

**QUALITY MANAGEMENT PRACTICE: A CASE OF MICRO, SMALL AND
MEDIUM CONSTRUCTION ENTERPRISES IN ARSI AND EAST SHEWA
ZONES OF OROMIA REGIONAL STATE**



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**A THESIS SUBMITTED TO
THE DEPARTMENT OF CIVIL ENGINEERING
SCHOOL OF CIVIL ENGINEERING AND ARCHITECTURE**

**PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE
DEGREE OF MASTER'S IN CONSTRUCTION ENGINEERING MANAGEMENT**

**OFFICE OF GRADUATE STUDIES
ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY**

**MAY, 2024 GC
ADAMA, ETHIOPIA**

**Quality Management Practice: A Case of Micro, Small and Medium Construction
Enterprises in Arsi and East Shewa Zones of Oromia Regional State**

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**A Thesis Submitted to
The Department of Civil Engineering
School of Civil Engineering and Architecture**

**Presented in Partial Fulfillment of The Requirements for The Degree of Master's in
Construction Engineering Management**

**Office of Graduate Studies
Adama Science and Technology University**

**May, 2024 GC
Adama, Ethiopia**

Declaration

I declare that this thesis entitled “Quality Management Practice: A Case of Micro, Small and Medium Construction Enterprises in Arsi and East Shewa Zones of Oromia Regional State” is my own work. That is, it has not been submitted for the award of any academic degree, diploma or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation.

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Recommendation

I, the advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled “Quality Management Practice: A Case of Micro, Small and Medium Construction Enterprises in Arsi and East Shewa Zones of Oromia Regional State” prepared under my guidance by Yassin Kedir submitted in partial fulfillment of the requirements for the degree of Master’s of Science in Construction Engineering Management.

Therefore, I recommend the submission of revised version of the thesis to the department following the applicable procedures.

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ACKNOWLEDGEMENT

First and foremost, I would like to thank the almighty God for His blessings each and every day. I extend my deepest and most sincere gratitude to my advisor, Dr. Lemma Beressa, for his invaluable guidance, knowledge, and advice throughout the development of this research paper, from its inception to its final presentation.

I also want to express my heartfelt thanks to my family for their unwavering moral support throughout my studies, especially my father, Mr. Kedir Hussein, who has been by my side and supported me throughout this journey. This accomplishment is due to his steadfast support and encouragement.

Finally, I would like to extend my appreciation to the East Shewa and Arsi Zonal Construction Authorities, as well as all those who generously gave their time and cooperated in providing essential information for this research.

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ACRONYMS

ASCE American Society for Civil Engineers.

ASQC American Society for Quality Control.

BSI British Standard Institute.

CII Construction Industry Institute.

ECI European Construction Institute.

GDP gross domestic product.

ISO International Organization for Standardization

PDCA Plan, Do, Check and Act.

QA Quality Assurance.

QC Quality Control.

QMS Quality Management System.

SMMCE Small, Medium and Micro Construction Enterprise.

SMMCEs Small, Medium and Micro Construction Enterprises.

TQM Total Quality Management.

Abstract

The construction industry is instrumental in driving global economic growth, yet it grapples with significant challenges in quality management, leading to substantial economic losses worldwide. This thesis seeks to evaluate the quality management practices of SMMCEs in the Arsi and East Shewa zones of Oromia Regional State. Employing a blend of qualitative and quantitative research methodologies, including questionnaires, interviews, and case studies, primary and secondary data were collected and analyzed using SPSS. The research encompassed 75 purposively selected professionals engaged in 69 ongoing building construction projects executed by SMMCEs in the specified zones. Findings reveal that while 51.67% of respondents acknowledge the importance of Quality Management Systems (QMS) in enhancing project outcomes, they consider them financially impractical, particularly for smaller firms. The Current project quality control practices are notably low, with material quality tests at 11.7%, concrete mix design preparations at 5.0%, and concrete cube sampling at 3.3%. Key influencers on quality management in construction projects undertaken by these firms include contractor-related, labor-related, and design-related factors, with relative importance indices (RII) of 0.854, 0.846, and 0.838, respectively. Recommendations emphasize the need for training and capacity-building initiatives for SMMCEs, alongside addressing labor availability and skills shortages to improve quality management practices and project outcomes.

Keywords: *Quality management, Relative importance factor (RII), Small, Medium and Micro Construction Enterprises (SMMCEs)*

1 INTRODUCTION

1.1 Background

The construction industry stands as a cornerstone of the global economy, with an annual output valued at approximately \$3000 billion, representing about ten percent of the world's GDP. This sector employs around 111 million workers, which constitutes roughly seven percent of the total global workforce, making it the largest industrial employer worldwide. Furthermore, construction activity directly or indirectly accounts for twenty percent of all employment (Bawane, 2017).

Within this critical industry, Micro, Small, and Medium Construction Enterprises play a pivotal role. Although there is no universally accepted definition for SMMCEs, they are typically characterized by metrics such as the number of employees, asset value, sales volume, and capital size. SMMCEs contribute significantly to the diversity and resilience of the construction sector, especially in developing countries like Ethiopia, where they serve as a cornerstone for governmental policies aimed at reducing unemployment and alleviating poverty.

The Quality is a fundamental aspect of the construction industry. Failure to achieve quality standards can result in project failure, client dissatisfaction, and dissatisfaction among end users. Additionally, poor quality can lead to delays, necessitating rework that incurs significant financial losses. Quality management in construction focuses on eliminating defects and variations, aiming to prevent the waste of time, materials, and financial resources associated with rework (Love, Edward & Smith, 2005).

Quality has become a critical factor for organizations striving to succeed and mitigate the risk of failure in the face of intense market competition. As noted by (Nguyen, 2018), organizations do not operate in isolation; they are part of a broader external environment. Ensuring high-quality outcomes is essential for maintaining competitiveness and achieving project goals. Project quality serves as a fundamental benchmark for project performance on a global scale. In the realm of construction projects, stakeholders aim to ensure that projects adhere to agreed-upon and acceptable standards (Oke, 2017).

In the current challenging and competitive construction market, quality management is imperative for the thriving of a Construction Company. Quality management should provide the necessary tools, techniques, and procedures that effectively lead to operational success for the company (Ashokkumar, 2014).

However, based on the Ethiopian Quality Award self-assessment model, quality management practices in Ethiopian manufacturing and service industries were found to be very poor (Kitaw, 2014). Similarly, a study by (Beshah 2011) identified poor quality management as a significant factor contributing to the weak performance and low competitiveness of many Ethiopian industries in the global market. Among the industries

examined in this research was the building construction sector.

(Ayalew 2016) further noted, through a comparative study conducted in the UK, that quality management practices in Ethiopia are even lagging behind those in other underperforming developing countries in Africa and it was also found that quality deviates from pre-determined or specified requirement by 21-40%.

This context underscores the critical need to scrutinize the quality management practices in construction projects undertaken by Small and Medium-sized Construction Enterprises. Given the vital role SMMCEs play in Ethiopia's construction industry and broader economic landscape, understanding and improving their quality management practices is essential for enhancing their performance, competitiveness, and contribution to national development goals.

1.2 Problem Statement

The construction industry plays a vital role in economic development, and SMMCEs are significant contributors to this sector. However, the quality management practices of in the construction industry often face challenges tailored to their unique needs, resources, and constraints. These challenges can lead to compromised project outcomes, customer dissatisfaction, and hindered growth opportunities.

In Ethiopia, as the government intensifies its policies to foster the development of Small and Medium-sized Construction Enterprises, the role of these construction firms becomes increasingly crucial within the national construction industry. Recognizing their importance, the government has begun awarding larger construction projects to SMMCEs. For instance, the Oromia Construction Authority regulation (OCA, 07/2015), recommends that all public construction projects with a cost of fifty million ETB or less to be offered to SMMCEs registered with their respective zonal and woreda administrations.

Despite this supportive policy environment, a significant concern remains: the quality of projects undertaken by SMMCEs. These projects are frequently criticized for poor quality, failing to meet their intended purposes, and leading to public dissatisfaction and anger. This situation underscores the urgent need for improved quality management practices within SMMCEs to ensure that they can effectively deliver on their projects and meet the expectations of the public and stakeholders.

According to (Kulemeka, 2015) the delivery of approximately 27% of projects executed by small and medium scale contractors in Malawi; which is a sub-Saharan African country between a year 2007-2010 was affected by poor quality of work. Records showed that ex gratia extension of time was granted on projects that could not be handed over due to poor quality. Consequently, additional time had to be allowed for contractors to rework and bring the works to acceptable level for handover.

The problem at hand is the need to assess and improve the quality management practices specifically tailored to the context of Micro, small and medium construction enterprises.

While there is existing research on quality management in construction, much of it focuses on larger companies or fails to address the unique challenges faced by have a distinctive formation characteristic, financial capacity, business organizational structure and hindering factors from other contractor firms operated on construction industry. Therefore, it is necessary to assess the quality management practice in context of to understand quality management awareness, implementations and challenges in operating in the construction industry.

This research aims to address this gap by conducting a comprehensive assessment of quality management practices in small and medium construction enterprises. The assessment will consider factors such as quality planning, training and competence, quality control processes, continuous improvement, compliance with standards and regulations, customer satisfaction, and quality performance metrics.

By identifying the specific challenges and opportunities for improvement in quality management practices within, this research will contribute to enhancing project outcomes, customer satisfaction, and overall competitiveness of small and medium construction enterprises. The findings of this study will provide valuable insights and practical recommendations that can be used by to develop and implement effective quality management practices tailored to their unique needs, resources, and constraints.

