PMI, 2021), project management is defined as "the application of knowledge, skills, tools, and techniques to project activities to meet project requirements". The term PM refers to the process of

directing project activity to achieve the desired results. Project teams can use a variety of methods to achieve these goals.

The organized effort to create a building or structure is known as a construction project (Flanagan & Jewell, 2008). Hence, any work done in conjunction with the construction, alteration, conversion, fitting out, commissioning, renovation, repair, maintenance, refurbishing, demolition, decommissioning, or dismantling of a structure is referred to as a construction project. It is the systematic process of erecting, renovating, or refurbishing a structure, building, or infrastructure. Residential, commercial, industrial, infrastructural, civil, and environmental projects are the most common types of construction projects, and they all follow a similar construction management style.

The process of planning, coordinating, and monitoring and supervising a building project is known as construction project management (Chitkara, 1998). From conception to completion, it entails leading and planning each stage of the project life cycle. It's a comprehensive approach aimed at completing projects on schedule, quality and budget. Construction project management is a complicated profession that entails dealing with a variety of issues, including cost control, scheduling, procurement, and risk assessment. From architects to owners to contractors, project managers deal with everyone involved in a building project.

According to PMBOK (PMI, 2021), quality is defined as "the degree to which a set of inherent characteristics of a product, service, or result fulfills the requirements". The ability to meet the customer's expressed or implicit needs is part of quality. The quality of a project's product, service, or outcome (referred to as deliverables) is assessed in terms of both compliance to acceptance criteria and fitness for use. Performance, conformance, dependability, resilience, satisfaction, homogeneity, efficiency, and sustainability are some of the different dimensions of quality. Hence, the degree to which a set of inherent

features fulfills requirements is how a project's quality is determined. It should be highlighted that quality must be prioritized alongside scope, timeline, and budget.

According to (Rose, 2005), Project Quality Management (PQM) is the process of continually measuring the quality of all activities and taking corrective action until the desired quality is achieved. The process of ensuring that all project activities required to develop, plan, and implement a project are effective and efficient in terms of the objective's purpose and performance is known as quality management. PQM is a subset of PM that applies to all projects, regardless of their product's nature. Quality Control (QC) is a never-ending process that begins and finishes with the project. It's more about preventing and avoiding low quality outputs than monitoring and correcting it. From the beginning of the project through the final steps in the project closing phase, it is an integral aspect of all project management activities. There are four main procedures in project quality management; quality definition, quality assurance, quality control and quality improvements (Arditi & Gunaydin, 1997).

Quality Management (QM) focuses on increasing stakeholder satisfaction by making incremental improvements to processes, such as eliminating redundant tasks, and by continuously enhancing the quality of materials and services given to beneficiaries. QM is the continual monitoring and use of quality processes in all elements of the project, not just detecting and repairing faults after the fact. It is a process, not an event; a flawed process cannot consistently provide a high-quality product or service. Quality management is a cycle of measuring quality, updating processes, measuring, updating processes, and so on, until the target level of quality is attained. There are three processes in the QM management area; quality management planning, quality management auditing, and quality control (Besterfield et al., 2014).

In construction sector, quality management entails putting in place rules, processes, and procedures to enhance the approach and methods in order to meet the desired quality

and standards. Quality management in construction refers to the policies, processes, and procedures put in place (typically by management) to improve an organization's ability to consistently and continuously improve its ability to deliver quality to its customers, whether those customers are clients/owners, contractors, or subcontractors.

Quality is a critical component of construction projects in the construction business sector (Ansah & Zhang, 2019). It becomes a competitive advantage and has a significant impact on the success and profitability of the company. In today's world, where competition is fierce, quality is not just a must, but also a means of survival for all businesses. In construction projects, there are three project constraints: cost, schedule, and scope, the needs to be considered. The successful project should be finished on schedule, within budget, and according to the agreed-upon parameters. In the construction sector, quality is tied to client happiness, and implementing a quality management system is a critical instrument for regularly and reliably achieving that aim. Hence, quality is defined and strongly linked to all project constraints: scope, cost, and time in construction projects.

Quality Management System (QMS) is defined as "all activities of the overall management function that determine the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system" (Mane & Patil, 2015). In the construction business, QMS are used in a variety of ways and can be implemented at the project level or at the organizational level. The concepts of quality planning (identification of quality standards), quality assurance (evaluation of overall project performance), and quality control (monitoring of specific project results) in the quality management processes were defined by PMI for the implementation of quality management in construction projects (PMI, 2021).

Several tools and techniques, such as benefit-cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts, pareto

diagrams, statistical sampling, flow-charting, and trend analysis, were identified as part of the implementation process. In the construction sector, the QMS relates to quality planning, quality assurance, and quality control. The construction industry's major purpose is to ensure that building projects are executed effectively within the limitations of highest quality, specified time, and lowest possible cost. Construction projects should create a flexible and supportive organizational environment that supports the development of quality management systems in all facets of their work, according to research based on QMS.

1.2 Project Quality Management

Project Quality Management is concerned with the project's management as well as the project's output. Failure to achieve product or project quality requirements in any situation can have major ramifications for any or all project stakeholders. It's more about preventing and avoiding low quality outputs than monitoring and correcting it. From the beginning of the project through the final steps in the project closing phase, it is an integral aspect of all project management activities. Quality management is the continual monitoring and use of quality processes in all elements of the project, not just detecting and repairing faults after the fact. Even initiatives that are completed on schedule and within budget will fail if the quality of the result is inadequate.

The principle of quality management is to make well-planned and structured efforts to reach the desired degree of quality for the product (Chin-Keng, 2011). Quality management in construction projects, from the standpoint of a construction company, should imply maintaining the required standard of construction work in order to satisfy clients, hence ensuring long-term competitiveness and business survival. (Chin-Keng, 2011) explained that quality management is responsible for creating an atmosphere in which relevant tools, processes, and procedures may be applied efficiently, resulting in a company's operational success. It is the process of implementing the organization's

quality policy into project and product quality requirements planning, management, and control in order to achieve stakeholders' objectives. It also encourages the performing organization to engage in continual process improvement efforts. Hence, because the entire project must be completed in order to meet the customer's needs, quality control and management is a primary concern for construction project managers.

In developing countries, poor management is widespread. The construction business in developing countries has a disdain for quality management implementation, according to the study. Lack of commitment to quality, inadequate managerial support, poor attention to quality issues, and poor-quality planning are some of the variables impacting the practice of quality management distinguished.

1.3 Background of Alemayehu Ketema General Contractor (AKGC)

AKGC is an Ethiopian construction company specializing in general contracting, construction management, design-build, and self-performing interior trades services.

In business since 1989, AKGC is a private-owned construction firm with offices and job sites throughout Ethiopia. AKGC provide the full spectrum of construction services including project planning, construct-ability review, value engineering, scheduling, cost estimating and budgeting, quality management, contract administration, and safety management.

1.4 Construction work of Edo – Serofta – Warka Road Project

The Federal Democratic Republic of Ethiopia is undertaking huge investments for construction, upgrading and rehabilitation of roads to enhance economic growth of the country. Construction works of Edo – Serofta – Warka road project, signed on December 13, 2018 G.C. between Ethiopian Roads Authority and Alemayehu Ketema General Contractor Plc, is one of these projects.

The project is located in Oromia Region of West Arsi Zone, connecting Dodola Woreda with Nansebo Woreda. The project start, Edo Town, is about 300km from Addis Ababa and 45km from the Zonal Capital, Shashemene, along the Shashemene-Dodola-Goba main trunk road. Brief

The Serofta -Warqa section of the road, last 50Km of the road, has been constructed in the early 1970's mainly for military purposes during the Ethio-Somalia war. As a result, it is known by its switching curves and steeper slopes. The topographic feature on which the existing road route is resting is generally mountainous with elevations in the order of 1822masl to over 3050masl.

The road to be constructed has a total designed length of 73.25 km to DS 4 standard. The road will be constructed with 7 meters carriageway and 1.0 meters shoulders on each side on rural sections; and in town sections the roadway is provided with additional 3.5 meters parking lane and 2.5 meters pedestrian walkway on each side. It also includes construction of new minor drainage structures, six bridges and road ancillary works.

1.5 Statement of the Problem

Construction projects for roads and highways that are finished on time, within budget, and to the required quality can greatly satisfy the client, the contractor, and the consultant; the project can then be deemed successful. But most road/highway projects in poor nations—including Ethiopia—fall short of the quality requirements set by the client. Quality must therefore be regarded equally with regard to project scope, timing, and cost. In order to satisfy the demands and expectations of the stakeholders, the project team should agree to scope modifications, time extensions, and additional charges if the stakeholders are dissatisfied with the project's outcomes or the quality of the project management.

Maintaining the necessary level of construction work should be the goal of quality management in construction projects in order to satisfy customers, preserve long-term competitiveness, and assure business survival. In today's more challenging and competitive construction market, quality management is essential for a construction company to thrive. Project quality management makes it possible to meet or beyond the needs and expectations of stakeholders. The expectations for quality management procedures have not always been met in construction projects. These demonstrate that the construction industry's disregard for quality assurances has made quality failures a pervasive feature of the industry.

Despite the notable increase in construction projects in Ethiopia over the past few decades, along with the number of participating construction businesses, conventional quality management practices have not been effectively upheld. Therefore, it is undeniably necessary to evaluate and investigate road construction quality management procedures by taking on particular projects in the nation. This will assist in creating a broad framework and best practices for construction building quality management techniques that can be embraced and applied consistently in subsequent projects of a similar nature throughout the nation.

1.6 Research Questions

- What methods, policies, tools, and techniques are employed in quality management?
- Outline the process for creating, implementing, and overseeing a quality management plan, including the involvement of top management.
- Identify issues, challenges, and problems arising from the application of quality management.

- Examine the methods utilized for training personnel in the application of project quality management.
- Evaluate the effectiveness of project team communication regarding project quality information.

1.7 Project Research Work Objectives

1.7.1 General Objective

Quality is one of the most essential success indicators that must be met in order for a project to be considered successful. In Ethiopia, past related study works have indicated that quality is a major issue in the construction industry. Hence, this project study work will access the PQM practice followed in the AKGC projects and help in aiding and developing project quality management practices in the construction sector in the country. Hence, the overall purpose of this research project work is to analyze the quality management practices used in the construction of the Edo – Serofta – Warka road project.

1.7.2 Specific Objectives

The specific objectives of the research project study work are:

- Investigate the quality management processes, policies, tools, and techniques applied in the construction of the Edo – Serofta – Warka road project.
- Examine the planning, implementation, and control processes of quality management, focusing on the responsibilities of top management.
- Identify challenges in managing and implementing quality management systems during the execution of the Edo – Serofta – Warka road construction project.
- Assess the training and engagement of staff in implementing project quality management, including the involvement of top management.

- Evaluate the effectiveness of project team communication regarding project quality information.

1.8 Research Project Work Scope

The primary objective of this research project work is to evaluate the quality management strategies and challenges specific to the construction of the Edo – Serofta – Warka road project. The scope of the research project study work focuses on examining the impact of process quality management on project management, as well as exploring tools, techniques, top management commitment, and barriers encountered in implementing quality management for the construction of Edo – Serofta – Warka road project.

1.9 Justification of the Study

Effective quality management is crucial for successful road construction projects, as it directly impacts costs, timelines, and overall project outcomes. Flaws in built facilities can lead to delays, increased costs, and even safety hazards. Addressing issues at the outset through quality management practices is key to avoiding rework and minimizing costs. In Ethiopia's construction industry, where costs have a significant impact, embracing and enforcing quality management practices is essential for the success of projects. Despite the importance, there's a need for increased awareness and implementation of quality management practices among professionals in the industry. This research aims to highlight the benefits of strict adherence to quality management principles, drawing on global best practices. By identifying and promoting effective quality management, this study intends to contribute to cost optimization and efficient service delivery in the Ethiopian construction sector, serving as a valuable resource for policymakers, construction companies, and future research endeavors.

1.10 Project Research Work Report Organization

This final thesis document of the project research work is divided into the following five main chapters. The current chapter, Chapter One, presented general overview, project quality management, background of Alemayehu Ketema General Contractor (AKGC), construction work of Edo-Serofta-Warka road project, statement of the problem, research questions, project research work objectives (general objectives and specific objectives), research project work scope, justification of the study and project research work report organization.

Chapter Two, gives details on review on construction project quality, quality management of construction projects, quality management of construction projects in developing countries, quality management of construction projects in Ethiopia, top management role in project quality management, factors affecting road construction project quality, awareness and implementation of construction quality, construction quality management issues and challenges, contract document clarity and administration, principles and practices of construction project quality management, project quality management process flow, tools and techniques of construction quality management, and research gap.

