ADDIS ABABA UNIVERSITY
SCHOOL OF COMMERCE GRADUATE PROGRAM
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THE EFFECT OF QUALITY MANAGEMENT PRACTICES ON ROAD CONSTRUCTION PROJECTS: IN THE CASE OF SENAN CONSTRUCTION COMPANY

Researcher: Eyerus Bekele
ID: GSE/005/13

A Research Project Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Masters of Project Management

Advisor: Dr Abdurazak M.
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STATEMENT OF DECLARATION

I hereby declare that the study which is being presented in this thesis entitled "The effect of Quality management practices on road construction projects: in the case of Senan Construction Company" is an original work of my own with guidance and support of the research advisor. It is submitted in partial fulfillment of the requirement for a Master's degree in project management. It had not been presented for a partial fulfillment for any educational qualification in Addis Ababa University or any other institution, and all the resources materials used for this thesis had been accordingly acknowledged.

_____ _____

Eyerus Bekele Date

LETTER OF CERTIFICATE

This is to certify that the research project "The effect of Quality management practices on road construction projects: in the case of Senan Construction Company" undertaken by Eyerus Bekele, is her own original work and that it has not been submitted to any institution.

Dr Abdurazak M.
Project work Advisor

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APPROVED BY BOARD OF EXAMINERS

Members of the Board of Examiners agree that Eyerus Bekele Biya's research project, "The effect of Quality management practices on road construction projects: in the case of Senan Construction Company" meets the requirements for the Master of Arts in Project Management degree and is acceptable in terms of the University's standards and regulations.

Board of Examiners ----------

External Examiner ----------

Internal Examiner ----------

Advisor ----------

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ABSTRACT

Quality management practices (QMP) is assessed to determine the effect on road construction projects and the outcome of the intended objective given by the client. A theoretical and empirical study was used in this research to understand and assess definitions, evaluate standards and manuals as well as conceptualize a framework. Quality management is a system composed to ensure the satisfaction of the end user. Quality management processes on road construction therefore are a set of systems ensuring roads are suitable, safe and durable for the user. The quality outcomes should balance present performance objectives with future needs and expectations of the future. This balance could be achieved through excellence in quality management; excellence in this case is a function of effectiveness and efficiency. Quality management process is a superset having independent variables (PQM, SM, EM, and C) that are further affected by other subdivisions. This research assess the effects of QMP on specific road construction projects undertaken by Senan construction company's 4 road construction projects (Ashewa meda – Urga Building Internal Asphalt Road Project, Assosa – Dilti Road Project, Eliya – Makuye Road Project and Bole – Arabsa Road Project) by measuring the correlation of variables towards affecting the quality outcome of the project objectives set by all stakeholders. Relevant theoretical and empirical topics on variables are synthesized into a questionnaire, and Likert scale was used to evaluate answers of respondents. The questionnaire was delivered to 70 individuals that were part of the projects in concern, from which 55 responses where collected. After analyzing the responses, this research concludes that QMP is directly affected by PMQ, SM, EM and C. In addition it also found out that Senan Construction Company lacks a quality management model creating a gap in SM, EM and C. Employee's qualitative reply indicates that qualification and training is not given on project quality management directly affecting effectiveness and efficiency on quality outcomes. Communication amongst stakeholders about quality management is not formal, creating a gap between independent variables in executing Quality management on projects. This research recommends that Senan Construction Company should adopt a quality management model to better quality outcomes on future endeavors, training and qualification of employees, and communicate QMP amongst stakeholders in order to stay relevant and competitive in the ever growing construction industry.

Keywords: Quality management process (QMP), project quality management (PQM), stakeholder management (SM), employee management (EM), and communication (C)

Abbreviation and Acronyms

C	Communication
CPI	Consumer Price Index
CQI	Continuous Quality Improvement
DW	Durbin-Watson
EM	Employee Management
ERA	Ethiopian road authority
ISO	International Organization for Standardization
OLS	Ordinary Least Squares regression
PDPC	Process decision program charts
PMBOK	Project Management Body of Knowledge
PM	Project Management
PMI	Project Management Institute
PQM	Project Quality Management
PROME	Project Management and Engineering Consultants Limited
QA	Quality Assurance
QC	Quality control
QM	Quality Management
QMP	Quality Management Process
QMS	Quality Management System
QP	Quality Policy
QS	Quality System
SPSS	Statistical Package for Social Science
SM	Stakeholder Management
SMART	Specific, Measurable, Attainable, Realistic and Timely
TQM	Total Quality Management
UK	United Kingdom
VIF	Variance Inflation Factor
WBS	Work Breakdown Structure

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The construction industry is a multifaceted sector that encompasses various tasks, such as designing, organizing, and executing construction projects. It also involves the management of workers, tools, and job sites, with the aim of developing, maintaining, and repairing infrastructure, buildings, and other structures. This industry plays a vital role in shaping our environment and society, and requires a diverse range of skills and expertise to be successful.

Its complex nature demands constant innovation, problem-solving, and collaboration to meet the evolving needs of communities. The challenge lies in constructing roads that are resilient against heavy traffic, inclement weather, and other environmental factors. It's truly an impressive endeavor that requires a great deal of expertise and resources. Road construction quality management is a set of techniques and procedures that make sure our roads are built to high standards (excellence). When we have an efficient and effective quality management system in place, it means that our roads perform safely and reliably.

This translates to a more enjoyable driving experience for everyone, making our transportation system better overall. They guarantee that our roads are secure, resilient, and meet all the necessary standards for design, materials, construction and operation. These practices are basically just processes, and systems we use to ensure that the goods and services we provide align with the requirements and specifications set out for the project (project success) (Harris, F. and McCaffer, R., 2001).

Project Quality Management are the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements in order to meet stakeholders' objectives (project outcomes). Project Quality Management also supports continuous process improvement activities as undertaken on behalf of the performing organization (PMI, 2017).

According to (ISO 8402, 1994); QMS is described as: a system of the organizational structure, process, resources and procedure needed to implement quality management and that it involves the activities of the overall management function that determines the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality

assurance and quality improvement. An efficient and successful completion of road project depends upon many factors. Such as Planning, site condition, resource (material, manpower and fund) availability, natural catastrophe etc. but not limited. Therefore, measurement of quality in an integrated form is necessary to evaluate the performance of any project (Nigam, N , Rahangdale,K., 2020).Total Quality Management (TQM) is 'the way of life' of an organization committed to customer satisfaction through continuous improvement. This way of life varies from organization to organization and from one country to another but has certain essential principles which can be implemented to secure greater market share, increase profits and reduce cost (Kanji Gopal, 1990).

TQM is achieved through an integrated effort among social units (personnel at all levels) to increase customer satisfaction by continuously improving performance. TQM focuses on process improvement, stakeholder involvement, and qualification and training in an effort to achieve customer satisfaction, cost effectiveness, and defect-free work. TQM provides a suitable work conditions for innovation and trends for technology advancement (Arditi, D., & Gunaydin, H. M., 1997).

Total Quality Management (TQM) is one of the approaches that contribute towards ensuring that projects are being delivered to the stakeholder requirements (Gherbal, N. , Shibani,A. , Saidani,M. & Sagoo,A., 2021).

A QMP is a formalized system that documents process, procedure and responsibility for achieving quality policies and objectives (ISO 9001, 2015) .

By utilizing quality management practices (QMP), we can guarantee that the roads adhere to necessary standards and regulations, providing a dependable and secure transportation system for all. Poor quality construction can lead to accidents, car damage, and higher maintenance costs.

That's why it's crucial to follow quality management practices to ensure that roads are built up to the necessary standards and requirements, so that people can rely on them for safe and dependable transportation. Significant improvements in technology, materials, and tools for building roads have been made in recent years. These developments have made it feasible to build roads more quickly, more effectively, and more affordably. However, in order to prevent the end product's quality from being compromised, these developments also necessitate modifications in quality management practices.

A paper work prepared by Rahel Dinku on project quality management has shown that there is higher focus on project planning process but not to project quality assurance and project quality management also communication is smooth between project team about project quality but not between section and customer which was the highly required one (Dinku, 2017).Other research by Dereje Bitew on project quality management in Addis Ababa has revealed that there are a lot of challenges related to insufficient management support, problems with contractors, unrealistic deadlines, and lack of management policy and strategy (Bitew, 2019).Construction companies use various methods, procedures, and systems to guarantee that the roads they build are of high quality. But the evaluation of these practices is crucial to identify areas where improvements can be made for future road building projects. So, let's discuss on assessing the effect of quality management practices on road construction projects and the standards that Senan Construction Company strives to meet. It explores the various techniques, procedures, and tools that the company uses. We thus conducts this research on this subject in this study to better understand the significance of quality management practices on the road construction sector and how it can be used to raise the general quality of construction projects.

1.2 Statement of the problem

Road Construction is one of the major critical infrastructures in a country where it can limit its development or let the country move forward. Therefore this road construction needs to use the appropriate method of quality management practice so that these roads are safe, durable and meet the specifications and standard however there is a major concern in the quality of the roads being constructed in Ethiopia which are the cause of accidents, damages to vehicles and unplanned maintenance cost.