1.3 Significance of the Study

This research will contribute to the existing body of knowledge by providing insights into the quality control management practices in context of in the construction industry. The findings will help identify areas for improvement, enhance their quality control processes, and ultimately deliver higher-quality projects. The research outcomes will also benefit industry stakeholders, policymakers, and academia by providing a comprehensive understanding of the challenges and opportunities in quality control management within the context of SMMCEs.

1.4 Objectives

1.4.1 General Objective

The primary objective of this research is to assess the quality management practices of SMMCEs involved in construction industry.

1.4.2 Specific Objectives

- To assess the existing construction quality management practices of SMMCEs and to compare it with standard practices of construction quality management practices
- To identify the main factors affecting the construction quality management practice on projects undertaken by SMMCEs.
- To formulate framework for improving the construction quality management practices on projects undertaken by SMMCEs.

1.5 Research Question

The study tried to answer the following specific research questions:

1. What does the practice of quality management practice look like on SMMCEs?
2. What are the main factors affecting the quality management practice on projects undertaken by SMMCEs?
3. What are the improvement factors to enhance the quality management practice on projects undertaken SMMCEs?

1.6 Scope of the Study

This study focuses on ongoing Construction projects undertaken by Small, Medium and Micro Construction Enterprises (SMMCEs) in the geographical bounds of Arsi and East Shewa zones of Oromia Regional state. The sectorial scope encompasses public building construction projects. Also, the study focuses on quality management practices and shortcomings on project construction phase.

2 LITERATURE REVIEW

2.1 Introduction

This section presents the related literatures in three sub sections the first section covers the overview of construction industry in general and the second part covers about Small, medium and micro construction enterprise and the third section cover literatures on quality management practices in construction industry. A recent and related literatures are selected based on the focus of achieving the objective of this study

2.2 Overview of the Construction Industry

The construction industry is one of the most important economic activities worldwide, with an annual output of \$3,000 billion. It accounts for 10 percent of the world's GDP. With 111 million workforce that amount to seven percent of total employment worldwide, the construction industry is considered to be the world's largest industrial employer. Significantly, twenty percent of all employment is directly or indirectly linked to construction activity (Bawane, 2017). In the case of developing countries, it provides not only the infrastructure but also offers employment to the large population of skilled and unskilled manpower.

2.3 Overview on Development of SMMCEs

The history of small business has been one of the most controversial stories in economic development in the world. It is not known when SMMCEs start. What is stated or identified as micro and small enterprises in many industrialized countries may differ in other developing countries. In developed countries, micro enterprises can be labeled as small or medium in developing countries. This is because the amount of capital invested and the number of people employed in operating and implementing SMMCEs and the level of technology vary from one country to another. Micro and small enterprises are defined in several countries within their different purposes and intention. Thus, definitions depend on the government policies.

2.3.1 Common Characteristic and Role of SMMCEs

There are assumptions that are common characteristics of SMMCEs. These common characteristics are; they have few employees, give low income, not experience much growth and do not produce for markets outside their local environment (Kesper, 2001) suggested that SMMCEs are the real potential engines of wealth creation, value re-orientation, job creation and poverty eradication in developing countries of Africa. There are, therefore,

sound economic and social reasons for promoting SMMEs enterprises are generally associated with more labor-intensive production and are hence perceived to have a high labor-absorptive capacity and from the economic point of view, it is generally believed that optimizing the contribution of micro enterprises to employment and economic development could be translated into the following broad objectives. These are Raising the rate of formation of new micro enterprises with growth potential and increased contribution to investment, employment and income generation; increasing the rate of economic ownership; and increasing the rate of graduation of micro enterprises into larger categories

2.4 Concept of Quality and Quality Management

The concept of quality management is an approach to ensure that a whole organization is involved in producing high-quality outcomes in everything they do. In the present era of globalization, Quality philosophy has revolutionized the concept of business. Quality programs are now essential to all corporate business tactics.

2.4.1 Quality Definition

ASCE describes quality as “Conformance to predetermined requirements”. Whereas, the definition proposed by CII, quality means “Conformance to established requirements”. It is important to note the use of the word “predetermined” in the ASCE definition and the word “established” in the CII definition. Both words convey the notion of firmness or certainty like the information used to define the requirements.

Quality has a different definition from different writers. Over the past decades, quality is defined by writers such as Joseph M. Juran, W. Edward Deming, Philip B. Crosby, and others in the area of quality management. Philip B. Crosby who is a “quality guru” defines quality as conformance to requirements. Philip Crosby emphasizes that money spent on quality is always well spent. Crosby’s four absolutes are: quality is defined as conformance to the requirements or standards, the best way to ensure quality is through prevention, zero Defects or no mistakes is the set performance standard for quality and the price of nonconformity is the measure for quality.

Furthermore, quality is defined by W. Edward Deming who is the founder of quality management that quality ought to consider and plan into the product as well as the process of the project (Deming, 1982).

As (Ashokkumar, 2014), concurs that quality is the degree of fineness in a competitive sense, such as reliability, serviceability, maintainability, or even individual characteristics. Usually, we understand quality in terms of an excellent product or service that fulfill or goes more than our expectations. These expectations are based on the intended purpose or use and its cost expensiveness.

The ISO 10006, a standard for quality in project management defines it as; “unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including

constraint of time, cost and resources".

2.4.2 Quality in Construction

Quality in construction is more difficult to explain. Firstly, the product is not an automatic unit but a piece of work with specific characteristics. An example will be building construction, the product can be a whole building or just a prefabricated component that eventually forms part of a building. Besides, the need to fulfill includes not only the client but also the expectations of the community as a whole, into which the completion of the building will be taking part. The construction cost and time of delivery are also important characteristics of quality. In other words, all these things must have properly introduced in designing the building and the outcome should have expressed absolutely in drawing and specifications. (Oyedele et al., 2015)

Construction is a very complex process that involves multiple parties and interests, ranging from the owner, architect, consultants, contractors, and vendors. Several studies on the construction industry conclude that its fragmented nature, lack of coordination and communication between parties, adversarial contractual relationships, and lack of customer focus inhibit the industry's performance (Bawane, 2017).

The construction sector in developing countries like Ethiopia is often characterized by low productivity, lack of standards, and low quality. Construction on site is not an automated process and unlike engineering goods, it is the people rather than the machines and technology that influence the project outcome (Tagesse, 2017).

There are also unique characteristics of a project, which differ from routine operations. Construction projects have five distinctive objectives to be managed: scope, organization, quality, cost, and time (Biniyam, 2018)

2.4.3 Quality Management

The PMBOK Guide outlines that quality management processes encompass all activities of the performing organization that establish quality policies, objectives, and responsibilities to ensure the project satisfies its intended needs. This comprehensive description addresses the project's requirements regarding time, cost, and scope, as well as the product's or customers' needs based on defined requirements. Project quality management is inherently connected to the organization's broader quality management framework, aligning processes and costs to achieve both project-specific and organizational quality objectives.

Quality Management refers to all activities of overall management functions, especially top management leadership, that determines quality policy objectives and responsibilities for all members of the organization. It includes all activities that managers perform to implement their quality policy. These activities include quality planning, quality control, quality assurance, and quality improvement. The most common quality managements employed in modern history are ISO quality management system and Total quality system.

Project quality management uses policies and procedures to implement, within the projects context, the organization's quality management system and, as appropriate, it supports continuous process improvement activities as undertaken on behalf of the performing organization. Project quality management works to ensure that the project requirements, including product requirements, are met and validated. (Oschman, et al., 2006)

2.4.4 Quality planning

According to the Project Management Body of Knowledge (PMBOK), quality planning involves identifying relevant quality standards for a project and determining how to meet them, essentially planning how to fulfill both process and product (deliverable) quality requirements. Quality is defined as the degree to which a set of inherent characteristics fulfills requirements. Key principles of quality planning include prioritizing customer satisfaction by aligning quality with customer requirements, emphasizing prevention over inspection to avoid mistakes rather than correcting defects, ensuring management's approval of quality-related costs, and committing to continuous improvement as an iterative process to enhance quality over time.

(Harris and McCaffer, 2021) defined quality planning as a set of activities whose purpose is to define quality system policies, objectives, and requirements, and to explain how these policies will be applied, how these objectives will be achieved, and how these requirements will be met.

The purpose of quality planning is to assure the organization's management and technical responsibilities for achieving an effective quality product. Quality Planning is choosing which quality standards are appropriate to the project on hand and determining how to satisfy quality standards (Ashokkumar, 2014).

2.4.5 Quality Assurance

Assurance is the activity of providing evidence to create confidence among all stakeholders that the quality-related activities are being performed effectively; and that all planned actions are being done to provide adequate confidence that a product or service will satisfy the stated requirements for quality. Quality Assurance is a process to provide confirmation based on evidence to ensure to the donor, beneficiaries, organization management and other stakeholders that product meet needs, expectations, and other requirements. It assures the existence and effectiveness of process and procedures tools, and safeguards are in place to make sure that the expected levels of quality will be reached to produce quality outputs.

(Harris and McCaffer, 2021) defined quality assurance as a set of activities whose purpose is to demonstrate that an entity meets all quality requirements. Quality Assurance activities are carried out in order to inspire the confidence of both customers and managers, confidence that all quality requirements are being met.

Quality management system does not add or replace the existing the company just it ensures the works are done according to the plan. In short, quality assurance is oriented

towards the prevention of quality deficiencies. It targets minimizing the risk of faulty works in the first place, in so doing one can avoid the unpleasant need for rework, repair, or rejection (Kidanu, 2014).