Chapter Three of this thesis document discusses in details on research approach, research design, population of the study, sampling size and sampling techniques, source of data, data collection tools, procedure of data collection, methods of data analysis and presentation, validity of reliability (reliability, validity), and ethical consideration.

In Chapter Four, interpretation and computation techniques deployed in the study (mean value computation used for the 5-point Likert scale, and relative importance index computation using Likert's scale), primary data analysis, general demographic information, quality awareness and practice assessment, quality management process assessment (quality planning assessment, quality assurance assessment, quality control

assessment, and quality communication assessment), top management commitment to quality assessment, quality management principles assessment (leadership assessment, customer focus assessment, engagement with people assessment, improvement within the project assessment, evidence based decision making assessment, and relationship management assessment), quality management implementation challenges assessment, contract document clarity and administration assessment, assessment of factors resulting in poor construction quality, and discussion summary is presented.

Chapter Five summarizes the fundamental findings and aspects of the research project work delivering details on summary of major findings, conclusion, recommendation, and direction for future research. Finally, Appendix A gives the questionnaire used for this research study work.

Chapter Two

Literature Review

In this chapter, information, summaries, descriptions, and evaluations of sources are provided with regard to their value to the road construction project quality management research. It offers an overview of the body of work in this area that has been examined by other writers and academics. It contains study findings on project quality management techniques, top management commitment to project implementation, and obstacles encountered from a range of academic disciplines.

A survey of relevant literature drawn from a range of secondary sources, including books, papers, journals, and websites, is included for conceptual research. The relationship between each referred work and the others is also examined in order to draw more informed conclusions, identify gaps in those works, and develop unique interpretations of earlier research projects.

2.1 Review on Construction Project Quality

As stated by (Rumane, 2017), "the fulfillment of the owner's needs as per defined scope of works within a budget and specified schedule to satisfy the owner's/user's requirements" is the definition of quality in a construction project. According to the previously set principles and scope of work criteria, a construction project is considered to be of high quality when it is completed. One of the most important components of construction project quality management is completing the project within the agreed upon budget, on schedule, and in compliance with all agreement criteria.

Quality-related worries have been a key source of anxiety throughout human history. Quality is one of the most crucial factors in construction projects' success (Mane, P. & Patil, J., 2015). The accomplishment of project participants' expectations and satisfactions can be characterized as both project success and quality in the construction industry. In

the construction industry, client satisfaction is directly correlated with quality, and putting in place a quality management system is essential to consistently and dependably reaching that goal.

It is known that the key indicators of project success, according to indicator matrices, are time, money, and quality measurement (Lamprou & Vagiona, 2018). Nonetheless, a number of earlier studies in this area highlight the significance and necessity of giving quality perspectives more consideration (Rumane, 2017). Project management frameworks offer the best practices for quality control in every construction project, together with associated techniques and resources (Wawak et al., 2020).

Still, there are a lot of quality problems in construction projects all over the world. Some of the quality aspects that can be translated are perceived quality, serviceability, durability, performance, compliance, and aesthetics (Tan, C.K., & Rahman, 2008). Although some variables, including aesthetics and perceived quality, can be subjective, the aforementioned quality characteristics can be used to evaluate the quality of construction building work.

In construction projects, there are several approaches to achieving quality control. Even though some quality management techniques have been around for centuries, some procedures are still necessary to address the present problems facing the sector. Customers' demands, such as the need for on-time project delivery, smaller contractor profit margins, and a decrease in project defect rates, are what drive the need to improve quality (Kerzner, 2017). The article went on to explain how quality has changed over time, going from being the responsibility of a select few employees in a company to everyone's role. Businesses are starting to assign shared responsibility for quality to all staff members in the modern world to guarantee that the company's culture is centered around quality.

2.2 Quality Management in Construction Projects

Throughout the course of a project, it is important to remember that project quality management is a separate entity that works with managing projects of all kinds and ensuring that the deliverables assigned to them are met (PMI, 2021). It is the procedure for organizing, supervising, and ensuring the quality of a project. This essentially means that project quality management is necessary to ensure that all projects, including building projects, are completed successfully. Before any strategy can be developed and put into action, it is vital to ascertain the organization's present quality level in order to apply efficient quality management techniques.

Throughout the construction process, project quality management is a unique entity that should not be overlooked. It is a complex process that involves multiple organizations on a single project, but the success of the project depends heavily on the duties of the Contractor, Consultant/Engineer, and Client/Employer. By acting as a conduit between the general public and the industry, contractors show the real performance of the latter. They serve as the public face of the building sector. Its objectives, policies, procedures, methods, and performance have an impact on all industry stakeholders. Therefore, it is essential to manage a process using a quality management system in order to maximize customer satisfaction at the lowest possible cost to the business while continuously improving the process (Rumane, 2017).

The Quality Management System (QMS) in the construction industry is associated with quality assurance, quality control, and quality planning (Mane, P. & Patil, J., 2015). Ensuring that building projects are implemented effectively within the constraints of greatest quality, stipulated time, and lowest possible cost is the primary goal of the construction business. The building and construction sectors should establish an adaptable and encouraging work environment that encourages the establishment of quality management systems across the board.

Quality management in the construction industry include implementing policies, procedures, and processes to improve methods and approaches and achieve the required standards and quality (Papp, 2018). In the construction industry, quality management refers to the policies, practices, and procedures (usually implemented by management) that enhance an organization's capacity to provide quality to its clients/owners, contractors, or subcontractors in a consistent and ongoing manner.

In the construction industry, the idea of quality has been valued for thousands of years. It is only recently that these quality principles and practices have become widely acknowledged. Throughout history, different nations have employed different approaches to quality at different points in time. In the early stages, Chinese construction workers depended on a set of rules to direct their efforts. Through inspection procedures and industry training, these standards are upheld to guarantee high-quality services in their business. The working culture and environment of a construction project are distinct from those of most other workplaces, claims (Rumane, 2017). A group of workers, usually from different organizations, are hired and assigned to a construction project in order to build the facility. These people might view a building project as finishing temporary tasks because of how short-lived they are. On the flip side, the project manager for the construction team needs to establish in the team that building long-term relationships is more important for career advancement than accomplishing short-term goals.

Capital intensive projects make up the bulk of construction projects. They are unique and not replicated (Rumane, 2017). As construction projects have grown more complex and technological, so too have the contractual arrangements and interpersonal dynamics among the participating parties. The materials used in road projects are pricy, intricate, mobile, and durable. Common elements of a Road project include earth moving equipment, fuel, and bitumen, aggregate. Some of these are usually produced by other construction-related enterprises or companies.

The type of contracts between the parties will greatly affect the quality system that the project needs, thus the project documents will need to clearly state who is in charge of fulfilling them. Included are schedules, plans, specifications, Bill of Quantities (BoQ), and other documents. In order to guarantee that the facility functions as planned, quality control in construction frequently involves making sure that the very minimum standards for materials and craftsmanship are satisfied. These minimal requirements are included in the specification documents. To verify conformity, finished work and batches of commodities are often accepted or rejected based on statistical methodologies and random sampling. A batch is rejected if there is nonconformance or if the proper design specifications are not followed.

Flaws or failures in construction facilities can be quite expensive. Small defects could require rebuilding, endangering the facility's ability to function. Every stage of a project has construction delays, which are common in Ethiopian construction projects (Hareru et al., 2016). Moreover, it is widely acknowledged that one of the main reasons' projects fails is delays in the building phase. Projects may incur additional costs and take longer to complete if delays are not identified and a corrective project management decision is not made in a timely manner. This can lead to frustration among all parties involved and, in some cases, become a significant barrier to development for developing nations like Ethiopia.

2.2.1 Quality Management of Construction Projects in Developing Countries

Because of its particular characteristics, the construction industry typically resists the quality guiding principles that apply to the manufacturing business (Bawane, 2015). Because construction is a complicated and diverse process, it requires a quality assurance plan that is appropriate to the needs of the sector. Multinational construction corporations present fierce rivalry for the building sector in emerging nations in the current globalization scenario. Multinational construction companies have an advantage

over domestic construction firms due to their advanced technology, stable financial conditions, superior manpower and organizational structure. As a result, building construction enterprises in developing nations have felt pressure to get a quality mark for their activities in recent times.

Low productivity, a lack of standards, and subpar quality are the hallmarks of the building sector in developing nations (Bawane, 2015). It is also chastised for not adopting the quality principle across the board, as the manufacturing sector has done. Several considerations make it difficult to regulate the quality of construction in emerging nations. These variables can be roughly divided into two groups: internal factors and external influences. The internal variables, which are significant issues resulting from internal defects in the sector, make it difficult to manage and ensure building quality. Contractual clauses, organizational structures, a lack of technological know-how, the gradual rate of mechanization, a lack of education and training, and restricted financial resources are a few of these.

Reforms within the construction industry alone will not yield the desired outcomes in terms of construction quality unless other issues are also addressed. Although unrelated to the building industry, these outside variables are essential to quality and management. Globalization, quality certification, and technical advancements in related industries are some examples of these external variables. As a result, there are several problems and obstacles facing the building industry in developing nations. The challenge in tackling the issue of construction quality and management is to find long-term solutions to these problems that these countries' construction industry face. The industry should use a deliberate approach to increase both human and nonhuman skills.

Several factors have been connected to the low success rate of projects in underdeveloped countries (Essilfie-baiden, 2019). Poor project performance in developing countries is generally attributed to a number of factors, including government policies, insufficient

funding, donor withdrawal, foreign exchange shortages, inappropriate contract conditions, political priorities, poverty, socio-cultural conditions, corruption, low institutional and human capacity, and the occurrence of unforeseen events like war and drought. Serious resource limitations combined with turbulence (unpredictability) and fast change in the project environment account for the majority of the particular issues that face project managers in developing countries. For the underqualified and underfunded project managers in those nations, these external concerns are making project planning and management very challenging.

The project environment is often unstable in developing countries because to the quick changes in the market, fluctuating sources of funding, and frequent modifications to the business climate and government rules. Initiatives in those nations are also impacted by the prevalence of corruption, war, drought, and political priorities set by the government. For instance, the cost of building materials is said to have climbed 400% in the last two years in Nigeria due to changes in government legislation (Essilfie-baiden, 2019). In the previous three years, construction expenses have almost doubled in Ethiopia, where inflation has reached double digits.

Another significant contributing factor to project failures in developing nations is the absence of competent personnel and institutional capabilities. In addition, the low level of project management development in those nations is caused by a number of factors, including a false belief that project managers are an unnecessary expense, a lack of trained project managers, and a lack of knowledge about the advantages and applications of project management in many developing country organizations. The fact that there are so few chapters in Africa speaks volumes about how important project management is in developing nations. The nature of project management is a challenge in and of itself for many project managers in developing countries, in addition to a lack of institutional infrastructure and trained project managers. Furthermore, managers in developing

countries are not trained for or accustomed to PM concepts, which are completely at odds with them.

2.3 Quality Management of Construction Projects in Ethiopia

One of the main forces behind Ethiopia's and the world's economic progress is the construction economic sector. Therefore, these initiatives' success is crucial. In construction projects, time, money, and quality are all crucial factors to take into account. Among these three, quality is thought to be one of the most crucial competitive factors. Sustaining and regulating building quality requires constant oversight, which is essential. In developing countries like Ethiopia, where many people depend on the construction industry for their living, construction is crucial. Given that construction techniques have recently drawn a significant number of international investors, construction is essential to Ethiopia's current economic development.

Construction delays and quality issues are common in Ethiopia and happen at every step of a project (Koshe & Jha, 2016). Moreover, it is widely acknowledged that one of the main reasons' projects fail, regardless of quality, is delays in construction projects. A construction project is deemed successful when it is completed within the allotted budget, on schedule, with the highest quality and safety standards, in compliance with the specifications, and to the satisfaction of all parties involved. This indicates that building methods are essential to the nation's economic growth. Important success factors for long-term project delivery should be sought, and emphasis should be placed on quality in the execution of construction projects.

Ethiopian construction quality management, however, is in dire need of improvement based on real-world experiences with construction project quality management techniques.

2.4 Top Management Role in Project Quality Management

The importance of top management commitment in implementing quality management is the primary focus on employee empowerment in any organization (Javed, 2015). Top management's dedication can contribute to more successfully achieving the quality goal. Top management's commitment to excellence enables employees to achieve quality. Although it was formerly disregarded, quality management has gained importance in today's business environment. However, quality management cannot be achieved without quality leadership. Although leadership's involvement in quality has not always been given much emphasis, the growing field of quality management suffers greatly when it does not.