Manage Quality is the process of translating the quality management plan into executable quality activities that incorporate the organization’s quality policies into the project. The key benefits of this process are that it increases the probability of meeting the quality objectives as well as identifying ineffective processes and causes of poor quality. Manage Quality uses the data and results from the control quality process to reflect the overall quality status of the project to the stakeholders (PMI, 2017).

(Arditi, D., & Gunaydin, H. M., 1997) , has discussed that there is great potential for quality improvement in the construction industry. In today's competitive world, the term 'quality' and its

concepts are vital for the construction industry. There is not much time or resources to waste. Reworks and delays are not acceptable. As in the manufacturing industries, the construction industry should focus on process quality. Due to poor road infrastructure, Ethiopia faces challenges on the way to eradicating poverty (Adiam, 2016).

As (Love, P.E. & Li,H., 2000)lack of attention to quality in construction can bring quality failures that have become endemic features of the construction process. From the perspective of any construction project: Quality Assurance and Quality Control are highly important aspects of any engineering or construction project without which successful completion of the project can‘t be imagined however, only involving them does not bring any good but proper use of them does not only results in a sound project but also leads to more economy utilizing optimization (Bhattacharjee, 2018) .

1.3Basic Research Questions

1. What are the problems encountered while the implementation of quality management practices during road construction projects and how can these problems be addressed?
2. Are the employees of Senan Construction Company trained in quality management practices?
3. What is the communication in the project team on quality management practices in Senan Construction Company?
4. What is the current stakeholder management in quality management process?

1.4 Objectives of the study

1.4.1 General objectives

This research aims to investigate the effect of quality management practices on road construction projects in Senan Construction Company.

The company’s methodology of Quality management practices is assessed to check what directly and indirectly impacts the quality management outcomes on road constructions. Certain projects were picked to evaluate the Quality Management Practices.

1.4.2 Specific objectives

At the end of the study, the researcher aims to: -

- Determine the problems encountered during the current quality management practice in road construction projects by Senan Construction Company,
- Assess employees of Senan Construction Company for qualification in quality management practices,
- Evaluate Project Quality Communication in Senan Construction Company on quality management implementation,
- . Determine the current stakeholder management in quality management process

1.5 Significance of the study

The main indicators for successful road projects are safe, durable and meet the specifications and standard to be guaranteed this has happened quality is the major indicator.

Whereas previous studies indicates there is an issue related to quality management practices and fulfilling quality criteria's. It is the belief of the researcher that the paper will give better guideline to Senan Construction Company on Project Quality Management Practices and fill the gap in the current quality management practices in road construction projects and provide a recommendation for improvement. On the other hand, the paper will be used as a reference for further studies and can also be used as a comparison with past and future studies.

1.6 Scope

This research is bound to the effect of quality management practices on road construction projects undertaken by Senan Construction Company. While road construction will be examined in this study, quality management practices, including its process, tools, and techniques, will be the sole and primary focus. This study is limited on four specific projects:-Ashewa meda – Urga Building Internal Asphalt Road Project (Ashewa Meda),Assosa – Dilti Road Project (Assosa), Eliya – Makuye Road Project (Gambella) and Bole – Arabsa Road Project(Addis Ababa).

1.7 Organization of the study

This study consists of five chapters. Chapter one covers background of the study, problem statement, research questions, objectives of the research, Significance of the Study, scope of the study and limitations of the study. Chapter two includes literature review from secondary sources of data (Theoretical Framework) and Conceptual framework. Chapter three covers

research methodology by discussing the research design, research approach, types of data and source of data. Chapter four includes data collection research findings, data presentation and data analysis. Chapter five covers conclusions and recommendations based on the results obtained and analyzed in the previous chapters.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Introduction

This section of the research aims to review related literature on the effect of Quality Management practices on road construction projects. The definition of standards and theoretical aspects of QMP will be reviewed; in addition, an empirical review of similar research will be assessed to form a conceptual framework for the research. The conceptual framework will focus on distinguishing areas of concern (predictors) based on their degree of influence on QMP (dependent variable).

2.2 Theoretical review

2.2.1 Management and Quality Management

Management assures that the (technically divided) operations of specific individuals remain a part of a unified process, for achieving the objectives of the business. (Lipovec, 1987)

2.2.1.1Management process:

The management process consists of planning and controlling the business at all social-unit levels. At an individual level, there are three processes: Planning the Organization, actuating the organization, and controlling the organization through which rational achievement of a social unit's goal(s) should be achieved. (Rozman,R. ,Sitar,A. S., 2007) (Tomazevic, 2010)

2.2.1.1.1 Project Management

Project management, according to Oberlender, is the art and science of combining people, equipment, materials, money, and schedules to finish a specific project on schedule and within the allotted budget (Oberlender, 2000). This effect of combining resources should involve relevant stakeholders by using PCM.

2.2.1.1.2 Project Communication Management (PCM)

PCM is a set of processes that enables data to be sent, received, and understood by relevant stakeholders. (Adobe, 2022)

2.2.1.1.3 Project Stakeholders

Project stakeholders are individuals and companies that actively participate in the project and their necessity might be positively or negatively impacted by the project's execution or its completion, according to the Project Management Institute (PMI, 2016). Stakeholder management processes must include the identification of the individuals, teams, and companies that might have an impact on or influence the project.

Another step is the analysis of stakeholder expectations and their implications for the project. The development of appropriate management strategies is the third phase for successfully incorporating stakeholders in project decision-making and execution. In addition to recognizing stakeholders' requirements and expectations, stakeholder management places a high priority on responding to issues as they arise, resolving conflicts of interest, and promoting proper stakeholder participation in project decisions and activities. Stakeholder satisfaction needs to be handled as a primary project goal. (PMI, 2016)

2.2.1.1.4 Quality Management (QM)

QM assures the satisfaction of the end user, for whom the system is composed. Quality outcomes are those that balance the performance objectives of the present with relevance to the future. (Hart, 2007)

2.2.1.2 Quality

According to Shah,Pitroda and Patel quality can be defined as the sign of human civilization and the process of human civilization, Quality control has an outstanding role in the construction industry. (Shah, K., Pitroda J., & Patel,N., 2012).

The entirety of products or service's features and qualities that have an impact on its capacity to meet explicit or implicit needs constitutes the ISO 9000 definition of quality. Wysocki also distinguished two sorts of quality as elements of any project. The first is product quality, which alludes to the caliber of the project's output. Process quality or the standard of the project management process in general, is the second of the eleven types of quality. (K.Wysocki, 2003)

2.2.1.2.1 Modern Quality Management Practices

The fundamental direction for promoting quality management development in the current market is toward the development of a system based on the concepts of total quality management. (IEEE Conference on Quality Management, 2016)

Quality, safety, and environmental management are frequently considered subsets of risk management. As such, these factors address more than the technical specifications of a project. It is frequently overlooked that the construction contract itself is a quality, safety, and environmental management system standard. A specialized management system to address the unique characteristics of a specific construction project is frequently required. (PMI, 2016)

2.2.2 Project and Project Management

2.2.2.1 Project

A project is a brief undertaking started with the intention of producing a special good, service, or outcome. Projects' transient character suggests that they have a clear beginning and end. The project's end happens when its goals have been met when it is abandoned because its goals won't or can't be realized, or when there is no longer a need for it. The client (customer, sponsor, or champion) may also decide to end a project if they so choose. Temporarily does not always imply that a project will be completed quickly. It speaks to the commitment to and endurance of the endeavor (PMI, 2017).

Additionally, one of the most widely accepted definitions of a project is that it is a series of distinctive, complicated, and interconnected operations with a single objective that must be finished on schedule, on budget, and in accordance with specifications (K.Wysocki, 2014).

2.2.2.1.1 Construction Projects

All projects have limited time, quality, and resources and are scheduled for a certain plan in terms of time, cost, and resources, (PMI, 2021). In the interim, the schedule operates as the project's blueprint by outlining exactly what the initiative will achieve and defining its beginning, middle, and end. A number of processes are involved in the construction business, according to Shooshtarian S., Warmerdam A., and Lingard H. These processes include installation and maintenance, of existing structures; additions and adjustments to existing structures; demolition or wrecking of existing buildings or structures; and site preparation operations. (Shooshtarian, S., Warmerdam , A. & Lingard,H., 2017)

2.2.2.1.2 Construction Project Management

Construction project management became a distinct and well-defined subject in the United States as a result of the enormous increase in construction projects throughout the 1940s and 1950s. Due

to its emphasis on the manufacturing industry at the time, business project management had a solid foundation. The distinctiveness of every construction project, as opposed to the repetitiveness of manufactured goods, was the primary driver for the change in construction project management.