The major purpose of quality assurance is to gain completed construction projects that meet all contract requirements. Assurance is defined as a level of certainty. Quality assurance personnel continually assure or make certain that the contractor's work complies with contract requirements (Ashokkumar, 2014).

2.4.6 Quality Control

Quality control is the process of monitoring and recording results of executing the quality management activities in order to assess performance and ensure the project outputs are complete, correct, and meet customer expectations. The key benefit of this process is verifying that project deliverables and work meet the requirements specified by key stakeholders for final acceptance. The Quality control process determines if the project outputs do what they were intended to do. Those outputs need to comply with all applicable standards, requirements, regulations, and specifications. Quality control should be performed throughout the project to formally demonstrate, with reliable data, that the sponsor's and/or customer's acceptance criteria have been met. This process is performed throughout the project. (PMBOK, 2017)

A quality system embraces quality control as its technical arm. Quality Control (QC) is the specific implementation of the program and related activities. Effective (QC) minimizes the probability of changes, mistakes, and omissions, which results in fewer disagreements and disputes. QC experts keep a detailed binder, separated by phases of the project with records of items that will be either verified or corrected, with sign-off as each is attained. This binder becomes part of the project record and is an important element to completing the project on time and with expected quality Maintained (Agbenyega, 2015).

Similarly Quality Control is defined as the monitoring of specific project results to determine if they comply with the relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance (Shengeza, 2017).

2.4.7 Quality Management System

(Willar & Coffey, 2016), stated that Several tools and techniques were identified as part of the implementation process, there are, quality audits, cause and effect diagram, Pareto diagrams, flow-charting, check sheet, control charts, flow- charting, statistical sampling, inspection, design of experiments, and trend analysis.

A significant mindset of quality management is the PDCA-cycle. This cycle includes the four components that are which was originally conceived by Walter Shewhart in the 1930s, and later adopted by W. Edward Deming. The model provides a general framework for the improvement of a process or system and is an iterative four-step quality strategy (Willar & Coffey, 2016) Plan: Establish objectives and processes necessary to deliver results following

the specification, Do: implementation of processes, Check: control and evaluate procedures and results against specifications and objectives Act: Taking actions to the result for necessary improvement and standard.

A good will Set direction and meet customers' expectations, improve process control, reduce wastage, Lower costs, increase market share, facilitate training, involve staff, Raise morale, and many more (Selam, 2016).

Some of the recognized quality management standards include; The ISO:9000 series, Total Quality Management, Quality Control, Quality Assurance, standard, and BS 5750 (Shengeza, 2017).

2.4.8 ISO 9001 Quality Management System

ISO was a consequence of the unification of two organizations, the United Nations Standards Coordinating Committee and the International Federation of National Standardizing Associations in 1947. ISO found its home in Geneva, Switzerland. In the early 1950s, the Technical Committee had developed "recommendations." Then ISO was becoming the standard for production, trade, and an element in national and industrial policies on quality, safety, environment, and consumer protection. Also, in the late 1970s, quality management and assurance introduced the ISO 9000 series of standards, termed one of ISO's most spectacular. Today, ISO has over 10,000 standards and they cover a broad array of fields (Willar & Coffey, 2016).

The first series of ISO 9000 developed by the International Organization for Standardization Technical Committees (ISO-TC 176) in 1987, was updated in 1994 and 2000, and again in 2008. The latest version of this standard was published in September 2015. The revision of ISO 9001 has the following aims: to improve the organization's ability to satisfy their client, to ensure the relevance of standards maintained, as business and industry has changed, to reflect the needs of all user groups and current operating environments/technology developments.

2.4.9 ISO Quality Management System in Ethiopia

Now a day's ISO expanded in Ethiopia because of different reasons according to (Kidanu, 2014) study on nine ISO certified contractors, the main driving force to implement ISO are: - For marketing purposes and to boost the reputation of the firm, To ensure higher productivity, Because GTZ is trained ISO 9001 for construction companies: the training provided by GTZ has motivated them to implement ,Customer requirements: mainly the University Capacity Building Program and ministry of education, as part of the capacity building program, were demanding certification or being in the process to get a certification as a requirement to participate in new university construction projects under the ministry of education.

2.4.10 Total Quality Management

Total Quality Management (TQM) is a comprehensive and structured approach to

organizational management to improve the quality of products and services through ongoing refinements in response to continuous feedback.

The main principles of the TQM concept are to achieve customer satisfaction and this is an important objective for any organization, including construction firms. However, the implementation of TQM might differ from one industry to another, while the construction industry differs from the manufacturing industry in implementation of TQM. The manufacturing industry is characterized by steady-state processes; the construction industry is usually a onetime process (uniqueness). Construction industry is also unique to manufacturing industry in the following ways: (1) the mobility of staff; (2) diversity in the types, forms, and shapes of construction projects; (3) geographical dispersion; (4) the contractual relationships; and (5) frequent prototyping of projects. The aim of this TQM culture is to achieve common objectives, namely: removal of waste, reduction of costs, improvement of reputation, and increased market share.

2.4.11 Cost of Quality

The cost of quality is considered by both (Crosby, 1976) and (Juran, 1986) to be the primary tool for measuring quality. In their approach, it is used to check the efficiency of the process, provide cost justification to doubters and select quality improvement projects. By bringing together these simply collected costs of review, testing, inspection, scrap, and rework, one can assure others need for quality improvement. The cost of quality has received increasing attention in recent years.

The American Society for Quality Control (ASQC) divides the cost of quality into four separate categories (Ashokkumar, 2014): -Prevention costs: which are costs incurred to prevent the occurrence of non-conformance in the future. Whereas Appraisal costs are costs incurred in measuring and monitoring current construction to assure conformance with the requirements. The other is Internal failure costs; which are costs generated prior to a product are shipped as a result of nonconformance to requirements. The fourth is External failure costs which are costs generated after a product is shipped as a result of nonconformance to requirements.

2.4.12 Factors Affecting the Quality of Construction Projects in General

According to (Bawane, 2017), several factors impede the management of construction quality in developing countries. The factors are classified into internal and external factors. Under internal factors, there are included contractual provisions, organizational structure, lack of technical expertise, the slow pace of mechanization, lack of training and skills, and limited financial capabilities. And under external factors, there are technological developments in allied Industries and globalization.

According to (Abas et al., 2015), the main factors that are affecting quality management in the construction industry include funding, the management team of the contractor, technical person availability, law and order situation, low bid, regulatory authorities, weather

condition, and cash flow.

The main factors affecting quality listed by (Oke et al. ,2017) are Use of unskilled trade subcontractors, Poor on-site supervision, Construction labor skills and induction, Commitment by the Supervising team, Poor planning and scheduling, Lack of communication, Project Manager's ignorance and lack of knowledge, Scarcity of resources, Poor material and plant management, Average delays in decision making, Number of projects at hand, Design changes, Conforming with specifications, Involvement of End-User client, Assurance with client's funding, Inclement weather conditions.

Therefore, combining the results of the literature review with results of the nominal grouping, the overall factors affecting quality were aggregated into the following groups in the following table 1

Table 1: Factors Affecting the Quality of Building Construction

No	Factors	Sub factors	Supporting literatures
1	Project-related factors	Scope of the project (type and nature) Location of the project Site access Period of the project	(Abas,2015), (Agbenyega, 2015) (Adenuga,2013), (Ahmed,2016), (Neyestani,2017)
2	Design-related	Completeness and consistency of design Documents Drawings are prepared in full details Conformance to codes and standards Experience and knowledge of designers	(Abas, 2015), (Adenuga, 2013) (Abas, 2015) (Karwitha, 2017) (Neyestani, 2016)
3	Contract-related	Cooperation between parties involved in contract Previous successful relations between parties A written contract with clear conditions Using a standard contract Types of the awarding system	(Abas, 2015) (Karwitha,2017) ,(Ahmed, 2016) (Nguyen, 2018) (Neyestani, 2017)
4	Material-related	Using a comprehensive material management system Cooperation between the contractor and material suppliers Availability of good quality construction materials	(Al-Sabek, 2015) (Agbenyega,2015),(Abas,2015) (Adenuga,2013)
5	Labor-related	Labor management system Using labor with high experience Using motivation system Training courses for labor Income level and wages of labor	(Oke, 2017), (Al-Sabek, 2015) (Ahmed, 2016), (Abas,2015) (Ahmed,2016) (Agbenyega, 2015), (Karwitha, 2017)

6	Equipment related	Availability of equipment Equipment management system Measurement of equipment Productivity Good utilization of equipment Equipment maintenance	(Abas, 2015) (Biniyam, 2018) (Nguyen, 2018), (Oke, 2017) (Ahmed, 2016), (Neyestani, 2016) (Karwitha, 2017)
7	Site staff-related	Cooperation between Supervision and Contractor's staff Understanding of contract administration by Supervision Skill and experience of Supervision staff Skill and experience of Contractor's staff	(Neyestani, 2017) (Karwitha, 2017), (Al-Sabek, 2015) (Neyestani, 2017), (Agbenyega, 2015) (Ahmed, 2016)
8	Financial Issues-related	Amount of contractor's cash flow Non-delay of interim payments	(Oke, 2017) (Al-Sabek, 2015), (Nguyen, 2018)
9	Owner-related	Nature of Owner's organization (Public or Private) Owner's quick response (no delays in making decisions) Owner's contribution to the design Owner's emphasis on quality	(Ahmed, 2016), (Neyestani, 2017) (Ahmed, 2016) (Biniyam, 2018), (Agbenyega, 2015)
10	Contractor Related	Lack of training course for personal Improper personal allocation to their task Lack of complying with specification identified in contract Lack of supervision of Sub- contractor Low experience and competence of the contractor Limitation of finance and budget	(Ahmed, 2016) (Adenuga, 2013), (Karwitha, 2017) (Neyestani, 2017) (Neyestani, 2017 (Ahmed, 2016), (Agbenyega, 2015), (Biniyam, 2018) (Ahmed, 2016), (Agbenyega, 2015)

2.4.13 Review on Quality Management Practice in Ethiopian Construction Industry

The research conducted on Grade one Building contractors in Addis Ababa from a total of sixty-four questionnaire survey distributed to different selected Ethiopian contractors reveals that contractors involved in building construction projects have a general understanding of quality and quality management concepts. However, the practical application of these concepts is limited. The main focus of the contractors is to complete the work on time and generate profits, rather than actively implementing quality practices. Additionally, the study highlights that labor-related issues emerge as the most common factor affecting quality in construction projects(FISSEHA, 2021).