All managers are accountable for quality management, but only the Chief Executive Officer (CEO) and senior management can provide the framework for leadership that is required to produce results. Senior management is in charge of several different responsibilities. They have to walk about and apply management concepts. To find out more about what's happening with a particular client, supplier, or project, management should get out of the office and visit departments, customers, and suppliers. The intention is to provide workers the freedom to choose for themselves.

Senior management's responsibility is now to ensure that the team's decision aligns with the organization's quality statements rather than to make the ultimate decision. You can minimize problem-solving and decision-making by assigning authority and responsibilities. With the required tools, employees must receive training in quality management procedures and methods. Senior managers can be visible and actively involved in the quality initiative through serving on teams, teaching teams, and giving seminars.

In light of this, top management's commitment to quality management is considered to be one of the most critical factors influencing its efficacy (Tan, C.K., & Rahman, 2008).

The construction industry has been documented to have a number of quality issues. It is their responsibility to illustrate, convey, and uphold the quality statements. In general, they should dedicate approximately one-third of their time to quality if they hope to succeed.

2.5 Factors Affecting Road Construction Project Quality

The quality of work performed is a critical factor in the success of road construction projects (Dilipbhai & Somabhai, 2020). One of the primary performance criteria that can cause delays and cost overruns in a construction project is its quality. Further, inadequate funding, design modifications, equipment shortages, miscalculated cost estimates, and limitations of suppliers can all affect quality. Other elements that impact quality are unclear evaluation criteria, bad planning, and scheduling conflicts. The significance of these attributes varies based on the nature of the project, the workplace, and the local culture.

Like budget and schedule restrictions, quality is also a crucial consideration in any building construction project. It is evident, therefore, that many nations have varied circumstances influencing the caliber of their building projects. Building projects plagued by poor quality often experience delays, cost overruns, and dangerous constructions. A number of problems, including inflation, procurement, material selection, poor on-site monitoring, lack of communication, and material price hikes, can lead to quality concerns. In addition, poor weather, poor communication, a deficiency in project management abilities, and low bids as a result of heightened competition are all variables that have a negative impact on the caliber of building projects. Other considerations included are the availability of building supplies, the state of politics, the experience of the site personnel, and accurate recordkeeping. Moreover, it is discovered that the client, efficient project management, building a productive construction crew, and the project's surroundings are among the key variables. Other significant problems that have been

discovered include a lack of worker training, a lack of technical people, and a lack of knowledge about the quality management system.

For construction projects to be completed with high quality, a team of contractors must work together, have a similar goal, not enforce bureaucracy or politics, introduce quality assurance measures, and have no blame culture. Problems with internal auditing and a lack of ongoing process development led to problems with quality. A weak training program, a communication breakdown amongst project participants, and a lack of trust in the provider are the main causes of low-quality performance.

A crucial performance metric for any construction project is its adherence to quality standards. Inadequate quality can cause a company to lose market share, reduce productivity, spend more on rework and repairs, damage its brand, and ultimately force it out of business. Critical elements affecting the quality of construction projects were divided into two categories by the study done by (Jha & Iyer, 2006): failure reasons and success factors. The competence of the project manager, support from upper management, participation monitoring and feedback, participant interaction, and owner competency are the success determinants. Conflict between project participants, unfavorable socioeconomic and weather conditions, the ignorance and lack of understanding of the project manager, incorrect project conceptualization, project-specific issues, and fierce rivalry during tendering are some of the failure factors.

Key factors influencing the quality of construction projects include the use of workers with little to no skills and expertise, sub-suppliers, consultants, and unskilled, inexperienced, and unskilled trade subcontractors (Oke, Ayodeji; Aigbavboa, Clinton; Dlamini, 2017). Lack of dedication on the part of groups and individuals tasked with overseeing and guaranteeing that building projects are completed to the necessary and authorized standard also contributes to poor site visits. In addition, poor planning and scheduling of construction resources, as well as ignorance and lack of information, can

arise from a lack of communication among project stakeholders, especially within the design team and between the team and the project's client or funder. These include things like labor, plants, materials, and time. Lack of resources or poor quality is often the root cause of poor project performance.

Construction codes and standards, financial issues, customer expectations, scheduling and planning, availability of resources including materials, human resources, and equipment, coordination, inspection, risk, project execution methodology, and organizational structure are the main factors affecting construction quality, according to a study done to analyze these factors via (Vadivel, 2016). Additionally, research conducted by (Joy, 2014) demonstrated that the necessity of producing high-quality completed products in building construction cannot be understated, and that the high cost of construction demands that the quality of the final product be guaranteed. The survey went on to show that code and standard compliance, materials, labor, and financial issues are the most important aspects that contractors and consultants agreed upon when it comes to construction project quality.

Furthermore, (Oni et al., 2019) demonstrated that the primary sources of factors determining the quality of construction projects are inadequate standard assurance and declaration, non-implementation of the National Building Code, inadequate inspection at all stages of construction, hiring an unqualified contractor, lack of a program for quality control inspection during construction, inadequate execution of policies, inadequate training for staff and craftsmen, inadequate specifications, bribery and corruption, and professional role usurpation.

According to findings from (Mutha, 2018), there are a number of factors that affect construction project quality, but they are not all equally significant, so they are ranked in order of significance. High level management can handle the most important components, while medium management can handle the less important ones, to achieve

building project quality. To develop management systems (policies and procedures) that address each component independently, more research is required. An adequate organizational structure and an efficient quality management program for quality implementation and monitoring must be implemented in order to achieve overall project quality.

Therefore, based on the literature review conducted, the following main construction quality affecting factors are adopted for the study of the assessment on project quality management practices: the construction works of Edo – Serofta – Warka road project;

- Awareness of construction project quality,
- Employee's qualifications and proficiency level,
- Construction-specific training caliber,
- Dedication of top management,
- Implementing quality management: issues and difficulties,
- Applied quality management procedures and techniques,
- Methodologies for quality assurance, planning, and control,
- Compliance with construction codes, specifications, and drawings during project execution,
- Communication of project quality,
- Impact of the internal and external environments/factors on quality, and

Ethical practices towards quality and PM perception.

2.6 Awareness and Implementation of Construction Quality

Good quality management is correlated with construction project quality across the course of the project life cycle (Ashokkumar, 2014). The quality of construction projects

is significantly influenced by two crucial stages in the project life cycle: design and construction. According to a study by (Ashokkumar, 2014), it is crucial that studies are done to increase construction companies' knowledge of quality, especially small businesses. Additionally, it is becoming more and more important to increase practitioners' understanding of quality management in the execution of building projects due to the absence of it. It also admits that one of the main things influencing construction quality and the cost of producing low-quality construction output is a lack of quality awareness in the project.

The relationship between knowledge of the construction quality policy and the availability of qualified specialists in Nigerian construction projects was investigated by (Emeka, 2020). Understanding these regulations was found to be distinct from compliance and implementation, which led to a high rate of subpar work and, very infrequently, the total collapse of buildings. According to research by (Zainul Abidin Nazirah, 2010), understanding the consequences of one's actions and acting accordingly will dictate how quickly steps are done toward a sustainable implementation of quality principles in building projects. It also noted that big developers have only recently started to focus more on raising awareness and implementing sustainable practices in their development projects.

Study conducted in 2013 by (Serpell et al., 2013), demonstrated that one of the fundamental elements affecting the success of building projects is awareness of the quality of construction. It makes the argument that awareness, interest, and knowledge regarding sustainable construction are first steps toward realizing high-quality construction projects. It further reveals that the main obstacles to raising awareness levels in quality consideration and effective implementation are affordability, regulatory framework gaps, low implementation of construction practices even in industrialized

(developed) countries, country-specific variations in construction firm quality awareness, and construction project performance evaluated exclusively on economic attributes.

Additionally, a study conducted by (Hussain et al., 2006) examined the connection between quality awareness and a quality management system. According to the article, focusing on quality at every level of the company can help solve complex problems and denote excellence. This technique is known as quality awareness. Recently, a lot of organizations have focused on quality, in part due to the various issues as well as the quality system's increasing relevance. Regardless of the nature of the task, quality awareness is a critical issue in all industries trying to address quality concerns. However, any company can succeed if it realigns its quality efforts to meet the demands of the business in a limited amount of time during implementation. Quality consciousness, then, is a lifestyle revolution that brings about positive change without necessitating large financial outlays. Everyone must be involved, from executives to staff members.

As a result, it can be said that investing in quality takes time and consistently produces profits; there is no quick fix for it. Furthermore, it is reasonable to conclude that knowledge of construction quality is one of the key variables impacting the quality management of any construction project work, as regulating, ensuring, and planning quality is the purpose of applying a quality approach in any sector, including construction. It also helps employees, managers, and supervisors understand their responsibilities in meeting customer demands and expectations in the quality domain.

2.7 Construction Quality Management Issues and Challenges

Prior researches have demonstrated that putting them into practice successfully and seamlessly presents a variety of problems (Bastas & Liyanage, 2018; Chen, 2019; Kaur et al., 2019; Olawumi & Chan, 2018). Lack of top management support and commitment, lack of time and resources, lack of motivation, resistance to technology, lack of enough

motivation, lack of quality equipment, inability to change corporate culture, employee resistance and/or negative attitude, improper planning, lack of ongoing training and education, incompatible organizational structure and isolated individuals and departments, ineffective measurement techniques and lack of access to data and results, improper communication, failing to pay enough attention to internal and external customers, inadequate use of empowerment and teamwork, and failure to continuously improve are some of the main obstacles and issues related to implementing construction quality management (*Shakehand with Life: 9 Obstacles in Implementation of TQM*, n.d.).

In addition, some of the primary obstacles to quality management that have been identified are excessive theory, documentation, details, rigidity, lack of implication and communication, lack of motivation, and inappropriate adoption of quality management practices (*8 Challenges Quality Management Professionals Face | Pauwels Consulting*, n.d.). Additionally, as stated in (*10 Factors That Affect Construction Quality Management*, n.d.), the ten main factors that are claimed to affect construction quality management are design complexity, vendor and supplier failures, material quality level, poor project management, miscommunication between teams, failure to keep track of and document changes and procedures, mishandling of subcontracts, scope creep, ignored audit and testing, and late changes.

2.8 Contract Document Clarity and Administration

Although it's common knowledge that a comprehensive, well-thought-out contract can help prevent miscommunications and costly legal disputes, parties to a contract sometimes fail to thoroughly consider or extrapolate the terms and restrictions of the agreement (Nyarko, 2021). Determining the exact parameters of a high-quality contract is especially crucial for Employer-Engineer agreements, since these contracts involve transactions that are just as complicated as the building projects, they are related to (Xue & Field, 2008). In light of this, a former deputy general counsel for the American institute

of architects has listed five qualities of a successful contract: 1) establishes a framework for future negotiations, 2) reflects the parties' goals and aids in their achievement, 3) establishes reasonable expectations, and 4) fosters cooperation by encouraging open communication and understanding.1. All things considered, a well-executed contract lays out a comprehensive and mutually understood agenda that makes the parties' objectives clear and attainable (Podvezko et al., 2010).

It is essential that the contract's wording be unambiguous and, to the greatest extent feasible, susceptible to just one interpretation in order to achieve these objectives. There are several methods available to guarantee equitable and unambiguous contract language: Contracts should be carefully read to understand their meaning and implications. Ambiguity should be avoided (Murdoch & Hughes, 2002). Objectively measured terms should be used. The negotiation process should be depersonalized in both the asking and receiving of contract demands. Lastly, quid quo pro, or asking for concessions when asked, should be observed. These procedures, which support transparency and coherence of meaning, are highly conducive to the development of workable and reliable contract language.

2.9 Principles and Practices of Construction Project Quality Management

To attain customer and client satisfaction, quality management is a system in which all crucial elements need to be taken care of. Quality control is a crucial and challenging responsibility in any business, but it is particularly so in the construction sector. Because every project is different, there will be differences in the quality management strategy for every project. Project quality cannot be maintained at the proper level by using traditional quality management techniques. Globally, the information technology industry and computer systems underwent significant change. The construction business is increasingly more integrated with the Information Technology (IT) sector to streamline and increase the effectiveness of construction (Shah & Varghese, 2019).

For construction projects, a variety of QMS principles, practices, and standards, such as International Organization for Standardization (ISO) based Total Quality Management (TQM) and Building Information Modeling (BIM), can be used. The purpose of ISO, a management system, is to keep an eye on data and processes. It does this by monitoring the necessary balance. TQM is a management method that operates under the presumptions that staff members regularly participate in the project program and that departmental tools and technology are efficiently managed. Using a software modeling approach called building information modeling (BIM), contractors, engineers, and architects can work together on the planning, building, and maintenance of a facility.