Furthermore, the lack of a single point of authority and control necessitated the use of construction project management in order to forecast performance under unfamiliar circumstances due to the following factors: planning for a workforce with unknown skills, using a management team assembled specifically for one project, relying on material suppliers and subcontractors with unknown reliability, working for owner's representatives with unknown rigidity, and more (Syal, 2011)

2.2.3 Project Quality Management

As a method of management, quality management is described as a "set of mutually reinforcing principles, each of which is supported by a set of practices and techniques." (Dean, J.W. and Bowen, D.E., 1994), it has shown discriminant validity in relation to other organizational performance improvement strategies (Hackman, J.R & Wademan, R., 1995)

In order for the project to fulfill the aligned objectives, project quality management has to follow the processes and activities of the company undertaking, which establish quality policies, objectives, and responsibilities. When necessary, it also supports ongoing efforts to improve the performing organization's processes. The goal of project quality management is to make sure that all project requirements, including product requirements, are satisfied. (PMI, 2016)

Plan quality management is the process of determining the quality standards and/or requirements for the project and its deliverables and describing how the project will prove compliance with these standards.

Perform quality assurance to guarantee that the proper quality standards and operational definitions are being applied. Do quality assurance, which is the process of reviewing the quality requirements and the outcomes from quality control measurements.

Controlling quality is the practice of keeping track of and recording the outcomes of quality operations to evaluate performance and suggest necessary adjustments.

2.2.3.1 Project Quality Management in Construction

Utilizing quality planning, quality assurance, and quality control policies, procedures, and processes, the performing organization implements the quality management processes and engages in ongoing project improvement activities. (PMI, 2016)

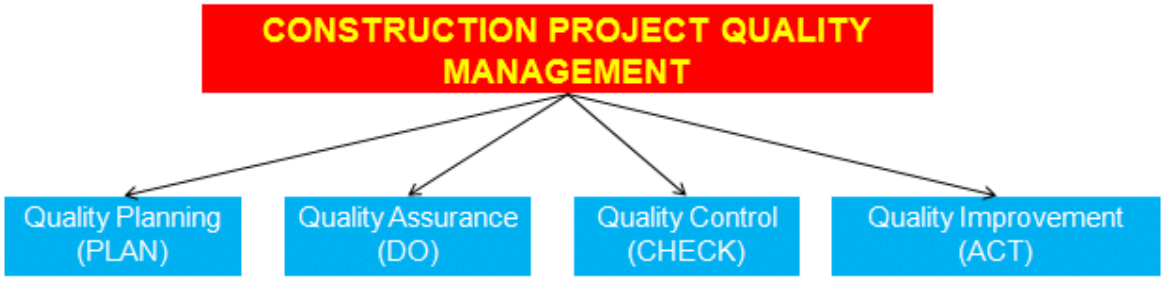

Figure 1: Approaches to conformance in Quality Management (Dissanayaka, 2001)

Li Hon claims that in order to strengthen project management, the principle must be elaborated in practice.

In order to ensure the health and sustainable development of construction enterprises, project management contents are introduced, along with management methods and objectives, including schedule control, quality control, cost control, and other aspects.

2.2.3.2 Quality Management Model

Care for all stakeholders must be incorporated into each phase of the management process if a social unit is to create a basis for excellence. Excellence can be understood as a function of both efficiency and effectiveness. Efficiency can therefore be assured through planning the organization, actuating the organization, and controlling the organization. The proposed management model for road network construction companies is based on a management process with five phases. (Esat Gashi, 2020)

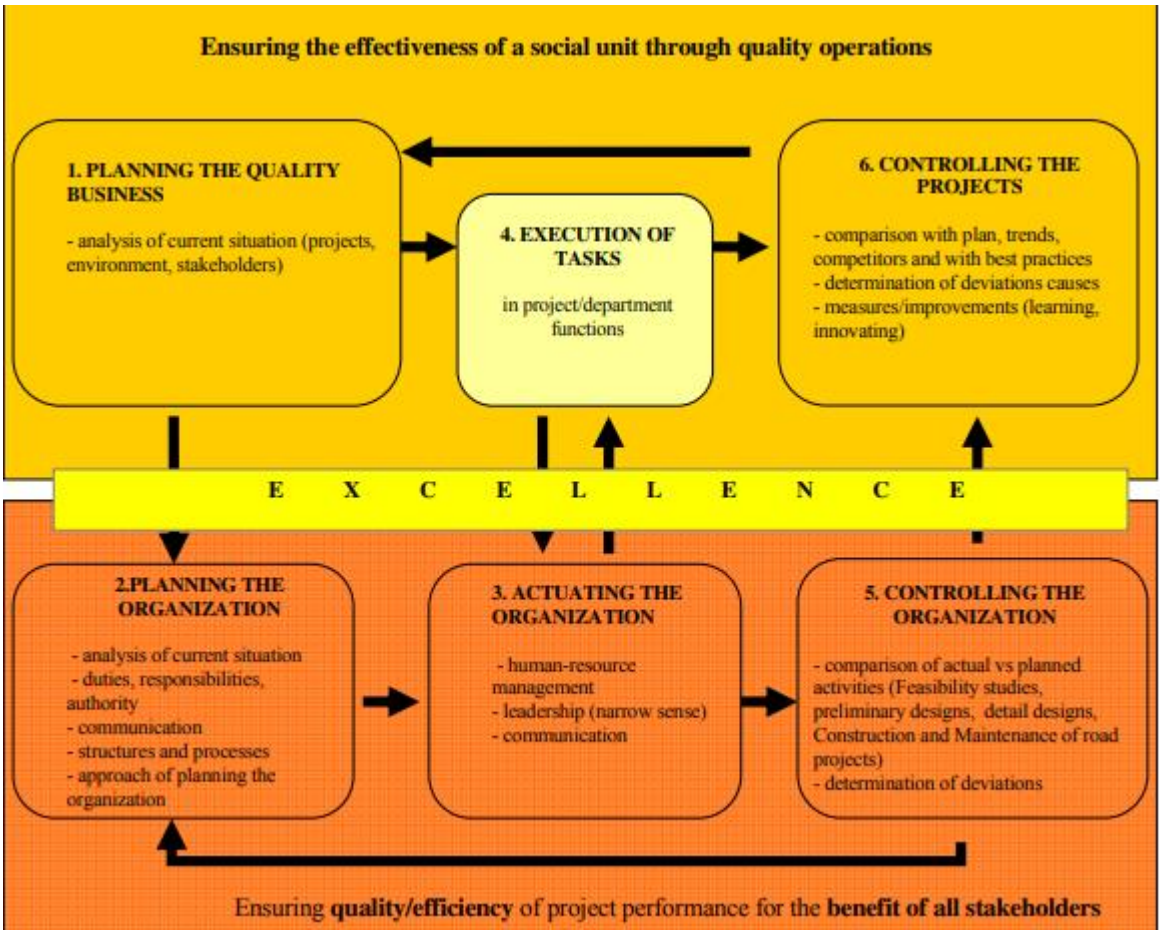

Figure 2: The quality management model for road construction companies. (Esat Gashi, 2020)

2.2.3.3 Project Quality Management Processes

R. Orwig and L. Brennan claim that the convergence of PM and QM has been concentrated on using PM to imply a total quality management trend or on ensuring the quality of the project outputs. (Robert A.Orwig & Linda L, 2000)

By considering both disciplines in terms of the fundamental principles of customer focus, teamwork, and continuous improvement, it can be shown that by instituting a formal project management methodology and basic PM techniques, project-based organizations are fulfilling the principles of quality. Parallel to the other planning stages, quality planning should be done. For instance, adjustments to costs or schedules as well as a thorough risk analysis of the effects on

plans may be needed if changes are recommended to the deliverables in order to fulfill the stated quality requirements.

The methods for quality planning that are covered here are those that are applied to projects the most. There are others that might be relevant for particular projects or application areas. The PQM processes are:

Plan Quality Management is the procedure for determining the project's quality objectives and determining how the project will show compliance with those criteria and/or standards.

Managing quality is the process of transforming quality management plans into applicable quality activities that incorporate the organization's quality policies into the project.

Control Quality is the process of monitoring the results of executing the quality management activities to assess procedures and ensure the project outputs are complete, correct, and meet customer expectations

2.2.3.3.1 Project Quality Management Planning

Research by I. Othman, N. Shafiq, and M. Nuruddin reveals the most crucial aspects of quality planning for construction projects are experiment design, inspection, and quality audit. The project charter includes a high-level description of the project and a list of product attributes.

It also includes the project-approved objectives, quantifiable project objectives, and pertinent success factors that will impact the project's quality management. A project management plan component contains the list below, but it is not limited to the:

1. Requirements management plan:-it provides the line for identifying, analyzing, and managing the requirements that the quality management plan and quality metrics will reference
2. Risk management plan:-This provides the framework for identifying, analyzing, and monitoring risks. Together, the data from the quality management plan and the risk management plan enable successful project and product delivery.
3. Stakeholder engagement plan: - provides the methodology for documenting the stakeholders' requirements and expectations that provide the foundation for quality management.
4. Scope baseline:-The WBS along with the outcomes documented in the project scope statement are considered while determining which quality standards and objectives are suitable for the project and which project deliverables and processes will be subjected to quality review. The deliverables' acceptance requirements are listed in the scope statement. The project's expenses may drastically increase or decrease depending on how the acceptance criteria are defined in terms of

quality costs. Satisfying all acceptance criteria implies the requirements of the stakeholders have been met (PMI, 2016)

2.2.3.3.1.1 Contract Requirements

Contract requirements include any and all requirements specified in the project contract documents (e.g., specifications, regulations, legislation, and standards [technical or legislative]). As M. Ferreira, J. Rogerson, the current tendency for clients to step back from detailed involvement in projects and reduce their in-house construction engineering resources will not necessarily minimize quality risks, even in turnkey contracts. Permits obtained by the buying organization also become part of the contract.