The research conducted highlighted the challenges faced by the building construction industry in Ethiopia in terms of low-quality performance. The study identified design-related, labor-related, and site staff-related factors as the most common issues affecting the quality practice in construction companies. The research also emphasized the need for improvement in various aspects, such as the appointment of experienced and skilled personnel, top management commitment and leadership, qualified and timely supply of construction materials, adequate and suitable designs, effective communication, and provision of training courses for employees at different levels of the company(Teshome, 2021).

The research found that Horra Company's quality operation or management practice is inadequate. He concluded that the company's practice requires more attention and improvement on quality management(NEGUSSIE, 2023)

Another study suggests that identifying and recognizing the primary factors impacting materials and workmanship is crucial for improving building project quality. There are 15 primary factors with sub-factors that affect building construction materials quality and workmanship. The study evaluated Ambo University buildings and found varying degrees and types of defects, with no defect-free buildings. Using specified new materials can help enhance building performance and quality(Sitota, 2021).

The quality management process at Dugda Construction PLC lacks standardization, according to this research(Melesse, 2021) The project quality management practice at the organization is challenged by insufficient management support, problems with contractors, unrealistic deadlines, and the lack of a quality management policy and strategy for successful quality management in road construction projects(Bitew, 2019).

The major factors that affect construction quality implementation according to study are: lack of management support (32.5%), project staff resistance to adopt quality systems (45.0%), inadequate internal communication (35.0%), lack of proper training and education (30.0%), and lack of skilled labor (32.5%)(Mulugeta, 2023).

2.4.14 Conclusive Remark

In general, from reviewed literatures, it can be drawn that the quality management is becoming one of most important factor survival any industry on the world, However the quality management practice is at infant stage in Ethiopian construction industry, even the bigger construction firms don't implement comprehensive quality management practices. This supports the need for assessment., awareness creation and recommendations of quality management practices focusing on smaller construction firms which are the backbone of government policy for un employment reduction and poverty alleviation

2.4.15 Research Gaps

A research gap refers to a topic or area where missing or insufficient information restricts the ability to draw a definitive conclusion for a particular question. In the context of this study, the researcher focused on the quality management practices of Small and Medium-sized Construction Enterprises (SMMCEs) operating in the Arsi and East Shewa zones of the Oromia regional state in the Federal Democratic Republic of Ethiopia. Through an extensive literature review, the researcher found that this specific question has not been addressed by existing studies.

Although there are research findings related to the quality management practices of grade one building contractors, real estate developers, condominium housing projects, and other larger construction projects, there is a distinct lack of supportive literature pertaining to SMMCEs in Ethiopia. This gap underscores the necessity of investigating quality management practices specifically for SMMCEs. These enterprises have unique characteristics regarding their formation, financial conditions, and legal and policy-related requirements.

Additionally, the classification, size categorization, business and legal requirements, and access to financial credit for SMMCEs are heavily influenced by national policies, which can vary significantly from country to country. This variability further substantiates the need to explore quality management practices within the specific legal and policy context in which Ethiopian SMMCEs operate. Therefore, addressing the research question on the quality management practices of SMMCEs in this particular regional and national context is crucial for developing a comprehensive understanding and providing relevant recommendations.

3 RESEARCH METHODOLOGY

3.1 Introduction

Research methodology primarily comprises the research design and research process, sampling design, data collection, and method of analysis. Hence, this chapter focused on research design and approach, the population of the study, sample size sampling technique, instruments of data collection, and procedure of data collection and its analysis, and presentation as well as validity and reliability of measurement.

3.2 Research Approach

Quantitative research is established based on the measurement of amount or quantity. It is applicable to phenomena that can be expressed in terms of quantity. In this study quantitative data was used as a measurement for answering objectives of the study for the concept of quality and quality management and factors that mostly affect the quality practice. Those can be answered by using quantitative data by ranking and measuring numerically. Qualitative Methods provide a different approach to scholarly analysis than methods of quantitative research. Qualitative approaches seek to gain insights and to understand people's perceptions of the world whether as individuals or groups. In qualitative research, the understandings, beliefs, views, opinions, and so on of people are explored. The data collected may be unstructured, but will tend to be more detailed, so that rich in content and scope. In this study also qualitative data was used to answer the objectives listed, mainly objective two which is about the evaluation of the current QMS practice gained by case study and interview were discussed briefly to strengthen the objective findings.

According to (Mark et al. 2009) mixing qualitative and quantitative approaches gives the potential to cover each method's weaknesses with strengths from the other method. In this study, a combination of qualitative and quantitative approaches of doing research will be employed. Research design is the blueprint for fulfilling research objectives and answering research questions in other words, it is a master plan specifying the methods and procedures for collecting and analyzing the needed information. It ensures that the study would be relevant to the problem and that it uses economical procedures. The same authors discuss three types of research design, namely exploratory (emphasizes discovery of ideas and insights), descriptive (concerned with determining the frequency with which an event occurs or relationship between variables) and explanatory (concerned with determining the cause-and- effect relationships).

The types of research employed under this study will be mixed, namely descriptive and explanatory research. The major purpose of descriptive research is description of the state of affairs as it exists at present. Then this study describes and critically assesses the factors affecting the construction quality management practice on construction projects executed

by of SMMCEs. Also, the study will employ explanatory in that the relationship between variables is correlated with an aim of estimating the integrated influence of the factors on construction quality practice.

3.3 Type and Source of Data

The study will employ both primary and secondary sources of data collection. In order to realize the target, primary data was gathered using well-designed questionnaire as best instrument. This to be completed by the project managers, site supervisors or other professionals who have a good knowledge on subject matter. Secondary data from files, pamphlets, office manuals, circulars and policy papers will be used to provide additional information. Besides, variety of books, published and/or unpublished government documents, websites, reports and newsletters will be reviewed to make the study fruitful.

3.4 Population and Sampling Techniques

3.4.1 Population

The target population of the study comprises micro, small, and medium construction enterprises (SMMCEs) engaged in active public building construction projects with a project cost of at least one million Ethiopian Birr (ETB), specifically within the Arsi zone and East Shewa zone of the Oromia regional state. Therefore, our population selection will be based on our stated project scope, these are:

Geographical scope: Arsi and East Shewa Zones of Oromia regional state

Sectorial: building construction projects

Owner type: - Public

Project status: - active construction phase

Project cost: - greater or equals to one million (ETB)

Table 2: Target population

Type of SMMCE	Number of SMMCEs participate on ongoing public building projects		Total
	Arsi	East Shewa	
Micro	10	37	47
Small	10	11	21
Medium		1	1
Total target population as per research scope			69

3.4.2 Sample frame

The sampling frame would be a list of all SMMCEs participated on ongoing public

building projects with project cost of greater than or equals to one million ETB in the Arsi and East Shewa Zones of Oromia regional state. The list these of SMMCEs with their corresponding project were obtained from their respective zonal construction authorities.

3.4.3 Sampling Technique

(Fellows and Liu ,2021) give the following procedures of sampling: Random sampling – Is a sampling procedure where the sample is derived by randomization process from a homogenous or homogenous conglomerate texture population. Systematic sampling – This form of sampling procedure, as the name implies, is a systematic selection of certain items according to a predetermined criterion. Stratified sampling – This sampling procedure essentially uses a stratified population instead of homogeneous population. Cluster or area sampling – This sampling procedure entails sampling into groups of a large population which is spread over a large area.

(Fellows and Liu ,2021), argue that if there is no evidence of variation in the population structure, or if there is no reason to ignore the structure then random sampling procedure is appropriate. However, in this research the difference in size and capacity between micro, small and medium enterprises may affect the issues regarding to quality practice we prefer to use stratified sampling to ensure the proportional representation of projects executed by different sizes of SMMCEs (micro, small, medium) in our research sample.

3.4.4 Sample Size

According to (Dawson, 2009), the correct sample size in a study is dependent on the nature of the population and the purpose of the study. According to the data from respective zonal construction authorities the total number all SMMCEs engaged on ongoing public building projects with project cost of greater than or equals to one million ETB in the Arsi and East Shewa Zones of Oromia regional state is 69. which is total number of target population. Once the total number of populations which is 69 is collected from zonal construction authorities in order to determine sample size, Yemane (1967) finite and large population sample size formula with 95% confidence level will be employed. The formula used to obtain this sample size is presented below.