2.10 Project Quality Management Process Flow

The three primary steps in project quality management are quality planning, quality assurance, and quality control, according to PMBOK (PMI, 2021). Every process has a variety of outputs, tools, and techniques.

Determining the quality standards that apply to the project deliverables and how the project will satisfy them constitute the process of quality planning. Using all of the data that was provided at the beginning of the project to determine how to assess quality and prevent defects is known as quality planning. The primary result of quality planning is a quality plan, which is a document (or set of documents) that details the requirements, resources, techniques, and standards of quality for a particular project, service, product, or contract. It comprises developing a quality checklist and quality strategy to be used in the project implementation stage. By using this checklist, you can be sure that the project team and other stakeholders are producing project outputs that satisfy the required quality standards.

The process of proving to stakeholders that all quality-related tasks are being completed on schedule is known as quality assurance. It guarantees that procedures are followed to

guarantee that all requirements for excellent results are met. Quality assurance is applied to project deliverables as well as project management processes and procedures. Tools such as a project audit or a process checklist can be used to achieve this. Metric-based systems are used in quality assurance testing to confirm that the quality management strategy is being followed. In order to guarantee that the project will achieve its quality standards, quality assurance is carried out during the project's implementation phase. It comprises a routine review of the project's overall performance.

The application of operational methods to guarantee that quality standards are fulfilled is known as quality control. This entails identifying, evaluating, and resolving problems. Quality control happens after a problem is found and suggests solutions, whereas quality assurance happens before a problem is discovered. Quality control checks each project's results to make sure they follow the rules. By identifying project risk factors, mitigating them, and coming up with solutions to prevent and eliminate them, it also searches for ways to prevent and eliminate subpar performance. The project can remain on schedule and under budget with the use of quality control. Testing and peer reviews are two ways to monitor the project's progress. Quality control is the process of using methods and procedures to assess actual quality performance in relation to objectives and determine what needs to be done to address deficiencies.

2.11 Tools and Techniques of Construction Quality Management

The usage of quality control tools was adopted by quality improvement as an ongoing procedure. Quality is considered a crucial aspect in the current competitive market. Implementing the seven fundamental quality control techniques will lead to several benefits, such as reduced waste, satisfying high customer expectations, cost savings, improvement initiatives, and product development. According to (Abdel-Hamid & Abdelhaleem, 2019), the seven primary fundamental construction quality control

instruments that are recognized and utilized in the construction industry are the check sheet, histogram, pareto chart, fishbone diagram, control chart, flowchart, and scatter diagram. In order to build the right kind of product, these tools are utilized at different points during the development process to describe issues, evaluate their impacts, pinpoint their primary causes, and take appropriate action.

Charts, check sheets, diagrams, graphs, processes, and techniques are examples of construction quality tools. They are used to establish concepts, plan them out, investigate the rationale, assess the process, analyze it, and create a variety of scenarios for ongoing quality improvement (Rumane, 2013). The probability of success is raised, accuracy and consistency are maintained, efficiency is increased, and processes are improved through the use of tools. In reality, the building process industry uses a variety of quality improvement methods, techniques, and procedures. Nevertheless, not all of these methods are applied since construction projects are unique and nonrepetitive. The construction industry commonly uses various quality management instruments, including quality classic tools, management and planning tools, process analysis and improvement tools, innovation and creative tools, Lean tools, cost of quality, quality function deployment, Six Sigma, and TRIZ.

The classic tools, which include the Cause-and-Effect Diagram, Check Sheet, Control Chart, Flowchart, Histogram, Pareto Chart, Pie Chart, Run Chart, Scatter Diagram, and Stratification, are the oldest quality control tools in history. The purpose of management and planning tools is to organize and schedule tasks that would enhance the quality. Examples of these tools are the Activity Network Diagram, Affinity Diagram, Interrelationship Digraph, Matrix Diagram, Prioritization Matrix, Process Decision Program, and Tree Diagrams. Tools for process analysis include 5 Whys Analysis, Process Mapping/Flowcharting, Failure Mode and Effects Analysis (FMEA), Cost of Quality, Critical to Quality, Cause and Effect Diagram, and Benchmarking. Statistical Process

Control, Six Sigma-DMAIC, Failure Mode and Effects Analysis (FMEA), Root Cause Analysis, PDCA Cycle, and SIPOC Analysis are examples of process improvement tools.

Brainstorming, the Delphi Technique, 5W2H, mind mapping, the Nominal Group Technique, Six Sigma-DMADV, and TRIZ are some of the innovative and creative tools. Among the lean tools are Value Stream Mapping, Visual Management, Cellular Design, Concurrent Engineering, 5S, Just in Time (JIT), Kanban, Kaizen, Mistake Proofing, Outsourcing, Poka Yoke, Single Minute Exchange of Die (SMED), and Waste Reduction. Cost of nonconformance and Cost of conformance are the primary elements and instruments utilized in the Cost of Quality process. Six Sigma and analytical tool sets, such as the Ford Global 8D Tool, DMADV Tool Set Phases, DMAIC Tool, and DMADDD Tool, are included in the Quality Function Deployment (QFD) toolkit. For the purpose of creating original problem-solving solutions, TRIZ (Algorithm for Inventive Problem Solving) offers a useful approach, toolkits, knowledge bases, and model-based technology. It supports system analysis, failure analysis, issue formulation, and patterns of system evolution.

2.12 Research Gap

To implement quality management in a way that provides a guiding framework to guarantee that the same knowledge, techniques, abilities, and controls are applied and practiced consistently each time a process is carried out, quality management systems must have the organizational structure, responsibilities, procedures, processes, and resources. It is believed that quality management principles, as discussed in the literature review section, will improve construction quality performance.

The goals of construction project quality management procedures are to meet client expectations, minimize expenses, and finish the project according to schedule. Although the goals seem straightforward and reachable, projects still run behind schedule, go over

budget, or fall short of their goals (Al-Hajj, 2018). Various project quality management methodologies are developed and implemented worldwide to attain constant success in project quality management. On the other hand, Ethiopia's construction and building sector has been slow to implement a standard QMS, leading to a number of quality problems and disgruntled customers. Therefore, evaluating the nation's construction project quality management methods while taking into account various projects is an essential first step in improving the quality management system in the nation.

Chapter Three

Research Methodology

This section provides a thorough explanation of the methodology employed and the manner in which the research project work was completed in compliance with the goals of the project work study. It provides a thorough explanation of the methods, instruments, sources, procedures, sampling plan, and chosen and implemented data analysis approach.

3.1 Research Approach

This research project's goal is to investigate the degree of influences and relationships between various variables and elements taken from similar previous works and the quality management procedures used in the construction of the Edo, Serofta, and Warka road project. As a result, the quantitative research method technique was used for this study, emphasizing the objective and statistical assessment of numerical data. Additionally, a 5-point Linkert scaling approach was used for the methodically created questionnaire intended to collect data.

3.2 Research Design

This research employed a descriptive research technique to examine and assess the points made and provided in the research question section. It makes use of the quantitative research method, which looks at the relationship between many factors to evaluate objective concepts. In order to determine the consistency of the methods and processes utilized to meet the project requirements and achieve acceptable quality standards, it also uses project quality management approaches to extract variables.

3.3 Population of the Study

The target population for this research project work encompassed employees from all the three major stakeholders' the client (ERA), the contractor (AKGC), and the client representative (Gondwana Consulting Engineers) located at various divisions and functional levels in the project. At the time of this research project study work, the Edo – Serofta – Warka road construction project was at its final phase of construction and the total number of populations was close to a total of 500 construction practitioners. A specific study population, derived from the broader target population, will be thoughtfully selected.

3.4 Sampling Size and Sampling Techniques

The sample size for this research project study work was computed using the formula provided via (Yamane, 1973). The simplified formula for sample size calculation for confidence level of 95% and precision level of 0.5. is given below;

$$n = \frac{N}{1 + N(e^2)}$$

Where;

n is the required sample size.

N is the total population size.

e is the level of expected precision.

Using the above stated formula for the survey sample size selection for the total population size of 500 and precision level of ±10% was computed to be 84. This size was crossed with the values given (Israel, 1992) in and found to perfectly match.

Next, purposive sampling—also referred to as judgmental, selective, or subjective sampling—is the sampling technique used in this research project. It is typically employed when one wants to identify scenarios that are particularly illuminating. In

order to carefully select members of the target group to participate in the sample survey study, the writers therefore rely on their own judgment. This made it easier to concentrate attention on a limited group of informants from different functional levels in order to quickly get the necessary knowledge while keeping the best possible viewpoint. The field of work, level of skill, and familiarity with project quality management on the Edo-Serofta-Warka road construction project are taken into consideration when selecting respondents. 95 project personnel received the questionnaire, and 86 of them actively participated in it.

3.5 Source of Data

The study used primary and secondary data sources to gather sufficient and pertinent information to address the research questions and achieve the study's goals. Primary data sources include those who are directly involved in the project activity work, such as technical specialists, support staff, top-level managers, and internal documents that offer details on the project's project management methodology. In contrast, secondary data was acquired from a variety of published sources, such as books, papers, journals, and project reports.

3.6 Data Collection Tools

Based on a methodically designed questionnaire, which was adopted and modified (Shemsu, Z. 2021), the research project study work used a quantitative data collection strategy. Additionally, because the questionnaire was designed to be completed online, it was quicker, more accurate, less expensive, easier to style, more honest, and more user-friendly for both researchers and participants. After that, the online survey instruments were given to the project's staff members, including the client, contractor, client representative, and members of the internal team. Secondary sources of data include

published works such as research results, project reports, papers, journals, and books from earlier related activities.

3.7 Procedure of Data Collection

After the questionnaire was developed following a review of previous relevant works and literature, it was given to the project's carefully chosen sample respondents, who included the client, contractor, and client representatives. The purpose of the questionnaire was to collect and record the data and information required for the research project work.

3.8 Methods of Data Analysis and Presentation

In order to evaluate the data gathered through the online questionnaire in respect to the overall goal of the research, the adviser and previous similar works recommended the use of appropriate quantitative data analysis techniques and tools (Relative Importance Index (RII) and mean value analysis). Initially, a variety of data editing methods were used to create the data, including checking the raw data for errors, omissions, classifications, and aggregation. Lastly, Excel was used to examine the gathered data.

3.9 Validity and Reliability

3.9.1 Reliability

The study work's questionnaire was meticulously created to ask related questions in several areas. In order to verify respondent coherency and data dependability, quality communication, quality trainings and inductions, and top management commitment to quality were purposefully assessed multiple times. After then, eight respondents to a pilot poll provided their responses. The pilot survey's results demonstrated that over 90% of the data was coherent. Furthermore, the questionnaire's reliability is around 90%

trustworthy due to its design, which takes use of the 5-scale Linkert scale-based data gathering technique (Louangrath, 2018).

3.9.2 Validity

In order to ensure that all research questions have been answered and the study's objectives have been adequately handled, a well-constructed questionnaire was employed in this investigation. Additionally, the authors checked the data gathered in some survey sections—such as the results of poorly executed construction projects—by outlining the clearly anticipated outcomes and determining whether the responses provided were indicative of validity. Further, empirical results of a 5-point scale Linkert scale survey computed via Monte Carlo simulation and NK landscape method showed to be 0.73 (Louangrath, 2018). This is well over the 0.35 benchmark for the very beneficial category put it in the adequate interpretation range (*Testing and Assessment - Reliability and Validity*, n.d.).

3.10 Ethical Considerations

The authors of this research project adhered to and followed all ethical research protocols during the course of the research project work.

Chapter Four

Data Presentation, Analysis and Interpretation

This chapter presents the findings, analysis, interpretation, discussions and presentation on the practice of quality management practices in the construction work of Edo – Serofta – Warka road project.

4.1 Interpretation and Computation Techniques Deployed in the Study

To assess and understand the main research study data, mean value and Relative Importance Index (RII) computation procedures and rankings are used. The methods used in this investigation are described in depth in the ensuing subsections.

4.1.1 Mean Value Computation Used for the 5-Point Likert Scale

When comparing data, the mean score or value is utilized to encapsulate the salient features of a series. It is used in statistical computations and is algebraically treatable. It's a central tendency measure that is reasonably consistent. The mean score of the responses is obtained using the formula below.

$$Mean = \frac{\sum s}{N}$$

Where;

s is weight given by respondent (1 to 5).

N is the total number of respondents or participators.