The project management team should consider area-specific standards, specifications, or regulations, including those arising from local, regional, and national regulatory agencies, that will affect the project. Specifications, regulations, legislation, and standards generally refer to either:

• Performance and acceptance criteria that pertain to the product(s) of the project, or

• Workmanship criteria or how work is to be undertaken (PMI, 2016)

2.2.3.3.1.2 Project Stakeholder Requirements

Initiating the list of stakeholders will, to some extent, depend on the location of the site since construction projects are carried out in clearly defined geographic locations. The owner, the contractor, or another stakeholder will invite additional stakeholders to participate in the project. Therefore, adding particular categories to its stakeholder register may be advantageous for the project management team. For instance, depending on their level of involvement in the project's execution, project stakeholders in the construction industry can generally be divided into direct and indirect categories. (PMBOK, 2016)

2.2.3.3.1.3 Quality Policy

The quality management policy also includes the degree to which the performing organization’s management is committed to quality and continuous improvement. The quality management policy of the organization includes quality assurance and quality control. (PMBOK, 2016)

2.2.3.3.2 Quality Assurance

The concept of quality assurance described by A. Chan has arisen to ensure that customer demands and a level of quality and conformance are met. Quality assurance is provided through the implementation of systemic management techniques that ensure control of the activities carried

out by each party. Examining the quality requirements and the results of quality control measurements is the process of performing quality assurance, which verifies that the appropriate operational definitions and quality standards are being followed. This procedure's main advantage is that it makes it easier to enhance quality control procedures.

2.2.3.3.2.1 Tools and techniques used in project quality assurance

2.2.3.3.2.1.1 Quality Management and Control Tools

The Plan Quality Management and Control Quality processes' instruments and methods are applied in the Perform Quality Assurance process.

2.2.3.3.2.1.2 Outputs of project quality assurance process

Change Requests

Project Management

Project Documents Updates

Organizational Process Assets Updates

Quality Outcomes and Metrics

Project Requirements Review

Quality Management Plan

2.2.3.3.2.1.3 Project Quality Management Executing

In construction projects, executing quality management involves the use of metrics and processes defined in the quality management plan to assure quality is being executed as planned. The project quality management plan provides inputs to the quality assurance process. (PMBOK, 2016)

2.2.3.3.2.2 Quality Audits

In their research, M. Rajendran, S. Devadasan found that quality audits are not only meant for checking the systems for their compliance with quality system standards, but they can also be used for exercising CQI and reaching benchmarks of TQM. An organized, independent process called a quality audit is used to check whether project activities adhere to organizational and project policies, processes, and procedures.

2.2.3.3.2.3 Quality Management Reviews

Quality management reviews, which are executed by the performing organization. provide an assessment and evaluation of the effectiveness and suitability of the project management system as a whole or in part. The results of quality management reviews are used to effect changes and

improvements to those elements of the project management system that are not performing satisfactorily (PMBOK, 2016).

2.2.3.3.3 Project Quality Control

In his research, Huang Yi-cheng wrote that as far as construction quality is concerned, there are breaches of construction procedure, errors in prospective design, faults in construction management, and the use of faulty raw materials and the natural environment. In addition, five factors, including people, materials, machines, methods, and the environment, will also affect construction quality control. To ensure construction quality, it is essential to establish a quality target responsibility system, exercise strict control over the market access system, purchase and use engineering materials, process quality, enhance staff's qualities, and adhere to scientific and reasonable construction methods. Controlling quality is the process of keeping track of and recording the outcomes of carrying out quality activities to evaluate performance and suggest necessary adjustments.

2.2.4 Factors Affecting Quality Management Practices In Construction Projects

By locating and removing the causes of subpar project performance, quality can be ensured (Lepartobiko, 2012). Making engineers comprehend and accept the system is the most challenging part of implementing ISO 9001 in engineering consultancies in Hong Kong, according to Tang and Kam (1999). This is followed by a lack of strong management backing and ineffective communication.

According to Abdul-Rahman (1996), there are a number of issues with the way quality management is being implemented in the UK, including the fact that QA and QM are not being used to their full potential, top management and workers on the job sites have different levels of commitment, and quality management is only being used during the construction phase.

According to Birhanu, the root causes of quality issues that contributed to poor quality management practices in Ethiopia are leadership issues, a lack of policy and strategy, ineffective resource management, ineffective process management, a lack of customer focus, and poor business performance (Birhanu, 2014).

2.2.4.1 Dos and Don’ts for Quality

Do	Don’t

Do ensure compliance with the ERACode of Professional Conduct and Ethics for both individuals and organizations.	Do not think that the ERA Code of Professional Conduct and Ethics only applies to Consultants and Contractors. It also applies to ERA staff.
Do use the standard TORs as the basisfor each new project.	Do not copy and paste from old documents in the preparation of newproject TORs.
Do use the standard report formats inthe ERA Quality Manual as the basis for every new project report (*procurement evaluation, feasibility studies, design, EIA, RAP, progress, status, completion etc.)* and standard procedures, forms, checklists. Do copy and paste relevant parts fromthe Word files of the ERA Quality Manual, and revise these for the particular project.	Do not copy and paste from previousproject reports in the preparation of new project reports.
Do think of the ERA Quality Manual asan ERA system, and take ownership.	Never think of the manual as a Consultant (WSP) manual.
Do consider this as the start of a system that will need feedback for the continual development.	
These recommendations apply equally to staff from ERA and Service Providers.	

Table 1: Dos and Don'ts for Quality

2.2 Empherical Review

A study conducted by Aleper was analyzing factors affecting total quality management in the road construction sector in Uganda where it has analyzed that the road objective were SMART but objective didn't hit well where quality standards are not fulfilled and specifications were ignored

and inspections delayed in this study both quantitative and qualitative approaches were used and finally the researcher suggested that technical staff should adhere to more stipulated and specified standards, accounting officer should be legally held accountable, review complex goal and objectives, set up an independent quality assurance, political influence be limited, conduct a short term technical job evaluation exercise, road funding sources and contract employment terms be reviewed (ALEPER, 2015).

(AHUMUZA, 2016)studied the effect of Quality Management System (QMS) based on ISO 9001 and service delivery in the road sector, a case of Project Management and Engineering Consultants Limited (PROME) in Uganda results indicate that in order for an organization to successfully implement quality management system, the top management must create, share and sustain quality management targets and values.

(Stephen Nyakala, Andre Vermeulen, Jan-Harm Pretorius and Thomas Munyai, 2017) in their study undertaken implementation of quality assurance practices and effectiveness of road construction industry in South Africa reporting using quantitative research methods. The findings show that there is a need for road authorities to ensure that rural road networks are well-constructed and that proper quality management systems are taken into consideration.

(Agbenyega, 2014),investigated quality management practices of building construction firms in Ghana the study has come to indicate the following as measures for effective quality management practices, namely: Management Commitment, Communication between Managers and Employees, Employee Involvement, Detailed and Logical Work Program, Regular Inspection and Audit of Quality Report, Training and Education of Team Members and Review/Analysis.

The quality management practices and major quality management challenges in road construction projects focused on AACRA studied by Dereje has discovered AACRA does not use all stages of quality management process, tools and techniques they use only Inspection are found to be the major quality management tools and techniques used to control quality of project. Therefore the researcher has brought some major recommendations to AACRA to have separate quality management policy in order to undertake complete project quality management process, enhance management involvement, capacity building on project management skills for successful implementation of road construction. (Bitew, 2019)

According to Birhanu in his study of quality management and engineering practice and challenges in Ethiopia states this major problems lack of effective supervision, communication, management

of commitment, proper equipment's and materials available for use, quality assurance team lead the process, staff turnover, skilled turnover, Inefficient resource management and problems with contractors and identified the following solutions : all quality promoters in the country first and foremost should strive to create a pool of consultants at national level to be emulated at the industrial level. (Birhanu, 2011)

2.3. Conceptual framework

A conceptual framework is a textual or visual depiction of an anticipated relationship between variables, which are just the traits or features the paper seeks to investigate.