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

Where: –

n = no. of samples

N = total population

e = error margin/ margin of error

By employing the above formula number of sample(n) is calculated as 63, then a representative sample from each stratum was determined based on proportional representation,

Table 3: Minimum sample determination

Type of SMMCE	Total population in two Zones	Number of samples $((n/N)*n_s)$
Micro	47	42
Small	21	20
Medium	1	1
Minimum number of samples		63

From total population of 69 SMMCEs; 63 SMMCE firms selected purposively based on their project cost rankings. Additionally, professionals involved in the design, supervision, and contract administration of projects undertaken by these SMMCEs were included in the study. Specifically, 2 professionals from the zonal urban development bureau and 4 from the zonal construction authority in each respective zone were included, totaling 12 additional professionals from government bodies. Thus, the survey includes a total of 75 selected professionals from SMMCE staff and government offices, all of whom have participated in the construction, supervision and contract administration of these projects.

3.5 Data Collection Techniques

The study will employ both quantitative and qualitative data. Quantitative data will be collected from the selected sample respondents using self-administered structured questionnaires. Qualitative data, on the other hand, will be collected through interview method, and case study. The study will also use the secondary data. The secondary data collected from different books, articles, journals, research works, documents written about SMMCEs, browsing the internet, etc. having relevance with the research topic.

3.5.1 Data Collection Procedure

The researcher was used different data collecting instruments such as questionnaires, interviews, and case studies. Because these instruments were believed to be suited for the data needed to achieve objectives.

3.5.2 Interview

The interview was conducted to gather relevant information and collect data from selected representatives face to face. An interview is a useful technique for collecting data that would probably not be accessible using techniques such as desk study and questionnaires. In this study the interview was conducted with a total of 6 selected professionals: 2 from zonal urban development office, 1 from Job creation and vocational offices and 3 from SMMCEs members. All of them have an industry experience of more than 7 years. The result from

this interview was incorporated into literature review and personal experiences in the industry to develop questionnaires.

3.5.3 Questionnaire

It is simplest and time saving method to collect data effectively from a huge number of respondents. Formulating questions from the identified variables, the questionnaire was designed to gather data from professional staffs of SMMCEs, construction authority and other government offices who have been participated in construction of public building construction projects undertaken by SMMCEs.

This questionnaire survey has both closed-ended as well as open- ended questionnaires. A rating scale is one of the most common formats for questioning respondents on their views or opinions of an event or attribute. The Likert Scale is the most commonly used approach to scaling responses in survey research. The questionnaire comprises four sections, each designed to address specific research objectives: Section one covers the respondent's profile; Section two explores the concept of quality and quality management; Section three examines current construction quality control practices; and Section four investigates factors affecting the quality of construction projects undertaken by SMMCEs. This final section includes sub-factors correlated to their main factors, which will be used to rank the primary factors affecting quality.

3.5.4 Case Study

A case study is a method of study in-depth rather than coverage. Case study approaches enable in-depth exploration of specific instances of a phenomenon. In this research, the case study aimed to evaluate some of quality control practices of SMMCE contractors with standard requirements on MUDHC 2014 which is used commonly referred standard specification document for building constructions in the country.

3.6 Data Analysis Techniques

3.6.1 Quantitative Data analysis

In fact, in analyzing the quantitative data, there are descriptive and inferential statistical techniques are known. Descriptive statistics are used for simplicity and clarity. For this research, only descriptive statistics (including percentiles, and RII) were used to analyze the background information of the respondents, the concept adopted in construction projects and to identify factors that affect the quality practice. Tables, means, percentage, standard deviation, and Relative importance index (RII) were used to present the results. Data were analyzed using SPSS. Ordinal data is a categorical statistical data type where the variables have natural, ordered categories and the distances between the categories are known. These data exist on an ordinal scale. Finally, rating-type questions were provided to the

respondents. The formula for the calculation Relative importance index

$$RII = \frac{\text{total amount}}{P * N}$$

Where: -

P = Population

N = the highest weight on the Likert scale

RII = Relative importance index was used in the study to rank the factors affecting the quality management practice. The ranking of the items under consideration was based on their RII values. The item with the highest RII value is ranked first (1) the next (2) and so on. The rating of all the factors for the degree of significance was based on the value of their respective relative importance index (RII). Literatures Interpreted of the RII Values as follows: -

Table 4: Relative Importance Indexes

RII coefficient(r)	Implication
$RII < 0.60$	Have a low significance.
$0.6RII < 0.80$	Have high significance.
$RII \geq 0.80$	Have very high significance

3.6.2 Qualitative Data Analysis

For this study explanatory analysis technique was used to analyze qualitative data. Accordingly, the investigator used this method to analyze the response from interviewees to describe the quality practice in construction projects undertaken by SMMCEs depends on the research questions.

3.7 Validity and Reliability of Instruments

As (Middleton, 2019) stated that Reliability and validity are concepts used to evaluate the quality of research. They indicate how well a method, technique. or test measures something.

3.7.1 Validity

validity is about the accuracy of a measure; the researcher checked the validity of questioners developed for this study. Before distributing the final questionnaires to the respondents, ii was checked and commented by friends and the advisor of the researcher. The final version of the questioners was distributed after incorporating all the comments and feedbacks obtained from different professionals.

3.7.2 Reliability

Reliability analysis was calculated to test whether the scale used in the study is internally consistent. As cited by (Hailu 2013) according to George and Mallery (2003) Cronbachs Alpha result which is greater than 0.70 is acceptable. For questionaries on part II the Alpha value was 0.816 which is acceptable according to the standard set by George and Mallery. Moreover, on questioner part III- for nine main factors affecting quality practices on projects undertaken by SMMCEs the Alpha values were between 0.716 to 0.93 this indicates that there is internal consistency between the items and measures the dimension of the variables. The SPSS output of these reliability Cronbach Alpha results was attached on Appendix section.

4 DATA ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter presents and interprets data obtained from questionnaires and case studies, followed by data analysis and discussion of findings. The data are presented and analyzed statistically, including mean, standard deviation, relative importance index, and ranking. It begins with general information about the respondents' profiles, which provides necessary context. The chapter then explores the concept of quality and quality management as adopted in these construction projects, assesses the current practice of QMS in the construction process, and investigates factors affecting quality practices in building construction projects undertaken by SMMCEs. To achieve the research objectives, 75 questionnaires were distributed to professionals involved in 63 public building construction projects by SMMCEs in the Arsi and East Shewa zones of Oromia Regional State.

Table 5 shows the number of questionnaires administered to construction projects undertaken by SMMCEs. Seventy-five (75) questionnaires were administered and sixty (60) were properly completed and returned representing eighty percent (80%) response. This percentage can be regarded as appropriate and an adequate representation of the population of this study and therefore valid for consideration.

Table 5: Questionnaire response rate

Respondents		Number of distributed	Number of returned	Percentage (%)
SMMCE contractor	Micro	42	32	76%
	Small	20	16	80%
	Medium	1	1	100%
East shewa Zone urban development office		2	2	100
East shewa Zone construction Authority		4	4	100%
Arsi Zone urban development office		2	1	50%
Arsi Zonal construction Authority		4	4	100%
Total		75	60	80%

4.2 Analysis and Discussion of Data from the Questionnaire

4.2.1 Respondents profile

Role of Respondents in Construction projects

Table 6: Role of the respondents on construction projects

S/N	Statements	Frequency	%age
1	Project manager	22	36.67%
2	Site engineer	12	20.00%
3	Other members of SMMCE	15	25.00%
4	Site supervisor (from government offices)	11	18.33%
5	Resident engineer	0	0.00%
	Total	60	100.00%

Source: researcher's own data 2024

From Table 6, out of the total respondents the majority (36.67%) were project managers in the surveyed construction projects. The other respondents were (20%) site engineers and (25%) Other members of SMMCE. Also (18.33%) site supervisor from concerned government offices participated in this survey. This means from the total (81.67%) of respondents are staffs of SMMCEs

Gender of respondents

Table 7: Gender of the respondents

S/N	Statements	Frequency	%age
1	Male	54	90.00%
2	Female	6	10.00%
3	Did not answer	0	0%
	Total	60	100%

Source: researcher's own data 2024

From Table 7, out of the total respondents the majority (90%) were males and the other 10% of the survey is covered by females.

Profession of Respondents

Table 8: Professions of the respondent

S/N	Statements	Frequency	%age
1	Architect	2	3.33%
2	Civil engineering	37	61.67%
3	COTM	13	21.67%
4	Surveyor	5	8.33%
5	Hydraulic/irrigation	3	5.00%
6	Others	0	0.00%
	Total	60	100%

Source: researcher's own data 2024

Table 8 shows the majority of professions (61.67%) of the surveyed respondents were civil engineers and 21.67% of the respondents were qualified with construction technology and management. The other respondents were also qualified with the architect, surveyor and hydraulic/irrigation with the percentages 3.33%, 8.33% and 5% respectively.

Level of Qualification of the Respondents

Table 9: Qualification of the respondent

S/N	Statements	Frequency	%age
1	High school	Complete	0.00%
2	TVET	16	26.67%
3	Diploma	7	11.67%
4	Degree	35	58.33%
5	Master's degree and above	2	3.33%
	Total	60	100%

Source: researcher's own data 2024

Table 9 shows the academic qualification of the respondents which are 58.33% are first degree holders. The other categories of academic qualification are given as follows; TVET level 26.67%, Diploma 11.67% and Master's degree and above 3.33%. The academic qualification of the respondents is important and supports the fact that they are knowledgeable and capable of providing the much-needed professional information required for the credibility of the data collected for the research

Experience of respondents in construction industry

Table 10: Experience of respondents in year

S/N	Statements	Frequency	%age
1	0-5 years	24	40%
2	6-10 years	22	37%
3	11-15 years	10	17%
4	16 years and above	4	7%
	Total	60	100%

Source: researcher's own data 2024

The firm's years of experience are summarized in Table 10, the results show 7% of the respondents have more than 16 years of work experience in the construction industry. The others (17%) of the respondents have 11 to 15 years of experience in the construction industries. The remaining respondents (37%) and (40%) have 6 to 10 years and 0 to 5 years of experience respectively. The majority (60%) of participants have more than 5 years of experience as understood from results. This helps the study to get enough information on quality management practices.