The survey data for this research project were analyzed using the mean value interpretation technique, which is as follows. The maximum (5) and lowest (1) possible values of the Linkert scale are corresponding to the possible ranges, which are calculated using (5-1 = 4). The arrays of potential ranges in the Linkert scale are then produced by dividing these ranges by the maximum value of 5, (4/5 = 0.80). Then, this number (0.8)

was added to the Linkert scale values in order to find the maximum of each cell. Therefore, the length of the cells is calculated as follows:

- Mean values from 1 to 1.80 represents (Strongly Disagree).
- Mean values from 1.81 until 2.60 represents (Do Not Agree).
- Mean values from 2.61 until 3.40 represents (Neutral, Neither Agree nor Disagree).
- Mean values from 3.41 until 4.20 represents (Agree). And,
- Mean Values from 4.21 until 5.00 represents (Strongly Agree).

4.1.2 Relative Importance Index (RII) Computation using Likert's Scale

The survey results for this study project were analyzed using the Relative Importance Index (RII) computing technique, which is as follows. The average of a factor's weight according to respondents' perceptions is called the RII. It is computed using the following formula.

$$RII = \frac{5 * n_5 + 4 * n_4 + 3 * n_3 + 2 * n_2 + 1 * n_1}{A * N}$$

Where;

n_5 is the number of respondents for strongly agree.

n_4 is the number of respondents for agree.

n_3 is the number of respondents for neutral.

n_2 is the number of respondents for disagree.

n_1 is the number of respondents for strongly disagree.

A is highest weight in the scale, that is 5.

N is the total number of respondents.

4.2 Primary Data Analysis

Seven main areas of variables and elements impacting project quality management, identified from past related works, were thoroughly investigated and analyzed in this

research study work. These Seven variable areas are quality awareness and practice, quality management process, top management commitment to quality, quality management principles, quality management implementation challenges, contract document clarity and administration, and factors resulting in poor construction quality were investigated through the systematic online questionnaire prepared for this purpose. Using Microsoft Excel™, quantitative primary data extracted from the questionnaire were analyzed using descriptive and explanatory statistics.

The researcher adopted a questionnaire for this research work and a total of 86 respondents were recorded for the research work data analysis. The link for the questionnaire was distributed/shared with 95 employees in the Edo – Serofta – Warka road construction project and the response rate were found to be 90.53%.

4.3 General Demographic Information

The general demographic information collected from this research work indicated that 15.12% respondents were females, and males account for the remaining 84.88%. This showed that male dominated the survey and it is perfectly in line with the fact that majority of workers/employees in the Edo – Serofta – Warka road construction project is dominated via males. Hence, it can be concluded that, gender representation in the survey is justly distributed.

Considering the role of responders in the Edo – Serofta – Warka road construction project, respondents were found to comprise 12.79% from project management team members, 10.47 % from contract administration team members, 39.53% from site construction team members, 24.42% from quality management team members, 8.14% from design review team members, and 4.65% from office work team members. In regards to the affiliation of responders in the project, it was found that 9.30% are affiliated to ERA (the Client),

51.16% to consultant, 32.56% to contractor and 6.98% to sub-contractors who took part in the project.

In relation to the level of responder's educational background/qualification level, 27.91% have Bachelor degree, 24.42% had Master degree, 22.09% had college diploma, 12.79% had Technical and Vocational Education and Training (TVET), 10.47% had high school completion, and the remaining 2.33% have PhD and above educational qualification. Regarding respondent's total work experience in road construction projects 22.09% have less than 3 years, 38.37% have between 3 to 5 years, 20.93% from 5 to 10 years, 15.12% from 11 to 15 years, and 3.49% have more than 15 years of work experience. Table 1 given below gives the summary of the general demographic information of the questionnaire survey participants.

Table 1: Summary of demographic information

Gender Composition		
Options	**Frequency**	**Percentage**
Male	73	84.88%
Female	13	15.12%
Role in the Edo – Serofta – Warka Road Construction Project		
Options	**Frequency**	**Percentage**
Project Management Team Member	11	12.79%
Contract Administration Team Member	9	10.47%
Site Construction Team Member	34	39.53%
Quality Management Team Member	21	24.42%
Design Review Team Member	7	8.14%
Others: Office Work	4	4.65%
Affiliation in the Project		
Options	**Frequency**	**Percentage**
Client (ERA)	8	9.30%
Consultant	44	51.16%
Contractor	28	32.56%
Sub-Contractor	6	6.98%
Level of Educational Background		
Options	**Frequency**	**Percentage**
PhD and above	2	2.33%

Master's Degree	21	24.42%
Bachelor Degree	24	27.91%
College Diploma	19	22.09%
Technical and Vocational Education and Training (TVET)	11	12.79%
High School Completed	9	10.47%
Total Year of Work Experience in Road Construction Projects		
Options	**Frequency**	**Percentage**
Less than 3 years	19	22.09%
3-5 years	33	38.37%
5-10 years	18	20.93%
11-15 years	13	15.12%
16 years and above	3	3.49%

4.4 Quality Awareness and Practice Assessment

In line with the literature reviews carried on past related works on road construction project quality management practices, quality awareness and practice were determined to be one of the critical factors affecting the road quality. The following major findings were recorded based on responses given by respondents who took part on the research project work survey.

Majority of responders, 34.05%, defined quality as meeting requirements and specification followed via increased competitiveness (22.16%), increased profit (10.27%) and client satisfaction (9.73%). Further, must thing to do (9.19%), challenge (5.95%), appearance or look (5.41%), efficiency (1.62%), expensive (1.08%), and luxury (0.54%) got the next ratings. It is worth to mention the fact that responders gave only 1.08% and 0.54% for expensive and luxury definition respectively. This shows that there is a good understanding towards quality in road construction project works among project practitioners.

At the time of the survey conduction, only 26.74% of respondent claimed to previously took project quality management course or trainings and the remaining 73.26% did not

take any quality course or trainings before. From those who took the training and courses 47.83% for months, 34.78% for weeks and 17.39% in one single course was the training duration. It is fair to conclude that significant amount of the road project practitioners didn't take any project quality management course/training or those who took the trainings are for only few months or less, and that will be a bottleneck and limiting factor in project quality awareness creation, practice and implementation.

Regarding familiarity with the tools and procedures used in quality management, 68.60% respondents claimed that they are familiar and the rest 31.40% are not familiar with. And from the responders who are familiar with quality management tools and techniques, 42.37% claim to use them in projects, 45.76% sometimes and 11.86% claimed not to use them at all. This shows that, although workers are aware with quality management tools and techniques their consumption and deployment is seriously compromised in road construction project works.

Regarding opinions on institutions perception and attitude towards quality, majority of responders assume that it is meeting specifications (43.85%) followed by defect elimination (24.62%) and competitive advantage tool (17.69%). Profit increasing tool (8.46%) was the next most assumed and the remaining responders (5.38%) do not have any idea about it. However, it is wise to note that nobody assumed it to be a luxury thing to accomplish. Further, 63.95% of the responders think that their institutions attention towards quality is maximum, 16.28% think it is fair, 8.14% think it is minimal and the remaining 11.63% claimed to have no idea about it.

31.40% of responders claim that there is a Quality Management System (QMS) in place for the Edo – Serofta – Warka road construction project. 59.30% claimed to have no idea about that and 9.30% claimed that there is no QMS in place for the road construction project. Further, those who claimed there is QMS in place, 25.93% assume it is ISO based, 18.52% TQM based, 7.41% check list based, and the rest (48.15%) have no idea about the

type of QMS on the project. This shows that there is information gap on the type of QMS deployed in the road project and that majority of the responders have no clear idea about it. This can be taken as one of the indicators that that there is a gap in the quality information communication flow.

Regarding keeping track of quality performances, 50.00% perceive that their institution keeps track, 20.93% are not sure of it, 10.47% didn't know anything about that and 18.60% claim that there is no track of quality performances about the project in their affiliated institution. Majority of responders, 58.14%, retaliated that their institution does not provide any quality management inductions and training to its employees, 31.40% not sure about that and only 10.47% respondents claim that their institution provides quality management inductions and training to its employees. From those who claimed their institution to provide quality management induction and training to it employee, 44.44% of the respondent claim that these trainings are conducted monthly, 33.33% biannually, 11.11% annually and the remaining 11.11% claim that they are conducted once. This clearly indicates that institutions attention towards quality management induction and training to it employee is terrible and it creates its own shortcoming in quality awareness creation and practice.

4.5 Quality Management Process Assessment

4.5.1 Quality Planning Assessment

The first variable studied under quality management process was quality planning process. A total of 17 questions were formulated to accesses the quality planning assessment and the following main findings were recorded. The overall recorded and analyzed data is presented in Table 2 given below.

Table 2: Quality planning assessment result

Q. No.	Impact Level – in Actual Frequency of Occurrences					Mean Value	RII	RII Ranking
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree			
Q#1	5	2	9	47	23	3.94	0.79	1
Q#2	2	11	3	55	15	3.81	0.76	5
Q#3	2	5	3	63	13	3.93	0.79	4
Q#4	1	13	21	49	2	3.44	0.69	10
Q#5	2	15	3	49	17	3.74	0.75	8
Q#6	3	6	5	51	21	3.94	0.79	1
Q#7	1	17	15	38	15	3.57	0.71	9
Q#8	11	16	14	33	12	3.22	0.64	15
Q#9	7	22	21	34	2	3.02	0.60	17
Q#10	4	19	17	37	9	3.33	0.67	13
Q#11	3	19	16	35	13	3.42	0.68	11
Q#12	2	6	11	59	8	3.76	0.75	7
Q#13	6	16	17	31	16	3.41	0.68	12
Q#14	0	0	19	53	14	3.94	0.79	1
Q#15	1	14	2	55	14	3.78	0.76	6
Q#16	1	23	18	43	1	3.23	0.65	14
Q#17	5	32	7	36	6	3.07	0.61	16
				Average Mean		**3.56**		

Hence, based on the results displayed in Table 2 above, the survey responders agree that the quality planning process incorporates 11 of the attributes stated in the questionnaire. These include: a brief description of the project, project quality objectives, responsibilities and authorities of project staff, a site organization chart with named personnel (if known), a list of contract documents and drawings, a site layout plan, the construction program

and sub-programs, a list of quality procedures and work instructions applicable to the project referencing the company's quality manual and procedures, a list of project-specific procedures and work instructions for inspection and testing, inspection and test plans or their list, and checklists or target dates for their provision.

However, it was found that majority of responders neither agree nor disagree, to the remaining 6 attributes and took a neutral position. These attributes are: schedules of subcontractor nomination material and equipment, procurement based on the construction program, list(s) of materials and appliances used for the project showing the verification requirement of each, list of quality records to be kept including appropriate quality records from subcontractors, frequency (or provisional dates if possible) of internal quality audits, and frequency of updating the quality plan. This finding showed that majority of the responders took a neutral position when it comes to subcontractor related attributes, procurements, and quality plan related factors of record keeping, frequency of quality audit and frequency of quality plan updating.

The overall mean value of the quality planning process was computed to be 3.56, falling under the category of agreement. Furthermore, via deploying Relative Importance Index (RII) concept to determine the relative importance of the factors stated under quality planning assessment, it was found that; Brief description of the project, Inspection and test plans, or list thereof, and Site layout plan, followed via Responsibilities and authorities of project staff, and Project quality objectives, were found to be the top 5 main factors affecting road construction project implementation in Ethiopia.

4.5.2 Quality Assurance Assessment

The second variable studied in the quality management process assessment was quality assurance factors. Four questions were formulated to evaluate the quality assurance mechanisms within the quality management process. These mechanisms include:

selecting appropriate quality management system requirements for each contract, clearly specifying these requirements in tender and contract documents, evaluating and selecting subcontractors based on their ability to meet specified requirements, and conducting appropriate checks, measurements, or testing of products while maintaining proper records. The overall recorded and analyzed data in quality assurance mechanisms are presented in Table 3, given below.

Table 3: Quality assurance assessment result

Q. No.	**Impact Level – in Actual Frequency of Occurrences**					Mean Value	RII	RII Ranking
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree			
Q#1	7	27	51	1	0	2.53	0.51	4
Q#2	1	25	52	7	1	2.79	0.56	3
Q#3	6	8	61	11	0	2.90	0.58	2
Q#4	0	1	70	14	1	3.17	0.63	1
				Average Mean		**2.85**		

Based on the results displayed in Table 3 above, majority of the survey responders took a neutral (neither agree not disagree) position on three of the four mechanism questions assessed. Responders took neutral position on quality assurance mechanisms of: clearly specifies the quality management system requirements in tender and contract documents, evaluates and selects subcontractors on their ability to satisfy specified requirements, and appropriate checking, measurement or testing of products and keeping proper records. It was also discovered that majority responders disagreed on the selecting the appropriate quality management system requirements for each contract in the project. The overall average mean value of the quality assurance process was computed to be 3.85, falling under the category of neutral stance.