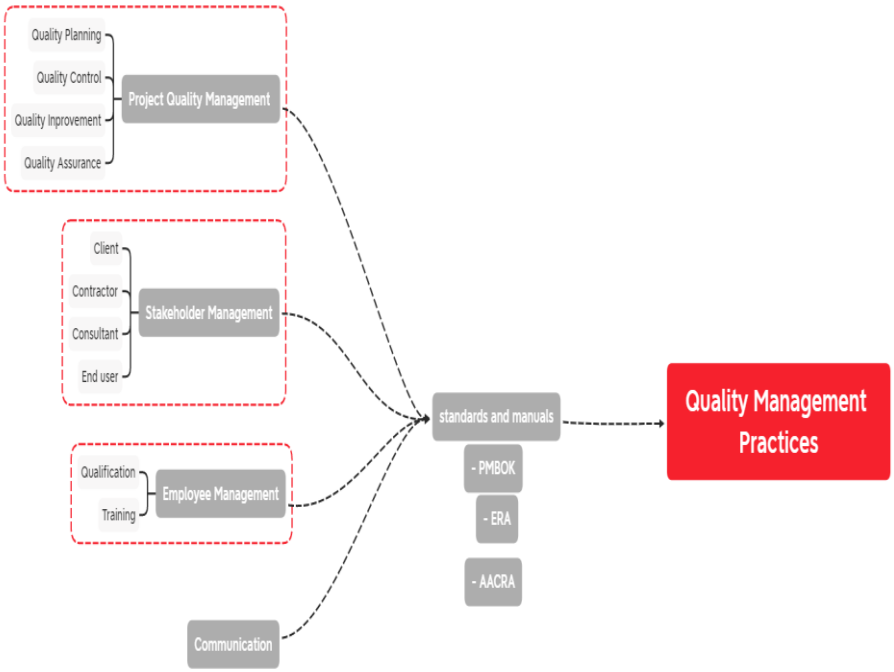

Figure 3: Conceptual framework

This research goal is to evaluate the effect of quality management process used in road construction. Therefore, QMP is the dependent variables while PQM, SM, EM, C are the independent variables or predictors of the effect.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter provides an insight into the various methods and the procedures that will be adopted in conducting the study. This chapter contains the research approach, the research design, population and sample, sources of data, data collection tools, data analysis methods, data presentation, validation and finally, the ethical consideration.

3.2. Research approach and design

3.2.1 Research approach

For the purpose of this research, both qualitative and quantitative research approaches have been used in combination. A quantitative method was selected because it is viewed as effective for gathering large amounts of data and comprehensive issues over a specified period. While the qualitative method was selected based on the assumption that it enables the researcher to generate meanings and phenomena within the real context of the research participants and to fill the gap left by the quantitative one (Kothari, 2004), Hence, the mentioned approaches are considered appropriate in order to answer the research questions that the proposed study intends to answer.

3.2.2 Research Design

The purpose of this study is to assess the quality management practices in road construction at Senan Construction Company. It assesses how quality management practices are being applied in the company based on the responses and determines the relationships between such factors. This enables us to fulfill the research of why or how the road construction project is affected and try to answer the different variables affecting the quality of the road project. (Kumar, 2011), asserts that the research design is a key master plan for various projects and case studies. Each research project implements or uses a research design to ensure that the studies are accurate, valid, and certain.

To assess the company's quality management practices, a descriptive and explanatory approach has been used. (Creswell, J. W., & Plano Clark, V. L., 2011)stated that the descriptive survey method is a method of investigation that attempts to describe and interpret what exists at present

in the form of conditions, practices, processes, trends, effects, attitudes, beliefs, etc. (Creswell, J. W., & Plano Clark, V. L., 2011).Explanatory research helps to connect ideas and understand cause and effect, meaning researchers want to explain what is going on. This type of research aims, for instance, at explaining social relations or events, linking factors and elements of issues to general statements, and building, testing, or revising a theory (Pallant, 2005).

3.3 Sampling Design

3.3.1. Target population

It is common knowledge that every stakeholder in a project contributes to the success of the project, but because of time constraints and the need for focus, I have selected a specific demographic. There are a total of 380 involved individuals working on these four projects, which are the Ashewa Meda-Urga road construction projects, the Eliya-Makuye Design Base Road project, the Assosa-Diletui Road project, and the Bole-Arabsa road project. This number includes everyone involved in the project, from top managers to daily laborers.

3.3.2. Sample and sample size

Purposive sampling approach has been employed as the sample technique, and it will be used by the aforementioned projects' quality management-related experts. In order to make it easier to manage, 70 samples were approached from the total of 380 employees. The target demographics of the various road building project participants have primarily come from the contractor side; however, other stakeholders are not left out.

3.3.3. Data Collection Procedures

To have qualified and organized data, I have used both qualitative and quantitative methods. This research has used both primary and secondary data sources to collect data. Primary data can be collected through observation, interviews, or the use of questionnaires (Saunders, M., Lewis, P., & Thornhill, A., 2012).Primary data have been gathered from the target population through a structured questionnaire. Secondary data that has been gathered from different sources includes annual reports and organizational profiles of focused organizations, different books and related research, journals, and articles from internet websites and magazines.

3.4. Measurement of Variables

Based on the theoretical and empirical study this research has determined variables that have an effect on the quality management practices of road construction projects. The variables are divided into two categories, namely independent variables (values that are not affected by other variables) and dependent variables (determined and affected by other variables). This variables help in determining factors that are correlated to the main focus (QMP) of this research paper.

Dependent variables

The purpose of these variables is to identify the value of correlation generated in relation to our main objective. In chapter one the objective is described as assessing the effects of quality management practices (QMP) on road construction, according to the definition presented in the theoretical review QMP is a super set of project quality management(PQM), stakeholder management(SM), employee management(EM), and Communication(C). Hence, variables of this superset are what we measure QMP with.

These dependent variables are further classified with our independent variables.

Independent variables

These variables are what constitute our dependent variables; the assumption is that change in value of these variables affects the dependent variables. This assumption will be evaluated and checked of its validity in the next chapter.

PQM: The definition stated in chapter two explains what constitutes PQM; in the definition we can observe three major divisions. These divisions are what we will be assessing as independent variables affecting PQM.

Quality Planning, Quality Control and Quality Assurance are independent variables that are evaluated to measure the project quality management of quality management on road construction projects.

Client management, contractor management, consultant management, and end user management are independent variables that are evaluated to measure the stakeholder management of quality management on road construction projects.

Qualification and training of employees are independent variables that are evaluated to measure the employee management of quality management on road construction projects. It is crucial to understand the evaluation of employee management could result in redundancy of value because employees are included in stakeholder management, the reason EM is a dependent

variable is to assess the process in which qualification and training is given in regards to quality management.

Communication could also be in either category, the reason being that communication could be formal or informal. Formal communication will be evaluated as dependent variable while informal communication will be evaluated along-side other independent variables.

Measurements

Variables will be synthesized into question strings (descriptive or explanatory). These strings will then be used as questionnaire to collect data through a 5 point Likert scale. The value of the strings will be denoted as 1= Strongly Agree, 2= Agree, 3= Neutral, 4= Disagree, 5= strongly Disagree for positively connoted questions and reverse for negatively connoted questions.

3.5 Validity and Reliability

(Frankel, R. M., & Wallen, N. E., 1993) Defined validity as the appropriateness, significance, and applicability of the specific inferences that researchers draw from the data they gather. Through individually designed questions that were accepted by the advisor, this study addressed content validity. According to (Muganda, 1999)reliability refers to the extent to which a research instrument produced consistent results over multiple tests. The obtained replies for the distributed questionnaires were examined using a reliability test of Cronbach's Alpha using SPSS. The Cronbach's Alpha value evaluates the level of agreement of internal consistency of measures on a standardized scale from 0 to 1 where higher values indicate higher level of agreement between variables. The case processing summary shown in table 3 indicates the value of respondents have 100% validity while the reliability statistics indicates a Cronbach's Alpha value to be 0.915.

Case Processing Summary

		N	%
Cases	Valid	55	100.0
	Excluded[a]	0	.0
	Total	55	100.0

a. Listwise deletion based on all variables in the procedure.

Table 2: Case processing summary: \\survey SPSS result,2022

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.915	.934	5

Table 3: Reliability: Survey SPSS result, 2022

3.6 Method of Data Analysis

The analysis section of the study enabled the researcher to focus on the assessment on the effect of quality management practices on road construction projects done by Senan Construction Company. After employing a questionnaire to obtain the data, the information was thoroughly analyzed, findings where then interpreted to reach a reasonable conclusion. The demographic features of the respondents and there assessment of the dependent and independent variables were described using descriptive statistics, including frequency, percent, mean, and standard deviation. The Pearson correlation coefficient (r) was used to assess whether there was a relationship between the independent and dependent variables. Finally, tables with explanations were used to present the findings.

3.7 Ethical considerations

The necessary precaution has been taken to make the study ethical. Respondents were informed ahead about the purpose of the data they were providing. They were told that the information they provide via the questionnaire is going to be used only for the purpose of academic study and remain confidential. Their privacy and identity will be confidential. The researcher will stay truthful to responses of the respondents and will be free from any personal assessment.

CHAPTER FOUR: Data Presentation and Analysis

4.1 Introduction

The analysis, interpretation and presentation of data are all covered in this chapter. Self-administered questionnaires that were given to the project's stakeholders focusing primarily on staff members served as the basis for the study's analysis. Out of the 70 questionnaires that were sent in total, the researcher was able to gather 55 that were adequate for the study. Central tendency measures, frequency distribution, cumulative percentages, means, and standard deviations make up the descriptive analysis for the current study. Additionally, SPSS is utilized in conjunction with tabular explanations. Correlation analysis was employed in the second section to highlight the nature and direction of the relationship between the four independent variables with the dependent variable. In order to maintain the presentation's logical flow, the demographic data of the respondents is highlighted after the instrument reliability test, then descriptive statistics, correlation analysis, and regression are presented in that order.