4.2.2 Concept Quality and Quality Management systems

The word quality has a different meaning for every construction firm for this reason the developers asked to select words that define quality. The professionals involved on construction projects executed by SMMCEs were also asked to one word from the option provided in Table 11.

Table 11: Response Rate on Definition of Quality

S/N	Statements	Frequency	%age
1	Conformance to specifications	18	30.00%
2	Doing without defect	28	46.67%
3	Beauty	5	8.33%
4	Meeting customer expectation	7	11.67%
5	Luxury	2	3.33%
	Total	60	100%

The analysis of Table 11 indicates that the majority of respondents prioritize defect-free execution (46.67%) and conformance to specifications (30.00%) as primary indicators of quality in construction projects. These definitions emphasize technical accuracy and adherence to standards. Meeting customer expectations (11.67%) and aesthetic considerations (beauty at 8.33%) also play significant roles, highlighting the multifaceted nature of quality that includes both functional and perceptual aspects. Luxury, while the least common definition (3.33%), still represents a niche perspective on quality.

This diverse set of responses underscores the complexity of defining quality in the construction industry, reflecting varied priorities and values among stakeholders. For effective quality management, it is crucial to address these multiple dimensions, ensuring that projects not only meet technical standards but also satisfy aesthetic and customer expectations.

Table 12: Perception of Quality-on-quality management system

S/N	Statement	Frequency	%age
1	A useful management system for success of any construction activity but expensive to implement in Small sized construction firms like SMMCEs	31	51.67%
2	A useful management system for success of any construction activity which can be implemented reasonably in any construction firms.	19	31.67%
3	Did not answer	10	16.67%
4	Others		
	Total	60	100%

Source: researcher's own data 2024

The analysis of Table 12 indicates that while there is broad recognition of the value of quality management systems in the construction industry, opinions vary regarding their implementation in SMMCEs. Over half of the respondents (51.67%) view these systems as beneficial but costly for small firms, pointing to limited financial capability of smaller firms. Meanwhile, 31.67% believe that quality management systems can be reasonably

implemented across firms of all sizes, suggesting that feasible solutions do exist. The 16.67% non-response rate highlights a potential gap in knowledge or certainty about quality management systems among some respondents.

Table 13: Priorities in the Construction project

S/N	Factors	5“ Very High Priority”	4” High Priority”	3” Medium Priority”	2” Low Priority”	1” very Low Priority”	Total respondents (N)	Weighted total	Item Mean	RII
1	Meeting project contract budget	35	13	12			60	263	4.38	0.88
2	Meeting quality standards	13	22	25			60	228	3.80	0.76
3	Meeting Project Time /Deadline	34	21	5			60	269	4.48	0.90

Source: Researcher’s own data

Table 13 provides insights into the priorities assigned by respondents regarding various factors in construction projects, including meeting project contract budget, meeting quality standards, and meeting project time/deadline. Meeting project time/deadline is perceived as the highest priority among the factors analyzed. It has the highest item mean (4.48) and RII (0.90), indicating that timely completion of projects is paramount for respondents. while meeting the project contract budget is considered a high priority, with an item mean of 4.38 and an RII of 0.88.. It’s the second-highest priority among the factors analyzed. Meeting quality standards is also a significant priority, although it ranks lower than budget adherence and project time management. The item mean is 3.80, and the RII is 0.76. Overall, the findings suggest that respondents place a strong emphasis on completing projects on time and within budget, with quality standards being considered less critical

4.2.3 The Current Practice of quality management

Quality improvement as which emphasizes that quality is the responsibility of everyone in an organization: as processes of managing change; as a strategy to improve organizationally competitiveness and effectiveness as a value system that emphasizes quality in product or services; and as an approach to doing business that covers the whole organization.

Table 14: Implementation of formal Quality Management system

S/N	Statement	Frequency	%age
1	Yes	0	0.00%
3	No	46	82.14%
4	Did not answer	10	17.86%
	Total	56	100%

From Table 14, it can be seen that only 56 respondents respond to this specific question and A notable portion of respondents (17.86%) did not provide an answer to this question. The reasons for non-response could vary, including a lack of awareness about formal quality management systems, uncertainty about organizational practices, or simply choosing not to answer. The vast majority of respondents (82.14%) reported that their organizations have not implemented formal quality management systems. This indicates a prevalent absence of structured quality management frameworks in these organizations. This is expected result as the implementation of formal quality management system is at infant stage even for bigger construction firms.

Table 15: Reasons for not implementing quality management system

S/N.	Statement	Frequency	%age
1	it is not something expected in SMMCEs and smaller construction projects	5	10.87%
2	It is too expensive	18	39.13%
3	Lack of knowledge on implementation	5	10.87%
4	Lack of awareness about its importance	3	6.52%
5	Less demand from customers /owners	3	6.52%
6	Did not answer	12	26.09%
	Total	46	100%

Source: Researcher's own data 2024

Table 15 presents data on the reasons cited by respondents for not implementing a quality management system (QMS) within Small, Medium, and Micro Construction Enterprises (SMMCEs) and smaller construction projects. the most common reason cited by respondents for not implementing a QMS is the perceived costliness of such systems, with 39.13% indicating this as a barrier. This highlights a respondent's perception of higher financial capability requirement for adopting formal quality management practices. A notable portion of respondents (26.09%) did not provide an answer to this question. Non- response could indicate uncertainty, lack of awareness, or a combination of other factors influencing the decision-making process regarding QMS implementation. A small portion of respondents (10.87%) indicated that the expectation for implementing a quality management system is low in SMMCEs and smaller construction projects. This suggests a perception among some stakeholders that formal quality management systems may not be necessary or relevant for smaller-scale projects or enterprises.

A portion of respondents (10.87%) reported a lack of knowledge on how to implement a quality management system as a barrier. This indicates a gap in understanding or expertise within organizations regarding the processes and requirements involved in establishing and maintaining a QMS. Some respondents (6.52%) cited a lack of awareness about the importance of a QMS as a reason for non-implementation.

Table 16: Quality plan

S/N.	Quality plan	Frequency	Percentage (%)
1	Yes	2	3%
2	No	33	55%
3	Did not answer	25	42%
	Total	60	100%

Source: Researcher's own data 2024

The result on Table 16 shows the majority (55%) of respondents stated that their organizations have not implemented a quality plan. This suggests a prevalent absence of structured quality planning frameworks within the surveyed organizations. A significant portion (42%) of respondents did not provide an answer to this question. Non-response could stem from various reasons, including uncertainty about organizational practices, lack of awareness about quality planning processes, or simply choosing not to answer.

Table 17: Understanding on Specification documents

S/N.	Statement	Frequency	%age
1	MUDHC 2014	11	18%
2	ERA 2014	5	8%
3	BaTCoDA	1	2%
4	Bill of quantities and Design drawings	29	48%
5	Did not answer	14	23%
	Total	60	100%

Source: Researcher's own data 2024

Table 17 presents data on respondents' understanding of specification documents within the context of construction projects. The most common understanding of specification documents, cited by 48% of respondents, is based on the Bill of Quantities and Design Drawings. 18% of respondents indicated their understanding of specification documents based on the MUDHC 2014 standard specification document. A smaller proportion (8%) of respondents reported their understanding of specification documents based on ERA 2014 standard specification document. Only 2% of respondents mentioned BaTCoDA specification document as their basis for understanding specification documents. A notable

portion (23%) of respondents did not provide an answer to this question. Non-response could indicate uncertainty or lack of clarity regarding specification documents or simply choosing not to answer.

In summary, the findings highlight that many of respondents have not a clear picture on standard specification documents referred in conjugation with design and bill of quantities in an Ethiopia's building construction projects (MUDHC 2014) standard specification document.

Table 18: Quality control practices on construction projects

No	Statement	Yes	No	Percentage (%)	
				Yes	No
1	Have you ever used inspection check lists in your construction project	34	26	56.7%	43.3%
2	Have you ever conducted material quality tests on samples before delivering to site.	7	53	11.7%	88.3%
3	Did you prepare mix design for concrete before concrete casting	3	57	5.0%	95.0%
4	Did you take concrete cube samples during casting to check the quality conformance of concrete.	2	58	3.3%	96.7%

Source: Researcher's own data 2024

The result on Table 18 shows that A majority (56.7%) of respondents have used inspection checklists in their construction projects, indicating a common practice for ensuring thorough inspections and adherence to quality standards. However, a significant portion (43.3%) reported not using inspection checklists. Regarding with the practice of material quality test A relatively small percentage (11.7%) of respondents reported conducting material quality tests on samples before delivering them to the site. This suggests that while some projects prioritize material quality testing, it is not a widespread practice among the surveyed projects, with the majority (88.3%) not conducting such tests. Regarding a practice of preparing mix design for the given class of concrete. Only a very small percentage (5.0%) of respondents reported preparing mix designs for concrete before casting. This indicates a low prevalence of formalized mix design processes among the surveyed projects, with the vast majority (95.0%) not undertaking this practice.