Furthermore, via deploying Relative Importance Index (RII) concept to determine the relative importance of the factors stated under quality assurance assessment, it was found that; Appropriate checking, measurement or testing of products and keeping proper records, followed via Evaluating and selecting subcontractors on their ability to satisfy specified requirements, were found to be the top 2 main factors affecting road construction project implementation in Ethiopia, under quality assurance process.

4.5.3 Quality Control Assessment

The third variable studied under quality management process assessment was quality control related factors. Four main quality control factors: Selecting what to control and set standards that provide the basis for decisions regarding possible corrective action, Establishing the measurement methods used comparing the actual results to the quality standards, acting to bring nonconforming processes and material back to the standard based on the information collected, and monitoring and standardizing measuring devices including detailed documentation for all processes were taken in to consideration. Summary of the overall recorded and analyzed data in quality control is presented in Table 4, given below.

Table 4: Quality control assessment result

Q. No.	**Impact Level – in Actual Frequency of Occurrences**					Mean Value	RII	RII Ranking
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree			
Q#1	0	9	7	59	11	3.84	0.77	3
Q#2	1	1	18	51	15	3.91	0.78	2
Q#3	0	3	16	52	15	3.92	0.78	1
Q#4	1	12	15	44	14	3.67	0.73	4
				Average Mean		**3.83**		

Based on the results displayed in Table 4 above, it was found that majority of responders agree that to the quality control factors assessed in this research work study. The overall mean value of the quality control process factor was computed to be 3.83, falling under the category of agreement. Furthermore, via deploying RII, it was found that; Acting to bring nonconforming processes and material back to the standard based on the information collected, followed via Establishing the measurement methods used, compare the actual results to the quality standards, were found to be the top 2 main factors affecting road construction project implementation in Ethiopia, under quality control process.

4.5.4 Quality Communication Assessment

The fourth and final variable studied under quality management process assessment was quality communication related factors. A total of 6 questions were formulated to accesses the quality communication in road construction projects and the following main findings were recorded. The overall recorded and analyzed data is presented in Table 5 given below.

Table 5: Quality communication assessment result

Q. No.	**Impact Level – in Actual Frequency of Occurrences**					Mean Value	RII	RII Ranking
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree			
Q#1	1	17	1	43	24	3.84	0.77	1
Q#2	0	27	1	39	19	3.58	0.72	2
Q#3	1	15	21	37	12	3.51	0.70	3
Q#4	11	9	22	31	13	3.30	0.66	6
Q#5	7	2	28	39	10	3.50	0.70	5
Q#6	3	15	14	43	11	3.51	0.70	3
				Average Mean		**3.54**		

Based Table 5 presented above, it was found that majority of responders agree to 5 of the 6 quality communication factors assessed in this research work study. These five quality communication factors are; specific targets and actions for quality improvement are documented by the project team, specific targets and actions for quality improvement are communicated by the project team, project's quality standards are communicated to the project team and stakeholders, the project gets timely information about customer quality needs, and employee's ideas on ways to improve quality in the project are welcomed by the top management. However, majority of responders took a neutral position when it come to the fact that there is a well-developed feedback mechanism in the project.

Overall, the grand average mean value of quality communication was found to be 3.56875, implying agreement with the factors stated. Furthermore, via deploying RII, it was found that; Specific targets and actions for quality improvement are documented by the project team, followed via Specific targets and actions for quality improvement are communicated by the project team, and Project's quality standards are communicated to the project team and stakeholders, were found to be the top 3 main factors affecting road construction project implementation in Ethiopia, under quality related communication domain.

4.6 Top Management Commitment to Quality Assessment

The next variable that was considered for this research work was top management's commitment to the road construction project quality. A total of 9 assessment questions were incorporated in the questionnaire prepared and the following table, Table 6 gives summary of the recorded and analyzed result.

Table 6: Top management's commitment to quality assessment result

Question No.	Impact Level – in Actual Frequency of Occurrences					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	0	4	11	57	14	3.94
Q#2	5	15	17	41	8	3.37
Q#3	2	8	7	47	22	3.92
Q#4	2	17	15	45	7	3.44
Q#5	0	21	12	43	10	3.49
Q#6	7	15	19	34	11	3.31
Q#7	7	8	23	41	7	3.38
Q#8	13	33	10	29	1	2.67
Q#9	32	17	10	27	0	2.37
				Average Mean		**3.32**

Regarding on the assessment of top management's commitment to road construction project quality, majority of responders believe or agree that the top management communicate the importance of meeting customer quality requirements, are dedicated to quality, demonstrate communicate and reinforce the quality statements, and conduct management reviews on project quality. It was further observed that majority of respondents assume a neutral (neither agree nor disagree) position on the facts that the top management clearly sets quality policies, seek to have more financial resources for quality, and seek to have more human resources for quality. Furthermore, it was also observed that majority of the responders disagree with the top managements quality commitment indicators of seeking for training opportunity for employees in quality, and incentivizing best employees in quality.

In conclusion, the overall mean value of the top management's commitment towards quality was computed to be 3.32, falling under the category of neutral (neither agreement

nor disagreement). It was observed that top management's commitment towards seeking for training opportunity for employees in quality related arena is limited.

4.7 Quality Management Principles Assessment

The next quality variable studied in this research work is quality management principles. A total of six sub-categories; Leadership, Customer Focus, Engagement with people, Improvement within the project, Evidence based decision making, and Relationship management were assessed in this part of the research work.

4.7.1 Leadership Assessment

The first sub-category of factors investigated under quality management principles was leadership. A total of 3 questions were formulated to investigate the leadership factors and the following main findings were recorded and presented in Table 7, given below.

Table 7: Leadership assessment result

Question No.	**Impact Level – in Actual Frequency of Occurrences**					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	0	2	6	55	23	4.15
Q#2	0	13	10	48	15	3.76
Q#3	6	2	8	61	9	3.76
				Average Mean		**3.89**

Based on the results obtained and displayed above in Table 7, majority of responders perceive or agree to the fact that all leadership components assessed: top management supports the project activities, top management have established a vision and direction for the organization, and top management is able to establish trust. Further, the overall mean value of the leadership was computed to be 3.89 implying agreement with the leadership component of the quality management principles assessment.

4.7.2 Customer Focus Assessment

The second sub-category of factors investigated under quality management principles was customer focus. Regarding the customer focus part of the quality management principles, 4 questions were formulated to accesses its reality and the following main findings were recorded and presented in Table 8, given below.

Table 8: Customer focus assessment result

Question No.	**Impact Level – in Actual Frequency of Occurrences**					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	0	16	6	58	6	3.63
Q#2	7	4	19	35	21	3.69
Q#3	10	3	27	37	9	3.37
Q#4	8	8	31	25	14	3.34
				Average Mean		**3.51**

Based on the results obtained and displayed above in Table 8, majority of responders agree that the project understands the needs of existing and future needs of the client, and the project activities meet client's requirements. However, it was observed that majority of responders took a neutral stance on matters of the project measures customer satisfaction, and the project aims to exceed client's expectations. Further, the overall mean value of the customer focus was computed to be 3.51 implying agreement.

4.7.3 Engagement with People Assessment

The third sub-category of factors investigated under quality management principles was engagement with people. To accesses the engagement with the people component of the quality management principles, three questions; the project ensures that people's abilities are used and valued, there is evaluation of individual performance in the project activities, and the project facilitates learning and knowledge sharing within the project

activities were adopted and put forward in the survey. Table 9 given below gives the summary of the survey findings.

Table 9: Engagement with people assessment result

Question No.	Impact Level – in Actual Frequency of Occurrences					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	9	14	18	29	16	3.34
Q#2	12	21	22	25	6	2.91
Q#3	8	19	15	25	19	3.33
				Average Mean		**3.19**

Regarding Engagement with people, majority of responders took a neutral position (neither agree nor disagree) towards engagement with the people component of the Quality Management Principles. This indicates that the perception of quality management principles which dictates engagement with people didn't get the necessary attention in road construction project. The overall mean value of the engagement with the people component of the quality management principles was computed to be 3.19 implying neutrality on the subject matter.

4.7.4 Improvement Within the Project Assessment

The fourth sub-category of factors investigated under quality management principles was improvement with the project. Two questions whether, Project activities are performed to improve project performance and capabilities, and the project empowers people to make improvements were formulated to access improvement within the project and put in to action in the survey. Table 10 given below shows the findings main summary.

Table 10: Improvement within the project assessment result

Question No.	Impact Level – in Actual Frequency of Occurrences					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	4	2	23	37	20	3.78
Q#2	6	3	25	35	17	3.63
				Average Mean		**3.70**

Based on the results obtained and displayed above in Table 10, in relation to improvement within the project, most responders believe that project activities are performed to improve project performance and capabilities, and the project empowers people to make improvements. The fact that majority of responders agreed to the improvement within the project and the fact that the overall mean value for the subject matter of 3.70 indicating that it is in agreement with the improvement within the project principle.

4.7.5 Evidence Based Decision Making Assessment

The fifth sub-category of factors investigated under quality management principles was evidence-based decision-making assessment. To access whether evidence-based decision makings were in place where one of the major quality management principles targets, three questions were adopted and put forward for the survey analysis. Table 11 given below delivers the summary the major findings.

Based on the results obtained and displayed below in Table 11, in relation to evidence-based decision-making process, majority responders assume or agree that the project ensures the accessibility of accurate and reliable data, decisions taken by the project are made based on analysis of data, and the project balance data analysis with practical experience. The mean values for all components of the evidence-based decision making

showed that majority of responders agree to all the possible factors assessed and the overall mean value of the subject matter was computed to be 3.62 implying overall agreement to the process of evidence-based decision-making

Table 11: Evidence based decision making assessment result

Question No.	Impact Level – in Actual Frequency of Occurrences					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	1	10	15	50	10	3.67
Q#2	0	15	17	39	15	3.63
Q#3	0	14	27	28	17	3.56
				Average Mean		**3.62**

4.7.6 Relationship Management Assessment

The sixth and final sub-category of factors investigated under quality management principles was relationship management assessment. A total of three questions were formulated to explore the situation on the subject matter and the following table, Table 12 gives the summary of the major findings on the subject matter.

Table 12: Relationship management assessment result

Question No.	Impact Level – in Actual Frequency of Occurrences					Mean Value
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree	
Q#1	0	13	33	35	5	3.37
Q#2	0	17	25	34	10	3.43
Q#3	0	13	26	37	10	3.51
				Average Mean		**3.44**

Based on the results obtained and displayed above in Table 12, in relation to relationship management, majority responders believe or agree that the projects identify and select

suppliers to manage costs and create value, relationships considers both the short and long term established within the project, and partners share expertise, resource information and plans in the project. Further, the overall mean value was found to be 3.44, which falls under agreement category in the Linkert scale evaluation scheme adopted for the research project work.

4.8 Quality Management Implementation Challenges Assessment

The next variable analyzed in this research project study work was quality management implementation challenges. A total of 24 assessment questions were formulated and the survey responders were asked to rank their overall impact levels using Linkert chart scaling method. Table 13 given below shows the summary of the major findings.

Based on the results displayed in Table 13 below, majority of responders agreed with the 10 of the 24 factors listed as the main potential quality management implementation challenges. These 10 factors are; difficulties in understanding the quality system, lack of adequate training in quality management for employees, lack of quality management policy and strategy, problems with contractors' performance, ineffective communication, inadequate information, unrealistic project deadlines, problem with Government bureaucracy, problem with scope change, and lack of standardized quality management guidelines.

Moreover, it was observed that majority of the responders took a neutral stance in the remaining 14 possible potential quality management implementation challenge factors. These 14 factors are; inadequate management support, unwillingness of project staff to accept the quality system, problem with more paper works, problem with documentation, difficulties in measuring results, lack of regular supervision in the project, problems with consultant's performance, lack of resources for quality management, increase of cost, increase of time, inadequate technical expertise/skills,

problem with raw materials shortage due to inflation, problem with right of way, and finally employee turnover.