4.2 Demographic Profile

According to the gender, age bracket, educational background, employment status, and years of experience of the respondents in this study, the researcher described the respondents' profiles. Here, respondents were asked to list their traits so that they may later be categorized and compared. A closed-ended questionnaire was used in the study to classify the respondent's profiles. Below are tables of respondent distribution frequency analysis, this distribution presents the focus group of the research. Area of focus for this study is presented to different stakeholders, amongst these stakeholder categories individuals and other social units that have been directly involved on the projects under assessment were high. Hence frequency of distribution based on age group, gender, educational level and job position show a relatively denser dispersion.

Distribution of Respondent by gender

The table 4.1 below indicates that the male (56.4%) and female (43.6%) participant stakeholders. In the project gender is almost balanced that means respondent would show if there is any problem encountered due to gender.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	24	43.6	43.6	43.6
	Male	31	56.4	56.4	100.0
	Total	55	100.0	100.0	

Table 4: Reliability: Survey SPSS result, 2022

Distribution of Respondent by age

Table 4.2 shows the seniority of respondents based on age, this data could indicate the level of experience stakeholders present in the project. Majority (50.9%) of the respondents are between 25-40 years, the others (38.2%) are between 31-40 years while the remaining 5.5% is divided equally amongst 18-24 and 41-50. The concentration of a certain age group could impact projects in terms of knowledge transferred in return impacting quality management.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24 years	3	5.5	5.5	5.5
	25-30 years	28	50.9	50.9	51.7
	31-40 years	21	38.2	38.2	95.0
	41-50 years	3	5.5	5.5	100.0
	Total	55	100.0	100.0	

Table 5: Respondents by age, Source: Survey SPSS result, 2022

Distribution of Respondents by Education Level

The result in table 4.3 indicates that graduates (58.2%) have more contribution on projects followed by Post graduates (36.4%), and undergraduates (5.5%). This data implies majority of respondents have the educational level to undertake major projects such as road construction.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Graduate	32	58.2	58.2	58.2
	Post graduate	20	36.4	36.4	94.5
	Undergraduate	3	5.5	5.5	100.0
	Total	55	100.0	100.0	

Table 6: Respondents by educational level, Source: Survey SPSS result, 2022

Distribution of Respondents by Job Position

As presented in Table 4.4 shows, the majority of respondents are engineers (40.0%) followed by other site workers covering around (10.9%), project managers (34.5%), supervisors (7.3%) and coordinators (7.3%). This could show the proportion on how the company allocates its human resource in sites.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Coordinator	4	7.3	7.3	7.3
	Engineer	22	40.0	40.0	47.3
	Other	6	10.9	10.9	58.2
	Project manager	19	34.5	34.5	92.7
	Supervisor	4	7.3	7.3	100.0
	Total	55	100.0	100.0	

Table 7: Respondents by position, Source: Survey SPSS result, 2022

Distribution of Respondent by Years of Experience

Table 4.5 shows the experience held amongst stakeholders, The majority(47.3%) of respondents have been in this line of work for 3-9 years followed by respondents that have experience for 9-12 years(23.6%),respondents with less than 3 years' experience(23.6%) and senior respondents with

experience exceeding 20 years(5.5%). This adjusts the concentration we saw in table 4.2 because knowledge sharing and human-human skill learning could be more attained by rationing experienced individuals to relatively amateur individuals on a desired outcome.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20+ years	3	5.5	5.5	5.5
	3-9 years	26	47.3	47.3	52.7
	9-12 years	13	23.6	23.6	76.4
	Less than 3 years	13	23.6	23.6	100.0
	Total	55	100.0	100.0	

Table 8: Respondents by years of experience, Source: Survey SPSS result, 2022

4.3. Descriptive Results and Analysis

Descriptive statistics were used to describe the study participants' responses. The findings and their interpretations are listed below. Table 9 describes number of responses assessed by the questionnaire. The descriptive statistics table breaks down sections of the questionnaire into their respective variables, then the mean value obtained from the survey will be determined along with the standard deviation. The mean value tells us where the average lies while the standard deviation indicates how scattered variables are from the mean.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
QMP	55	1.80	3.20	2.5091	.30017
PQM	55	2.00	3.00	2.3564	.28980
SM	55	2.20	2.80	2.4764	.15149
EM	55	2.40	3.60	2.6945	.31706
C	55	2.40	3.60	2.6436	.33265

Valid N (listwise)	55				

Table 9: descriptive statistics, Source: Survey SPSS result, 2022

4.4 Correlation Results and Analysis

The strength and direction of the relationship between two variables are displayed through correlation. Correlation coefficient (r), also known as Pearson product moment correlation, is a statistical indicator of a linear relationship between two variables. Person's "r" is mostly used to measure data at the interval or ratio level and is based on the standard deviation (Yabebal, 2017).To determine whether there is a statistically significant relationship between the independent factors and the dependent variable in this section of the study, correlation analysis was carried out. The coefficient of correlation can have values between -1 and +1, with the signs denoting the relationship's direction (Dancy, A., & Reidy, K. J. , 2004).

Correlations

		QMP	PQM	SM	EM	C
QMP	Pearson Correlation	1	.686**	.660**	.520**	.597**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	55	55	55	55	55
PQM	Pearson Correlation	.686**	1	.887**	.779**	.835**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	55	55	55	55	55
SM	Pearson Correlation	.660**	.887**	1	.741**	.800**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	55	55	55	55	55
EM	Pearson Correlation	.520**	.779**	.741**	1	.873**
	Sig. (2-tailed)	.000	.000	.000		.000

	N	55	55	55	55	55
C	Pearson Correlation	.597**	.835**	.800**	.873**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	55	55	55	55	55

**. Correlation is significant at the 0.01 level (2-tailed).

Table 10: correlation analysis, Source: Survey SPSS result, 2022

Pearson's correlation test has been used; the result is presented in table 10 above. The Pearson correlation coefficient for the variables indicate that purpose of project quality management, stakeholder management, Employee management, and Communication are significantly correlated to quality management practices. The direction of relationship depends on the connotation of the questions (*refer to measurements*) if the value of r is positive this implies that as the level of the independent variables increase so does the value of dependent variable value, while negative results indicate inverse relation amongst the dependent and independent variable. The strength of correlation is measured with a value range starting from -1 through 1, values that are above ±0.6 (highly correlated), between ±0.4-0.6 (moderate correlated), and ±0.3-0(poor correlation) All four independent variables correlation coefficient will be interpreted as follows. Purpose of project quality management r = 0.686 this value indicates high correlation of dependency with the dependent variable, suggesting how influential it for QMP; Stakeholder management r = 0.660 this value indicates the high degree of correlation with the dependent variables. Indicating the effect, it has on the on QMP; employee management r = 0.520 this value indicates moderate correlation with the dependent variable, Indicating high effect on QMP. Communication r = 0.597 this value shows moderate correlation with the dependent variables.

4.5 Diagnoses test

4.5.1. Linearity

The predicator variables in the regression have a straight-line relationship with the outcome variable. The mean of the disturbances must be zero, according to the assumption. Table 10 indicates p value to be linear (slope of linearity), according to the assumption linearity is achieved.