Moreover, on the issue of concrete cube sampling only a negligible proportion (3.3%) of respondents reported taking concrete cube samples during casting to check the quality conformance of concrete. This indicates minimal adherence to concrete quality control practices involving the testing of cube samples. The overwhelming majority (96.7%) reported not taking cube samples.

Table 19: Quality manager who is responsible for executing Quality Plans and Checklists

S/N.	Is there a quality manager	Frequency	%age
1	Yes	0	0%
2	No	27	45%
3	Did not answer	33	55%
	Total	60	100%

The result on Table 19 shows the A significant portion (55%) of respondents did not provide an answer to this question. Non-response could indicate uncertainty or lack of clarity regarding the existence of a designated quality manager within their projects, or simply choosing not to answer. However, 27 (45%) of the respondents insists that there is no a quality manager who is responsible for executing Quality Plans and Checklists.

Table 20: Discussion about quality improvement with stake holders

S/N.	Have you ever discussed about quality improvement with stake holders in your current project?	Frequency	%age
1	Yes	24	42.11%
2	No	26	45.61%
3	Did not answer	7	12.28%
	Total	57	100%

The result on Table 20 shows the A slightly higher percentage (45.61%) of respondents indicated that they have not discussed quality improvement with stakeholders in their current projects. This suggests a notable portion of projects where quality-related discussions with stakeholders may be lacking, A significant portion (42.11%) of respondents reported having discussions about quality improvement with stakeholders in their current projects.

A small percentage (12.28%) of respondents did not provide an answer to this question. Non-response could stem from various reasons, including uncertainty about whether such discussions have occurred or simply choosing not to answer.

Table 21: Trainings on quality management

S/N.	Have you ever taken trainings in any form of quality management system	Frequency	%age
1	Yes	8	13%
2	No	50	83%
3	Did not answer	2	3%
	Total	60	100%

Table 21 presents data on whether respondents have undergone training in any form of quality management system. A small proportion (13%) of respondents reported having taken training in any form of quality management system. This suggests that only a minority of respondents have received formal training in quality management practices.

The majority (83%) of respondents indicated that they have not undergone training in any form of quality management system. This indicates a prevalent absence of formalized training initiatives focused on quality management among the surveyed respondents. A very small percentage (3%) of respondents did not provide an answer to this question. Non-response could indicate uncertainty about whether they have received training or simply choosing not to answer.

The data suggests a low level of participation in training programs focused on quality management, with only a small proportion of respondents indicating that they have undergone such training.

4.3 Factors Mostly Affect Quality Practice of Construction projects undertaken by SMMCEs

4.3.1 The Effect of SMMCE contractor related factors on Quality of Construction projects undertaken by SMMCEs

Table 22: SMMCE contractor related-factors

A. SMMCE contractor related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1	Awareness of SMMCEs top management (founding members) towards Quality management	Frequency		2	8	24	26	4.23	0.847
		Percentage		3%	13%	40%	43%		
2	Lack of technical experience of members of SMMCEs.	Frequency			14	16	30	4.27	0.853
		Percentage			23%	27%	50%		
3	Limited Financial conditions of SMMCEs	Frequency			13	15	32	4.32	0.863
		Percentage			22%	25%	53%		
4	Lack of well-defined organizational structure of SMMCEs	Frequency		3	9	19	29	4.23	0.847
		Percentage		5%	15%	32%	48%		
5	Dispute and lack of mutual understanding between members of SMMCE	Frequency		4	9	22	25	4.13	0.827
		Percentage		7%	15%	37%	42%		
6	Poor communication skill of SMMCEs members with other stake holders,	Frequency		1	12	21	26	4.20	0.840
		Percentage		2%	20%	35%	43%		
7	Lack of training for staffs on quality and other project/contract related topics	Frequency			3	24	33	4.50	0.900
		Percentage			5%	40%	55%		
Grand								4.27	0.854

Table 22 presents data from respondents that the most important sub-factor is the lack of training for staff on quality and project-related topics (RII=0.90). This is followed by limited financial conditions (RII=0.863) and the lack of technical experience among members (RII=0.853). Awareness of quality management among top management (RII=0.847) and the lack of a well-defined organizational structure (RII=0.847) are also major concerns. Additionally, poor communication skills with stakeholders (RII=0.840) and disputes and lack of mutual understanding among members (RII=0.827) further impact quality. These findings emphasize the need for improved training, financial management, technical skills, leadership awareness, organizational structure, communication, and conflict resolution to enhance project quality in SMMCEs.

4.3.2 The Effect of Design on Quality of Construction projects undertaken by SMMCEs

Design and construction are integrated systems throughout the life of construction projects. During our interview and questioner preparation process two issue are raised: the completeness and consistency of design documents and in detail preparation of drawings and specifications. Those factors are compared according to the importance they have given on quality.

Table 23: Design Related - Factors

B. Design related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1.	Lack of preparation of drawings, bill of quantities and specifications in full detail	Frequency			14	19	27	4.22	0.84
		Percentage			23%	32%	45%		
2.	Incompleteness and Inconsistency of design documents and bill of quantities	Frequency			17	17	26	4.15	0.83
		Percentage			28%	28%	43%		
Grand									0.84

Source: Data collected by the researcher through Questionnaire, 2024

Table 23 presents data on design-related factors affecting quality practices in construction projects. Respondents rated the lack of preparation of drawings, bill of quantities, and specifications in full detail as having medium to very high importance, with RII of 0.84. This suggests that incomplete or inadequate design documentation can significantly impact the quality of construction projects. Similarly, respondents rated the incompleteness and inconsistency of design documents and bill of quantities as having medium to very high importance, with a RII of 0.83. This indicates that inconsistencies or discrepancies in design documentation can pose significant challenges to quality management practices in construction projects.

In Summary The interpretation of the data highlights the critical role of design-related factors in influencing quality practices in construction projects. Incomplete or inconsistent design documentation, including drawings, bill of quantities, and specifications, can lead to errors, rework, and delays, ultimately affecting the overall quality of construction projects. Addressing these factors by ensuring comprehensive and accurate design documentation is essential for enhancing quality management practices and improving project out-come.

4.3.3 The Effect of Labors on Quality Construction projects undertaken by SMMCEs

Labors are one of the most important resources we use to construct buildings, especially when the resource for equipment is limited and also some work could not be done by equipment only so, using labors are necessary. Especially in developing countries like Ethiopia, construction needs a lot of labor because of the shortage of technological capacity we have. From interview and experience on construction projects undertaken by SMMCE, three labor related factors were selected. These are Shortage of experienced skilled labors: Lack of labors communication skill and Low-income level & wages of labors. The participant of the survey ranked the variables under labor considering the effects on quality practices of building construction projects as shown in the table below.

Table 24: Labor Related Factors Affecting Quality Practices

C. Labor related		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1.	Shortage of experienced skilled labors	Frequency			7	19	34	4.45	0.890
		Percentage			12%	32%	57%		
2.	Lack of labors communication skill	Frequency		5	13	18	24	4.02	0.803
		Percentage		8%	22%	30%	40%		
3.	Motivation and trainings on quality and construction skills	Frequency		3	7	24	26	4.22	0.843
		Percentage		5%	12%	40%	43%		
Grand									0.846

Source: Data collected by the researcher through Questionnaire, 2024

Table 24. Shows that respondents rated the most critical labor-related sub-factor affecting quality practices in building construction project undertaken by SMMCEs is the shortage of experienced skilled labor, with a high Relative Importance Index (RII) of 0.890, indicating its significant impact as perceived by 57% of respondents. Motivation and training on quality and construction skills is also crucial (RII 0.843), with 43% rating it as very high important. Additionally, the lack of communication skills among laborers, while slightly less critical, still holds substantial importance (RII 0.803), with 40% viewing it as very high important. The overall grand RII of 0.846 underscores the essential role these factors play in maintaining quality practices, emphasizing the need for construction firms to focus on addressing skilled labor shortages, enhancing training programs, and improving communication skills to ensure high-quality outcomes.

4.3.4 The Effect of Materials on Quality of Construction projects undertaken by SMMCEs

The construction industry needs a lot of materials both in type and amount so using these resources is very essential. Quality of materials have higher endurance and resistance to both time and weather conditions. In current Ethiopian construction market scenario, it is expected that in addition to proper material testing and handling practice, shortage of

material and unpredicted escalation of material price affects the construction quality practice in construction projects. Here are materials related sub- factors are ranked according to their level of importance for quality as shown in Table 4.19

Table 25: Material related factors

D. Material related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1.	Shortage of construction material and price escalation	Frequency		2	12	22	24	4.13	0.827
		Percentage		3%	20%	37%	40%		
2.	Poor material storage and handling system	Frequency		3	15	10	32	4.18	0.837
		Percentage		5%	25%	17%	53%		
3.	Poor material quality testing practice	Frequency		1	13	21	25	4.17	0.833
		Percentage		2%	22%	35%	42%		
Grand								4.16	0.832

Source: Data collected by the researcher through Questionnaire, 2024

Table 25 presents that the most important factor is the poor material storage and handling system (RII 0.837), with 53% of respondents rating it as very high important. This is closely followed by poor material quality testing practices (RII 0.833), considered very high important by 42% of respondents. The shortage of construction materials and price escalation, while slightly less critical, still has a significant impact (RII 0.827), with 40% rating it as very high important. The grand RII of 0.832 underscores the overall importance of these factors, indicating that construction firms must focus on improving storage and handling systems, enhancing quality testing practices, and managing material shortages and price fluctuations to ensure high-quality construction outcomes.