Table 13: Quality management implementation challenges assessment result

Q. No.	Impact Level – in Actual Frequency of Occurrences					Mean Value	RII	RII Ranking
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree			
Q#1	0	28	20	35	3	3.15	0.68	17
Q#2	7	26	11	31	11	3.15	0.68	17
Q#3	1	12	16	50	7	3.58	0.77	5
Q#4	0	3	9	55	19	4.05	0.87	1
Q#5	1	7	18	48	12	3.73	0.80	2
Q#6	8	5	28	26	19	3.50	0.75	7
Q#7	10	16	25	24	11	3.12	0.67	20
Q#8	11	16	11	37	11	3.24	0.70	14
Q#9	13	24	11	25	13	3.01	0.65	22
Q#10	10	7	13	52	4	3.38	0.73	10
Q#11	3	15	20	47	1	3.33	0.72	11
Q#12	7	24	12	35	8	3.15	0.68	17
Q#13	2	7	15	55	7	3.67	0.79	3
Q#14	8	20	31	27	0	2.90	0.62	24
Q#15	3	13	32	28	8	3.30	0.69	13
Q#16	0	16	25	38	7	3.42	0.74	8
Q#17	8	21	17	36	4	3.08	0.66	21
Q#18	12	5	18	39	12	3.40	0.73	9
Q#19	12	8	18	36	12	3.33	0.72	11
Q#20	11	8	32	26	9	3.16	0.68	16
Q#21	13	21	21	18	13	2.97	0.64	23
Q#22	7	6	19	35	19	3.62	0.78	4
Q#23	2	13	18	39	14	3.58	0.77	5
Q#24	0	19	39	21	7	3.19	0.69	15
				Average Mean		**3.33**		

Furthermore, via deploying Relative Importance Index (RII) concept to determine the relative importance factors involved in quality management implementation challenges,

it was found that lack of adequate training in quality management for employees, followed via lack of quality management policy and strategy, ineffective communication, problem with scope change, and lack of standardized quality management guidelines, were found to be the top five challenges of quality management implementation factors in the road construction project.

4.9 Contract Document Clarity and Administration Assessment

The next variable analyzed in this research project study work was contract document clarity and administration. A total of 12 assessment questions were formulated and the survey responders were asked to rank their overall impact levels using Linkert chart scaling method. Table 14 given below shows the summary of the major findings.

Table 14: Contract clarity and administration assessment result

Q. No.	**Impact Level – in Actual Frequency of Occurrences**					Mean Value	RII	RII Ranking
	[1] Strongly Disagree	[2] Disagree	[3] Neither Agree nor Disagree	[4] Agree	[5] Strongly Agree			
Q#1	0	0	7	23	56	4.57	0.91	1
Q#2	12	17	10	10	37	3.50	0.70	12
Q#3	2	2	16	27	39	4.15	0.83	6
Q#4	0	0	12	23	51	4.45	0.89	3
Q#5	5	6	22	26	27	3.74	0.75	11
Q#6	2	8	20	28	28	3.84	0.77	10
Q#7	0	0	22	29	35	4.15	0.83	6
Q#8	0	0	22	23	41	4.22	0.84	5
Q#9	2	5	22	27	30	3.91	0.78	9
Q#10	0	0	15	28	43	4.33	0.87	4
Q#11	3	8	11	21	43	4.08	0.82	8
Q#12	0	0	8	25	53	4.52	0.90	2
				Average Mean		**4.12**		

Based on the results displayed in Table 14 above, majority of responders strongly agreed with the 5 of the 12 factors listed as the main potential contract clarity and administration factors. These 5 factors are; Be a team member and be able to effectively represent the interests of the contractor, have a working knowledge of construction materials construction skills means and methods and the relationships between subcontractors' suppliers and local administration, Reviewing and applying contract modifications, having a good communication link between the Employer, Engineer and the other Contractors Department, and Revision of the Contract Document and identifying ambiguities.

Moreover, it was observed that majority of the responders agreed to the remaining 7 possible potential contract clarity and administration factors. These 7 factors are; Know the contents of the Employer-Contractor agreements, Know and understand the project forms to be used for the project particularly the conditions of the contract and the underlying principles of contract law upon which they are based, Understand the codes and regulations that govern the project, Be open-minded and responsive, Observing project progress for review of contractor applications for payment, Attending project meetings, and Availability of knowledgeable contract administration personnel. The overall mean value was found to be 4.12, which falls under agreement category in the Linkert scale evaluation scheme adopted for the research project work.

Furthermore, via deploying Relative Importance Index (RII) concept to determine the relative importance factors involved in contract clarity and administration, it was found that; Be a team member and be able to effectively represent the interests of the Contractor, followed via Revision of the Contract Document and identifying ambiguities, Have a working knowledge of construction materials construction skills means and methods and the relationships between subcontractors suppliers and local administration, Having a good communication link between the Employer Engineer and the other Contractors

Department, and Reviewing and applying contract modifications, were found to be the top five factors of contract clarity and administration affecting road construction project quality management.

4.10 Assessment of Factors Resulting in Poor Construction Quality

The final variable studied in the quality management practice of the Edo – Serofta – Warka road construction project was possible factors resulting in poor construction quality. A total of 10 possible categories of factors were adopted from past related works and put in to action. These 10 factor categories are related to Project, Design, Contract, Material, Employee, Sub-contractor, QMS, Finance, Client, and External environment related factor categories.

Based on the data extracted from the survey conducted in this research project work, except for the project related factors, where majority of the responders choose to stay neutral (Neither Agree nor Disagree), there was a general agreement that the other 9 factors are the main possible reasons resulting in poor road construction quality. In order to establish their degree of influence, RII and mean value analysis was carried on the original data recorded in the survey and the following result shown in Table 15 was computed.

Table 15: Poor construction quality factors assessment result

No.	Factor Category	Average Mean	RII	RII Ranking
1	Project related factors	3.34	0.72	10
2	Design related factors	3.49	0.75	7
3	Contract related factors	3.68	0.79	4
4	Material related factors	3.73	0.80	2
5	Employee related factors	3.49	0.75	8
6	Sub-contractor related factors	3.56	0.76	5
7	QMS related factors	3.78	0.81	1
8	Finance related factors	3.46	0.74	9
9	Client related factors	3.69	0.79	3
10	External environment factors	3.51	0.76	6

Hence, as per Table 15 shown above, QMS related factors are found to be the most critical reasons resulting in poor road construction quality followed via Material, Client, Contract, and Sub-contractor related factors. Further, External environment, Design, Employee, Finance, and Project related factors were recorded to have the next top five factors resulting in poor road construction quality.

4.11 Discussion Summary

According to the main findings of this research study work, it was observed that Edo – Serofta – Warka road construction project practitioners have a solid understanding and commitment towards the road construction project quality. 68.60% responders (59 out of 86), were found to be familiar with the tools and procedures used in quality management. Among those 88.14% (52 out of 86), deploy tools and procedures used in quality management either sometimes or all the time. Moreover, 63.95% of the responders (55 out of the 86) believed that their institutions attention and commitment towards quality is maximum, and 16.28% responders (14 out of 86) believe that it is fair. Which shows that

it is a good indicator and the first step towards is a good indicator towards road construction project quality assurance.

It was also noticed that there is a fair quality control mechanism put in place in the Edo – Serofta – Warka road construction project, which respondents rate the quality control in the project to be mean averaged 3.83, which indicates agreement with the process. Moreover, top management's commitment to quality was found to be average (average mean value of 3.32, which again indicates agreement), other than seeking for training opportunity for employees in quality arena, which got average mean values of 2.67 and 2.37 respectively, displaying disagreement.

However, it was observed that the survey data indicated that the road construction project has both internal and external quality management gaps and problems. It was found that only 26.74% of respondent (23 out of the total 86) took project quality management course or trainings before and the remaining 73.26% (63 out of the total 80) did not take any before. Further, from the 23 responders who claimed to take project quality management course and trainings, it was found that 47.83% (11 responders out of the 23) took it for months, 34.78% (8 responders out of the 23) for weeks and 17.39% (4 responders out of the 23) in just one single course was the training duration. Hence, lack of adequate ongoing project management trainings and involvement can be taken as the major source of project quality shortfalls. Further, the fact that majority of employee in the project lack knowledge and experience in quality management is another major issue that needs to be addressed in future similar projects.

Furthermore, from the 59 out of the 86 responders who claimed to be familiar with the tools and procedures used in quality management, only 42.37% (25 out of 59) claim to use them effectively, 45.76% (27 out of 59) use them sometimes and 11.86% (7 out of 59) claimed not use them at all. This showed that because of the limited knowledge and exposure to quality management systems, reluctance to use quality management tools

and methodologies in the project were one of the main problems. It is also one of the main reasons for causing obstacles in project quality awareness creation, practice and implementation.

It was also noticed that majority of responders find it difficult to be confident regarding subcontractor related attributes, procurements, and quality plan related factors of record keeping, frequency of quality audit and frequency of quality plan updating. Moreover, it was also observed that the perception of quality management principles, which dictates engagement with people, didn't get the necessary attention in the project as its average mean value from the survey was found to be 3.19, showing a neutral position regarding the subject.

The study further showed that main factors resulting in poor road construction quality as perceived via responders are lack of QMS related resources (mean value of 3.98), lack of quality material (mean value of 3.91), political atmosphere (3.86), gaps in employee related skill and experience (mean value of 3.84), lack of technological advancement (mean value of 3.81), and lack of cost control system (mean value of 3.80). Furthermore, lack of adequate training in quality management for employees, lack of quality management policy and strategy, lack of standardized quality management guidelines, and problem with scope creep were also noticed to be critical factors affecting road construction project quality management implementations.

4.12 Overall Assessment Summary

Based on the survey data presented in Chapter Four, the study on the Edo – Serofta – Warka road construction project highlights several critical aspects of project quality management that require attention and improvement. While practitioners show familiarity with quality management tools and procedures, using them regularly or occasionally, indicating a general willingness to engage in quality management,

institutions recognize the importance of quality but may not be fully effective in their approach.

The existing quality control mechanisms are viewed positively, indicating their general adequacy. However, there is a significant shortfall in training, which is a major barrier to effective quality management. The inconsistency in training duration impacts the depth of understanding and capability in quality management.

Furthermore, there is a significant gap between knowledge and practical application, with reluctance or inability to consistently use quality management tools highlighting the need for more comprehensive training and support. Challenges also exist in managing subcontractor-related attributes, procurements, and aspects of quality planning such as record-keeping and audit frequency. These areas are critical for maintaining overall project quality and require more robust management practices.

Additionally, quality management principles are not fully integrated into the project culture, indicating a need for greater emphasis to foster a proactive quality management environment. Key factors contributing to poor road construction quality include a lack of Quality Management System (QMS) resources, inadequate quality of materials, political factors impacting project execution, skill and experience gaps among employees, lack of technological advancement, and inadequate cost control systems.

Additional critical factors include a lack of adequate training, clear quality management policies and strategies, standardized guidelines, and issues with scope creep. Addressing these areas through enhanced training programs, clear policies, strengthened quality control mechanisms, advanced technologies, targeted skill development, and increased institutional support is crucial for improving the quality and success of future road construction projects

Chapter Five

Summary, Conclusion and Recommendation

This chapter presents the main summary of the findings, conclusions drawn from the study, and recommendations for future similar road construction projects in terms of project quality management.

5.1 Summary of Major Findings

The following main summary of findings are worth mentioning based on the analysis and investigation carried in this research work.

- The study showed that there is quite a noticeable problem of workers not having exposed to quality management related courses or trainings before. Numerical data from the study showed that 73.26% (63 out of the total 86) did not take any quality management related courses or trainings before.
- It was also noticed that the study identified that only 23 respondents were qualified in quality management indicating that there are limited experts in the area of quality management, practicing in the project.
- Because majority of workers in the project lack quality management related trainings and skills, reluctance in effectively using QMS tools and techniques is also noticed. The study showed that 57.63% (34 out of 59) claim not to use them either effectively or use them at all.
- Top management's commitment towards quality, whose average mean value of was computed to be 3.32, is average (neutral stance) and that needs to be enhanced for future similar projects. Furthermore, it should be noted that majority of workers believe that their commitment towards securing quality management related trainings and incentive measures in quality practice are limited. Numerical

data analysis from the study showed that an average mean values of 2.67 and 2.37 were recorded respectively, displaying disagreement.

- Although all institutions commitment towards quality in the project was found to be solid, it was noticed that their attention towards quality management induction and training to its employee is very limited and that generates shortcoming in quality awareness creation, practice and implementation. This needs to be carefully looked in to get improved and addressed for future similar road construction projects.

5.2 Conclusion

Overall, it was observed that the Edo – Serofta – Warka road construction project has solid stance in quality management. As successful project management increases the likelihood of successfully completing projects within schedule, cost, scope, and quality constraints, it can be taken as exemplary platform project for future similar road construction projects. However, top management's commitment towards quality in the project was found to be average and that needs to be improved.