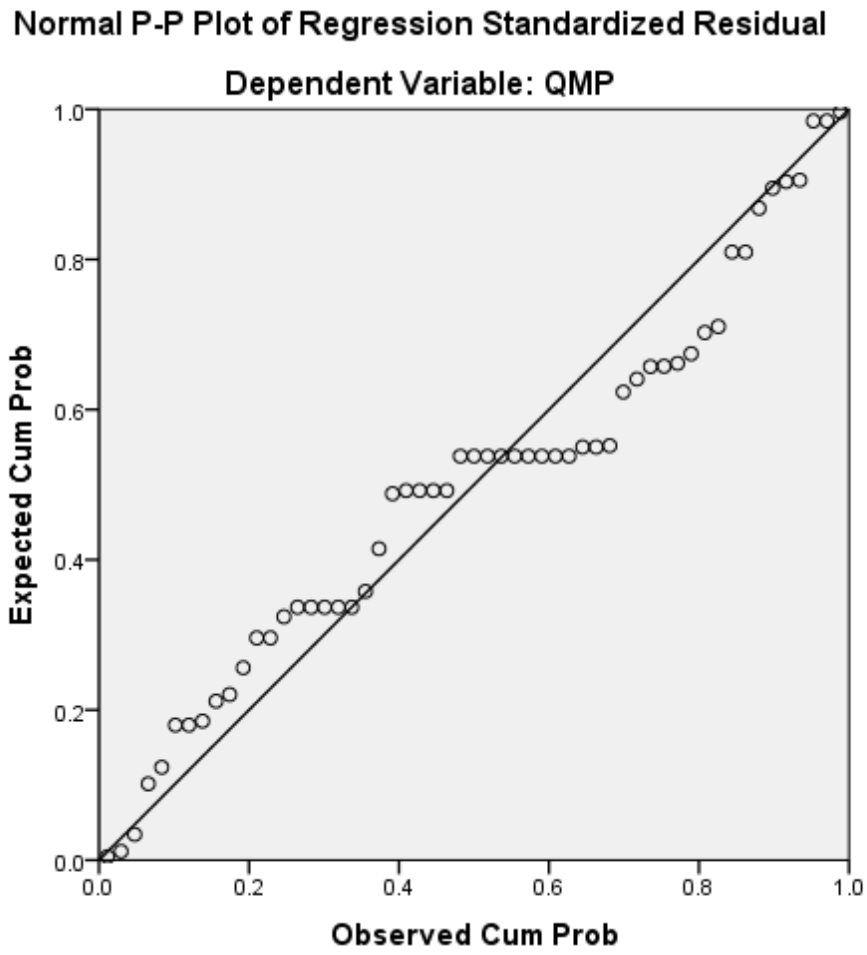

Figure 4: Linearity plot

4.5.2. Assumption of No Autocorrelation

It is assumed that there is a linear relationship between the research and the explanatory factors. Data autocorrelation results from the presence of log or exponential elements in the model, which raises doubts about the model's linearity. The linear regression model presupposes independent error terms. This indicates that one observation's error term is not affected by another observation's error term. A Durbin-Watson (DW) test statistic shows the degree of autocorrelation in a data set. DW value ranges from 0-4, where 0 denotes negative autocorrelation while 4 denotes positive autocorrelation. A DW value of 2 or close to 2 indicates that there is no autocorrelation in the residuals. As a result, the DW test was performed to ensure that the assumption was not violated. The outcome is shown in table 11 below. The result shows that the model's DW is 1.774, which is

relatively close to 2. As a result, the null hypothesis of no autocorrelation was not rejected, and the model did not violate the assumption.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.699[a]	.488	.448	.22311	1.774

a. Predictors: (Constant), C, SM, EM, PQM

b. Dependent Variable: QMP

Table 11: model summary, Source: Survey SPSS result, 2022

4.5.3. Multicollinearity Test

The predicator variables are highly correlated with each other, as shown in table 12

Using OLS (Ordinary Least Squares regression) estimation method, the assumption is that the predicator variables are not correlated with each another. The result in table 12 shows that the VIF for all of the variables is less than 10, indicating that there is no multicollinearity among independent variables them. The greater the Variance Inflation Factor (VIF) value, the more troublesome or collinear the variable X. If the VIF of a variable exceeds 10, that variable is said to be highly collinear (Gujarati, 2004).The independent variables' variance inflation factor (VIF) has been calculated.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.226	.658		.343	.733		

	PQM	.487	.256	.470	1.900	.063	.167	5.988
	SM	.474	.447	.239	1.060	.294	.201	4.973
	EM	-.140	.200	-.148	-.700	.487	.229	4.369
	C	.128	.220	.142	.584	.562	.172	5.802

a. Dependent Variable: QMP

Table 12: multicollinearity test model, Source: Survey SPSS result, 2022

4.5.4. Normality Assumption

The validity of the inference from the regression shown in table 13 the residuals of the regression have a normal distribution. Hence the number of respondents is less than 100 it is best to use the Shapiro Wilk method of normality test.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Project Quality Management	.446	55	.000	.588	55	.000
Stakeholder Management	.444	55	.000	.605	55	.000
Employee Management	.527	55	.000	.361	55	.000
Communication	.389	55	.000	.501	55	.000

a. Lilliefors Significance Correction

Table 13: test of normality, Source: Survey SPSS result, 2022

4.6 Regression Results and Analysis

4.6.1. The Chi-square Goodness-of -fit test

The Chi-square goodness of fit test is a statistical hypothesis test used to determine whether a variable is likely to come from a specified distribution or not. It is often used to evaluate whether sample data is representative of the full population. The correlation coefficient helps in determining the value of the test. It is a number between -1 and 1, inclusive, indicating the measure of linear association between two variables, and also shows whether the correlation is positive or negative

4.6.2. Homoscedasticity

Equal distribution of residuals or homogeneity of variances has resulted in the analysis indicating homoscedasticity. This test indicates that data residue is not indicating other values in regards to correlation of variables amongst each other.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.377	4	.594	11.936	.000[b]
	Residual	2.489	50	.050		
	Total	4.865	54			

a. Dependent Variable: QMP

b. Predictors: (Constant), C, SM, EM, PQM

Table 14: ANOVA

4.6.3. Discussion of Regression Results

As described in chapter 3.6 variables correlation has been tested to show the significance independent variables have on the dependent value. In this section, inference on QMP will be shown using the regression results of the analyzed data. The measures of association will be provided for each dependent variable to evaluate the effect on QMP. Partial correlation, coefficients of correlation (VIF), standard deviation from the mean and standard error coefficient will be interpreted and discussed.

Purpose of Project Quality Management

Project quality management has a value of r=.891 indicating high correlations on QMP. Table 15 suggests that improving PQM will directly affect QMP because partial correlation value (.686) is above 0.6. Table 12 shows the coefficients of correlation amongst data within the variable to be strong (VIF=5.988). While standard deviation is (.28980) from the mean (Table 9), showing strong relation with the dependent variable. The standard error coefficient of PQM (.256) shows low error from the constant std. error data.

Measures of Association

	R	R Squared	Eta	Eta Squared
QMP * PQM	.686	.470	.695	.484

Table 15: Regression results

Purpose of Stakeholder Management

Stakeholder management has a value of r= .660 indicating high correlation on QMP. This will be taken into account when inference of regression on QMP is calculated in the findings of this study. Table 12 shows the coefficients of correlation amongst data within the variable to be strong (VIF=4.973). While standard deviation is (.15149) from the mean (Table 9), showing strong relation with the dependent variable. The standard error coefficient of SM (.447) shows low error from the constant std. error data.

Measures of Association

	R	R Squared	Eta	Eta Squared
QMP * SM	.660	.436	.686	.470

Table 16: Purpose of Stakeholder Management: Source: Survey SPSS result, 2022

Purpose of Employee Management

Employee Management has a value of r=.520 indicating moderate correlation with QMP. This will be taken into account when inference of regression on QMP is calculated in the findings of this study. Table 12 shows the coefficients of correlation amongst data within the variable to be high (VIF=4.369). While standard deviation is (.31706) from the mean (Table 9), showing strong relation with the dependent variable. The standard error coefficient of EM (.200) shows low error from the constant std. error data.

Measures of Association

	R	R Squared	Eta	Eta Squared
QMP * EM	.520	.270	.525	.275

Table 17: Purpose of Employee Management: Source: Survey SPSS result, 2022

Purpose of Communication

Communication has a value of r=.597 indicating high correlation with QMP. This will be taken into account when inference of regression on QMP is calculated in the findings of this study. Table

12 shows the coefficients of correlation amongst data within the variable to be strong (VIF=5.802). While standard deviation is (.33265) from the mean (Table 9), showing strong relation with the dependent variable. The standard error coefficient of C (.220) shows low error from the constant std. error data.

Measures of Association

	R	R Squared	Eta	Eta Squared
QMP * C	.597	.356	.668	.446

Table 18: Purpose of Communication: Source: Survey SPSS result, 2022

4.7 Relation of Findings with Objectives

The analysis of answers for the questionnaire in relation to specific objectives will be discussed below. The questionnaire is sub divided into three sections concerned with demography, quantitative data on independent variables and qualitative data on dependent variables.

As stated on the specific objective (1.4.2) the following topics are the main questions raised in the the effects of quality management in road construction. Reducing problems encountered during quality management practices, employees qualification in quality management practices, Project Quality Communication, reducing problems encountered during the implementation of project quality management practices in Senan Construction Company.

Identifying and reducing problems encountered where asked direct short questions to identify relevant qualitative data. While Stakeholder engagement, Employee qualification and training, and communication where analyzed through quantitative questions to identify the mean statistics of respondents on raised topics. The degree of correlation amongst variables is presented in table 9. The relative effects of each variable are then regressed to determine homoscedasticity amongst collected data.

Chapter 5: Findings, Conclusions and recommendations

The chapter is divided into three sections: Finding summary, conclusion and research-based recommendations.

5.1. Finding summary

The main focus of the study is assessing the effects of QMP on road construction: in the case of Senan construction company. Theoretical and empirical definitions are organized to focus on certain areas that affect QMP. After defining and pinpointing focus areas, Primary data was collected using Likert scale questioners. Replies of the questionnaire are summarized in the study's descriptive results. According to the conceptual framework (figure:3) of this study the effect of QMP is dependent on four independent variables (PQM, SM, EM, and C). Each independent variable is assessed to focus on areas of concern that needed improvement. From the descriptive result (Table 9), respondents believe all of the above four variables are important and agreed that QMP has positive effects on project success. The effects results shown in Table 14 assesses deeper into: Quality assurance, Quality Improvement, Employee training and qualification, and communication and shows these areas have been lacking in Senan Construction Company. According to the study's correlation findings Table 10, the summary of the regression results showed that PQM had a highly positive impact on project quality management success. The overall structure of the questionnaire is in line with earlier studies format on quality management practices effects. Quality management practice success is positively impacted by the engagement function, which includes project quality management (r=0.686), stakeholder management (r=0.660), Employee management (r=0.520), and Communication(r=0.597). The findings above demonstrate a strong correlation between all aspects of quality management and project success.

5.2. Conclusion

The research's goal was to assess the effect of quality management practices on road construction. In order to understand the underlying principles and process of Quality management process, a theoretical review was conducted along with an empirical review to incorporate prior studies conducted in the specific concern of the study. Based on the literature review, a testable hypothesis was developed (Refer to the article), and a conceptual framework was created to check the effect of independent variables (figure 3) on assessing the effects they have on QMP and review the process and improve on the dependent variable of project success. The main objective of the study is to assess quality management processes that where undertaken by Senan Construction Company on four road construction projects. The research framework guide used a 5-point Likert scale to create a self-developed questionnaire having both positive and negative connation. Questions

where formulated to deeply assess each independent variable and its significance to the whole. The information was then gathered from 55 participants (78.57% response rate). The statistical analysis is then carried out using SPSS version 27. To describe the findings of the study variables (both dependent and independent), descriptive, correlation, and regression analysis were used. The four independent variables project quality management, stakeholder management, Employee management, and Communication have a strong correlation, according to the correlation results (see table 10). To test the null hypothesis and determine a causal link between independent and dependent variables a linear regression model was used to conduct regression analysis. Diagnostic tests were carried out to ensure that the study's model met the assumptions of a traditional linear regression model. Some of the independent variables (project quality management, stakeholder management) are positively connoted having a positive correlation while negatively connoted questions (Employee management and Communication) have a reverse correlation output (values may be negative due to a single Likert scale value coding for all variables), the correlation of variables has a significant effect on the project success, according to regression results. The study findings shows that quality management process of Senan Construction Company, appropriate measures should be put in place to adequately address stakeholder management and communication in road construction projects, as it plays a critical role in project quality success. Project quality management, Employee management, and Communication elements were essential to the project's success and assisted in bridging the enormous gap between expectations and values of quality attained by projects. Satisfaction of Stakeholders especially end users suggests the overall quality management of the company. Quality outcomes of projects, is balanced through the performance objectives of the present in correlation with needs and expectations of the future. A clear gap is created in Senan's QMP due to lack of quality management models. This research has been able to demonstrate a generic QM model test for assessing the current QMP at Senan Construction Company. In conclusion the QMP on road constructions at Senan Construction Company lack a well-defined model on Quality management.

5.3. Recommendation

According to the finding of this study the effects of QMP has a significant impact on the satisfaction on the end user. The driving factors for ensuring quality management on road constructions have been listed as follows project quality management, stakeholder management,

Employee management, and Communication this are divided into various factors as mentioned on the study's conceptual frame work. It is critical for project teams to effectively address the overall weight of quality management process if they are to achieve the desired levels of project success in all social units. Project quality success depends on effective and efficient performance in quality management or satisfaction of the end user. A poor quality management could lead to project termination and imposes a risk on the construction company. To improve the quality management Senan Construction Company should develop a quality management model. The development of this model would entail that excellence is reached in Quality Management. Excellence in this case could be understood as a function of both efficiency and effectiveness, which in turn would benefit the performance of the company. In addition Employee training and qualification on quality management should be addressed to enhance deliverables and capability of the company in future road construction endeavors. Communication in project quality management is the other area of concern that needs improvement, quality management issues that arise are not clearly addressed to all stakeholders because of lack of proper channels. It is recommended that proper communication channels amongst stakeholders on quality management should be deployed by Senan Construction Company.

Findings of the study indicate that, for Senan Construction Company road projects to be successful and competent appropriate measures should be put in place to address quality management issues. Hence it plays a vital role and contributes to excellent (effective and efficient) project performance and management. It can be concluded from this study that, as road projects involve different stakeholders with varying interests and requirements, Senan Construction Company should make it mandatory to focus on project quality management, stakeholder management, employee management and communication so as to ensure the involved stakeholders determine the achievement of the desired project excellence and assure Project success.

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QUESTIONNAIRE

ASSESSMENT OF PROJECT QUALITY MANAGEMENT IN ROAD MANAGEMENT IN THE CASE OF SENAN CONSTRUCTION COMPANY

Dear Sir/Madam

The Purpose of this survey is for academic purpose. In order to assess the effect of quality management practices in road construction, undertaken within the Addis Ababa University School of Commerce College of Business and Economics conducted the study described below: in the case of Senan Construction Company. The results won't be made public, and all responses will be handled with the utmost confidentiality. There is no right or wrong answers because the responses are based on your experiences. The questionnaire should take at most 10 minutes to complete.

SECTION-I
Please, indicate your gender?: Male [ ] Female [ ]
Please, indicate your age?: 18-24 years [ ] 25-30 years [ ] 31-40 years [ ] 41-50 years [ ] 51-60 years [ ] 60+ years [ ]
Please, indicate educational level?: Elementary completed [ ] High school diploma [ ] Vocational school [ ] Undergraduate [ ] Graduate [ ] Post graduate [ ]
Job position: Project manager [ ] Engineer [ ] Supervisor [ ] Coordinator [ ]Other [ ]
Experience: Less than 3 years [ ] 3-9 years [ ] 9-12 years [ ] 20+ years [ ]
Others:

SECTION-II

Please indicate your level of agreement with the following quality management practices assessment and project successstatements as honestly as possible, keeping your own project/organization/department in mind.

	Quality Management Practices					
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	There are checkpoints in place during each road construction project to monitor quality performance and progress	[ ]	[ ]	[ ]	[ ]	[ ]
2	Regular inspections or audits to evaluate the quality of road construction projects are set	[ ]	[ ]	[ ]	[ ]	[ ]
3	Mechanisms are in place to identify and address any quality issues that arise during road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]
4	I believe there are improvements in the quality of road construction projects since implementing quality management practices	[ ]	[ ]	[ ]	[ ]	[ ]
5	Are all materials used for road construction projects tested to ensure they meet necessary quality standards?	[ ]	[ ]	[ ]	[ ]	[ ]
	Project Quality Management					
1	There are established clear quality objectives on road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]
2	There is a project quality plan in place for each road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]
3	Senan Construction Company prioritizes quality over speed in delivering their road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]

4	Data related to the quality of road construction projects is tracked and analyzed to identify trends and areas of improvement	[ ]	[ ]	[ ]	[ ]	[ ]
5	There are documented quality management systems for road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]

Stakeholders Management						
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	There is a team responsible for ensuring quality is maintained throughout each road construction project	[ ]	[ ]	[ ]	[ ]	[ ]
2	Customer satisfaction improved since the implementation of quality management practices	[ ]	[ ]	[ ]	[ ]	[ ]
3	There is a lack of participation from employees in the implementation of quality management practices?	[ ]	[ ]	[ ]	[ ]	[ ]
4	There is a process in place to respond to customer complaints and feedback about the quality of road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]
5	Senior management is actively involved in overseeing the quality of road construction projects	[ ]	[ ]	[ ]	[ ]	[ ]

Employee Management						
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	I believe there is no adequate training in quality management practices for all employees of Senan	[ ]	[ ]	[ ]	[ ]	[ ]

	Construction Company involved in road construction projects					
2	Are there penalties in place for employees who do not adhere to quality management practices during road construction projects?	[ ]	[ ]	[ ]	[ ]	[ ]
3	Do you believe in employee's ability to implement quality management practices in their daily work?	[ ]	[ ]	[ ]	[ ]	[ ]
4	I believe there is a lack of participation from employees in the implementation of quality management practices	[ ]	[ ]	[ ]	[ ]	[ ]
5	Do you believe there are communication issues among employees due to the implementation of quality management practices?	[ ]	[ ]	[ ]	[ ]	[ ]

Communication						
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	There is a process for communicating project goals and objectives to all stakeholders	[ ]	[ ]	[ ]	[ ]	[ ]
2	I can ensure that all stakeholders are aware of their roles and responsibilities in the communication process	[ ]	[ ]	[ ]	[ ]	[ ]
3	There is a process for identifying and addressing any issues related to communication during the project lifecycle	[ ]	[ ]	[ ]	[ ]	[ ]
4	There have been delays in completing road construction projects due to communication	[ ]	[ ]	[ ]	[ ]	[ ]
5	Metrics will be used to measure communication during projects	[ ]	[ ]	[ ]	[ ]	[ ]

Short Answers

1. What is the current quality management practice in Senan Construction Company and its implementation?

2. What are the problems encountered in Senan Construction Company while the implementation of quality management practices during road construction and how can these problems is addressed?

3. Are the employees of Senan Construction Company properly taught and equipped to apply quality management techniques in projects involving the building of roads?

4. Is there proper communication in the project team on project quality management in Senan Construction Company?

5. How does Senan Construction Company handle innovation and constant improvement in quality control procedures for road building projects?

Thank you.