The Edo – Serofta – Warka road construction project quality management practice is however significantly challenged by a number of factors, including a lack of skill and expertise knowledge, quality material, issues with reluctance in deploying quality management methods effectively, scope changes, and a lack of clear quality management system policy and guidelines. Moreover, for future projects, greater attention should be given towards quality management related trainings and capacity buildings via contractors, clients and consultants if it deemed to realize quality objective scientifically and systematically.

Furthermore, the identified main factors resulting in poor road construction quality construction projects, which are mainly related to capacity in quality management,

quality material, clear quality management policy and strategy formulation, and standardized quality management guidelines needs to be addressed.

5.3 Recommendations

The researcher suggests the following recommendation for improving project quality management even further for road construction building projects in Ethiopia bridging the gap between theories and project implementation.

- More specialist quality management and independent quality assurance teams should be employed in future similar road construction projects and shall oversee the construction process.
- The quality of raw material inputs for road construction projects, such as quarry site works, needs to be improved through standard testing and should be conducted and supervised by qualified personnel.
- Advanced technology for road construction projects needs to be considered and adopted to get a higher-quality road in the country.
- Road construction employee's awareness towards construction quality should be continuously boosted through regular trainings and inductions.
- The project quality management process, including quality planning, assurance, and control, must be clearly formulated and communicated to all workers.
- Appropriate and uniform quality management processes should be adopted and used in construction project works.
- Road construction companies should utilize comprehensive project management frameworks like PMBOK to ensure all aspects of the project are well-planned and monitored.

- Better implementation and awareness of international quality management standards such as ISO 9001 to ensure consistent quality across all projects
- Top managements should have the extra responsibility in identifying possible gaps that demand their intervention continuously to bolster quality-focused activities.
- More studies on construction quality management in similar road construction projects should be conducted.

5.4 Direction for Future Research

Future similar researches in assessing factors affecting project quality management practices in road construction projects in Ethiopia should be conducted incorporating detailed analysis with larger population size in the sector, covering more projects countrywide, incorporating additional factors from past related works globally which will be valid in Ethiopia's context, and drawing country specific factors from the existing road construction firms in Ethiopia which might be valid only to the reality in Ethiopia.

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Appendix A: Questionnaire

Addis Ababa University
College of Business and Economics
School of Commerce
Department of Project Management
M.A. Research on Project Quality Management

Dear respondent,

The purpose of this questionnaire is to gather data for a study titled Assessment on Project Quality Management Practices: The Case of Edo – Serofta – Warka Road Construction Project,' as part of the requirements for a Master of Arts (M.A.) degree in Project Management.

This questionnaire consists of 8 parts and should take approximately 20 minutes to complete. Your responses are crucial to the success of this study, and I kindly request that you provide thorough and honest answers. Please rest assured that all responses will remain anonymous.

Your willingness to participate and cooperate is greatly appreciated, and your input will significantly contribute to the ongoing research. I sincerely thank you in advance for your involvement in this initiative.

Name: Binyam Solomon	Mobile: +251-911855356	Email: binsbez@gmail.com

Please put a tick mark "X" to all your responses next to the box provided beside each statement or question in Part one and two. And use Likert Scale Description: [1] Strongly Disagree; [2] Disagree; [3] Neither Agree nor Disagree; [4] Agree; [5] Strongly Agree for the other Parts.

PART ONE: General Information

1. What is your role in the Construction Works of Edo – Serofta – Warka Road Project you are involved?

Project Management Team Member ☐	Contract Administration Team Member ☐
Site Construction Team Member ☐	Quality Management Team Member ☐
Design Review Team Member ☐	Others (please specify): _____

2. What is your affiliation in the project?

Client (ERA) ☐	Consultant ☐	Contractor ☐	Sub-Contractor ☐

3. What is your gender?

Male ☐	Female ☐

4. What is the level of your educational background?

PhD and above ☐	Master's Degree ☐	Bachelor Degree ☐
College Diploma ☐	Technical and Vocational Education and Training (TVET) ☐	
High School Completed ☐	Others (please specify): _____	

5. Your total work experience in building construction projects.

Less than 3 years ☐	3-5 years ☐	5-10 years ☐	11-15 years ☐	16 and above ☐

PART TWO: Quality Awareness and Practice

6. Which of these words, in your opinion, best defines quality? (You are not restricted to one response)

Expensive ☐	Must Thing to Do ☐	Increased Profit ☐	Challenge ☐
Luxury ☐	Appearance or look ☐	Increased Competitiveness ☐	
Customer Satisfaction ☐	Meeting Requirements and Specification ☐		
Others (please specify): _____			

7. Have you ever taken Project Quality Management Course or Trainings?

Yes ☐	No ☐

If your answer above is 'Yes', for how long?

Days ☐	Weeks ☐	Months ☐	Years ☐
Others (please specify): _____			

8. Are you familiar with the tools and procedures used in quality management?

Yes ☐	No ☐	No response ☐

If your answer above is 'Yes', do you use these tools and procedures effectively?

Yes ☐	No ☐	Sometimes ☐	Barely Sometimes ☐	No response ☐

9. What is your company's (institution's) perception and attitude towards quality?

Defect Elimination ☐	Meeting Specifications ☐	Luxury Thing to Accomplish ☐
Competitive Advantage Tool ☐	Profit Increasing Tool ☐	No Idea ☐
Others (please specify): _____		

10. What is your company's (institution's) attention towards quality?

Minimal ☐	Fair ☐	Maximum ☐	No Idea ☐
Others (please specify): _____			

11. Is there a Quality Management System (QMS) in place at your Company?

Yes ☐	No ☐	I don't Know ☐

If your answer above is 'Yes', what type of QMS is used?

ISO ☐	TQM ☐	BIM ☐	No Idea ☐
Others (please specify): _____			

12. Does your organization keep track of quality performances?

Yes ☐	No ☐	Not Sure ☐

13. Does your Company provide quality management inductions and training to its employees?

Yes ☐	No ☐	Not Sure ☐

If your answer above is 'Yes', how frequent is the training?

Once ☐	Every Month ☐	Biannually ☐	Annually ☐
Others (please specify): _____			

PART THREE: Quality Management Process

Quality Planning: Does your organization quality plan contain the following attributes?

Descriptions	1	2	3	4	5
Brief description of the project.					
Project quality objectives.					
Responsibilities and authorities of project staff.					
Site organization chart, with named personnel if known.					
List of contract documents and drawings.					
Site layout plan.					
Construction program and sub-programs.					
Schedules of subcontractor nomination, material and equipment.					
Procurement, based on the construction program.					
List(s) of materials and appliances used for the project, showing the verification requirement of each.					
List of quality procedures and work instructions applicable to project by making reference to the company's Quality Manual and Procedures.					
List of project-specific procedures, work instructions inspection and testing.					
list of quality records to be kept, including appropriate quality records from subcontractors.					
Inspection and test plans, or list thereof.					
Checklists, or target dates for their provision.					
Frequency (or provisional dates if possible) of internal quality audits.					
Frequency of updating the quality plan.					

Quality Assurance: Does your organization consider the following factors in your quality assurance mechanism?

Descriptions	1	2	3	4	5
Selects the appropriate quality management system requirements for each contract.					
Clearly specifies the quality management system requirements in tender and contract documents.					
Evaluates and selects subcontractors on their ability to satisfy specified requirements.					
Appropriate checking, measurement or testing of products and keeping proper records.					

Quality Control: Does your organization consider the following factors in your quality control mechanism?

Descriptions	1	2	3	4	5
Select what to control and set standards that provide the basis for decisions regarding possible corrective action.					
Establish the measurement methods used, compare the actual results to the quality standards.					
Act to bring nonconforming processes and material back to the standard based on the information collected.					
Monitor and standardize measuring devices, include detailed documentation for all processes.					

Quality Communication: Does your organization consider the following factors in quality related communications?

Description	Rating				
	1	**2**	**3**	**4**	**5**
Specific targets and actions for quality improvement are documented by the project team.					
Specific targets and actions for quality improvement are communicated by the project team.					

Project's quality standards are communicated to the project team and stakeholders.					
There is a well-developed feedback mechanism in your project.					
Your project gets timely information about customer quality needs					
Employee's ideas on ways to improve quality in the project are welcomed by the top management.					

PART FOUR: Top Management Commitment to Quality

Descriptions	1	2	3	4	5
Communicate the importance of meeting customer quality requirements.					
Clearly sets quality policies.					
Dedicated for quality.					
Demonstrate, communicate, and reinforce the quality statements.					
Conduct management reviews on project quality.					
Seek to have more financial resources for quality.					
Seek to have more human resources for quality.					
Seek for training opportunity for employees in quality.					
Incentive best employees in quality.					

PART FIVE: Quality Management Principles

Group	Description	Rating				
		1	2	3	4	5
Leadership	Top management supports the project activities.					
	Top management have established a vision and direction for the organization.					
	Top management is able to establish trust.					

Customer focus	The project understands the needs of existing and future needs of the client.					
	The project activities meet client's requirements.					
	The project measures customer satisfaction.					
	The project aims to exceed clients expectations.					
Engagement with people	The project ensures that people's abilities are used and valued.					
	There is evaluation of individual performance in the project activities.					
	The project facilitates learning and knowledge sharing within the project activities.					
Improvement within the project	Project activities are performed to improve project performance and capabilities.					
	The project empowers people to make improvements.					
Evidence based decision making	The project ensures the accessibility of accurate and reliable data.					
	Decisions taken by the project are made based on analysis of data.					
	The project balance data analysis with practical experience.					
Relationship Management	The projects identify and select suppliers to manage costs and create value.					

	Relationships considers both the short and long term established within the project.					
	Partners share expertise, resource information and plans in the project					

PART SIX: Quality Management Implementation Challenges

Descriptions	1	2	3	4	5
Inadequate management support.					
Unwillingness of project staff to accept the quality system.					
Difficulties in understanding the quality system.					
Lack of adequate training in quality management for employees.					
Lack of quality management policy and strategy.					
Problem with more paper works.					
Problem with documentation.					
Difficulties in measuring results.					
Lack of regular supervision in the project.					
Problems with contractors' performance.					
Problems with consultant's performance.					
Lack of resources for quality management.					
Ineffective communication.					
Increase of cost.					
Increase of time.					
Inadequate information.					
Inadequate technical expertise/skills.					
Project deadline is unrealistic.					
Problem with Government bureaucracy.					
Problem with raw materials shortage due to inflation.					
Problem with Right of way.					
Problem with scope change.					

Lack of standardized quality management guidelines.					
Employee turnover.					

PART SEVEN: Contract Document Clarity and Administration

Descriptions	1	2	3	4	5
Be a team member and be able to effectively represent the interests of the Contractor.					
Know the contents of the Employer-Contractor agreements.					
Know and understand the project forms to be used for the project, particularly the conditions of the contract, and the underlying principles of contract law upon which they are based.					
Have a working knowledge of construction materials, construction skills, means and methods, and the relationships between subcontractors, suppliers, and local administration					
Understand the codes and regulations that govern the project					
Be open-minded, and responsive					
Observing project progress for review of contractor applications for payment					
Reviewing and applying contract modifications					
Attending project meetings					
Having a good communication link between the Employer, Engineer and the other Contractors Department					
Availability of knowledgeable contract administration personnel					
Revision of the Contract Document and identifying ambiguities					

PART EIGTH: Factors Resulting in Poor Road Construction Quality

Description		Rating				
Category	**Factors**	**1**	**2**	**3**	**4**	**5**
Project related Factors	Project Scope					
	Project site location					
	Project deadline.					
Design related factors	Completeness and consistent					
	Drawing detail levels					
	Codes and standards compliance					
	Accurate and detailed BoQ					
Contract related factors	Collaboration b/n contracting parties					
	Clarity and fairness					
Material related factors	Availability					
	Quality					
	Storage					
Employee related factors	Communication skill					
	Skill and experience					
	Income level					
	Incentive measures					
	Trainings					
Sub-contractor related factors	Selection method and procedure					
	Cooperation b/n contractors and sub-contractors					
	Sub-contract conditions					
	Sun-contractor performance evaluation system					
QMS related factors	Quality control and quality assurance system					
	Cost control system					
	Time schedule					
	Resources					
Finance related factors	Cash flow contracts					
	Interim payment process					

Client related factors	Decision making delays					
	Client emphasis on quality					
External factors	Bribery and corruption					
	Political atmosphere					
	Technological advancement					

Additional Comments (if you have any)

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