4.3.5 The Effect of client related factors on Quality Practice of Construction projects undertaken by SMMCEs

Table 26: Client Related factors

E. Client related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1.	The client’s less focus on quality for projects undertaken by SMMCE	Frequency		10	25	12	13	3.53	0.707
		Percentage	7%	17%	42%	20%	22%		
2.	The client’s delay in contractor payments and on decisions like approval of variations and change in modifications etc.	Frequency			10	21	29	4.32	0.863
		Percentage			17%	35%	48%		
3.	Lack of good communication and understanding between client and other stakeholders	Frequency			15	25	20	4.08	0.817
		Percentage			25%	42%	33%		
4.	Poor Monitoring and feedback	Frequency		1	18	13	28	4.13	0.827
		Percentage		2%	30%	22%	47%		
5.	Excessive tolerance of client on SMMCEs contract non-performance (time and Quality)	Frequency		10	20	16	14	3.57	0.713
		Percentage		17%	33%	27%	23%		
Grand								3.93	0.785

Table 26 presents data on owner/client-related factors affecting quality practices in construction projects undertaken by Small, Medium, and Micro Construction Enterprises (SMMCEs). Respondents rated the client's less focus on quality as having medium to high

importance, with $R=0.707$ and a mean score of 3.53. This suggests that the client's prioritization of quality can significantly influence quality practices in construction projects. When clients prioritize quality, it fosters a culture of excellence and accountability throughout the project.

The client's delay in contractor payments and decisions was rated as having medium to very high importance, with $RII=0.863$ and a mean score of 4.32. Delays in payments and decision-making processes can disrupt project timelines and cash flows, impacting the ability of SMMCEs to maintain quality practices and meet project requirements.

Respondents rated the lack of good communication and understanding between the client and other stakeholders as having medium to high importance, with a mean score of 4.08. Effective communication and collaboration among stakeholders are essential for aligning expectations, addressing concerns, and resolving issues promptly, which are crucial for maintaining quality practices in construction projects.

Poor monitoring and feedback were rated as having medium to high importance, with a $RII=0.827$ and mean score of 4.13. Effective monitoring and feedback mechanisms enable stakeholders to track project progress, identify deviations from quality standards, and take corrective actions promptly, contributing to the overall quality of construction projects.

The excessive tolerance of the client on SMMCEs contract non-performance was rated as having medium importance, with $RII=0.713$ and a mean score of 3.57. While some tolerance may be necessary, excessive leniency can undermine accountability and incentivize non-performance, potentially compromising project quality and timelines. Summary The interpretation of the data highlights the significant impact of owner/client-related factors on quality practices in construction projects undertaken by SMMCEs. Clients' focus on quality, promptness in payments and decisions, effective communication and understanding, monitoring and feedback, and appropriate tolerance levels all play crucial roles in shaping the quality outcomes of construction projects. Addressing these factors requires collaborative efforts among stakeholders to foster a culture of quality, transparency, and accountability throughout the project lifecycle.

4.3.6 Effect of Site supervision related factors

The Site supervision related factors are ranked according to their level of importance for quality by the respondents as shown in Table 27

Table 27: Site supervision related-factors

F. Site supervision related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1	Inadequate site inspection, feedback and consultation	Frequency		2	10	18	30	4.27	0.85
		Percentage		3%	17%	30%	50%		
2	Lack of experience of site supervisors on quality control practice	Frequency		8	11	16	25	3.97	0.79
		Percentage		13%	18%	27%	42%		
3	Lack of good on-site communication skill of site supervisor	Frequency		2	15	18	24	4.08	0.82
		Percentage		3%	25%	30%	40%		
4.	Deley on decision making, /approval of payment certificates, shop drawings, work permits, material quality, work orders and etc./	Frequency			13	16	31	4.30	0.86
		Percentage			22%	27%	52%		
Grand									0.83

Source: Data collected by the researcher through Questionnaire, 2024

Table 27 Shows that the most critical factor is the delay in decision-making and approvals (RII 0.86), with 52% of respondents rating it as very high important. Inadequate site inspection, feedback, and consultation follow closely (RII 0.85), with 50% rating it as very high important. The lack of good on-site communication skills of site supervisors is also significant (RII 0.82), with 40% considering it very high important. Lastly, the lack of experience of site supervisors in quality control practices, while still important, has a slightly lower impact (RII 0.79), with 42% rating it as very high important. The grand RII of 0.83 indicates the overall high importance of effective site supervision, emphasizing the need for timely decision-making, thorough inspections, good communication, and experienced supervision to ensure high-quality construction practices.

4.3.7 The Effect of Projects on Quality Practice of Construction projects undertaken by SMMCE

The complexity of the project and the accessibility of the project site. These factors are assessed based on their perceived importance by construction professionals engaged in building construction projects undertaken by SMMCEs.

Table 28: Project Related factors

G. Project related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1	Complexity of project	Frequency		2	25	19	14	3.75	0.75
		Percentage		3%	42%	32%	23%		
2	Location of the project (Difficulty to access the project site)	Frequency		1	18	13	28	4.13	0.83
		Percentage		2%	30%	22%	47%		
Grand									0.788

Source: Data collected by the researcher through Questionnaire, 2024

Table 28 presents data on project-related factors affecting quality practices in building construction. Respondents rated the complexity of the project as having medium to high importance, with RII=0.75 and a mean score of 3.75. Complex projects present unique challenges in terms of design, execution, and coordination, which can impact quality practices. Managing complexity requires careful planning, skilled workforce, and effective project management strategies to ensure quality outcomes.

The location of the project, particularly difficulty in accessing the project site, was rated as having medium to high importance, with RII=0.83 and a mean score of 4.13. Accessibility issues can hinder logistics, transportation of materials, and workforce mobility, affecting project efficiency and quality. Overcoming location challenges requires innovative solutions and meticulous planning to maintain quality standards despite site constraints.

4.3.8 The Effect of Contract on Quality of Construction projects undertaken by SMMCE

Owners should be able to prepare adequate, clear, complete, and comprehensive contract documents, which include completed drawings, specifications, and contract conditions with fair responsibilities distribution. Insufficiency or incompleteness of these documents is identified as contributing factor for the inaccuracy of cost, time, and quality achieving problem. Contract documents consist of so many things like for example quality control prices. These prices are for obtaining samples; performing contractor quality control testing; performing tests for contractor quality control testing; performing tests for contractor process control; providing inspection; exercising management control; submitting a written control quality Plan, maintaining control charts; submitting the records, and certifications; and furnishing labor, materials, tools, equipment, and incidentals necessary to complete the work. So, these costs help the contractors to keep the quality of construction. Contract related factors are ranked as shown in Table 29

Table 29: Contract related factors affecting quality practice

H. Contract related factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1.	Fixed rate tendering approach affects SMMCEs quality performance	Frequency		10	19	16	15	3.60	0.720
		Percentage		17%	32%	27%	25%		
2.	Bad relationship of parties involved in contract	Frequency		3	15	12	30	4.15	0.830
		Percentage		5%	25%	20%	50%		
Grand								3.88	0.775

Source: Data collected by the researcher through Questionnaire, 2024

The above Table 29 Shows the clear written contract with fair responsibilities distribution was ranked first with RII=0.79. A clear and fair written contract conditions with non-ambiguous responsibilities distribution is essential for the active participation of parties. The second-ranking is given to the relationship between parties involved in the contract and using standard contract both with the RII=0.76. The construction works need the cooperation and works of different bodies as stated on the contract of a project and to make this cooperation workable and make the environment good for work the relationship between parties should be free from conflict.

4.3.9 The Effect of Legal and policy factors on Quality of Building Construction

Table :30 Legal-policy related-factors

I. Legal and policy factors		Statistics	very Low Important	Low important	Medium important	high Important	Very high important	Mean	RII
1.	Gaps on existing manpower Requirements(criteria) for professional licensing at Construction authority	Frequency		18	10	19	13	3.45	0.690
		Percentage		30%	17%	32%	22%		
2.	Targeted Procurement method of SMMCEs during tendering	Frequency		13	22	15	10	3.37	0.673
	limits fair competition and better-quality performance	Percentage		22%	37%	25%	17%		
3.	Wrong doing, kickbacks and fraud practice in process of SMMCEs formation and licensing	Frequency		2	12	18	28	4.20	0.840
		Percentage		3%	20%	30%	47%		
4.	Lack of motivations, trainings and capacity building programs for SMMCEs by concerned authorities.	Frequency		0	16	12	32	4.27	0.853
		Percentage		0%	27%	20%	53%		
Grand								3.82	0.764

Source: Data collected by the researcher through Questionnaire, 2024

Table 30 presents that the impact of legal and policy-related factors on the quality of building construction undertaken by SMMCEs, reveals that the most significant factor is the lack of training and capacity-building programs for SMMCEs, with a high mean score of 4.27 and RII of 0.853, indicating that 53% of respondents find this very highly important. Corruption and fraud in the formation and licensing processes also pose a substantial challenge, reflected by a mean score of 4.20 and an RII of 0.840, with 47% considering it very highly important. Gaps in manpower requirements for professional licensing and targeted procurement methods that limit fair competition are also notable

concerns, with mean scores of 3.45 (RII 0.690) and 3.37 (RII 0.673) respectively. The grand RII of 0.764 underscores the overall importance of these factors, emphasizing the need for regulatory improvements, fair procurement practices, and robust training programs to enhance the quality of building construction projects.

4.3.10 Main Factors Affecting Quality Practice of Construction projects undertaken by SMMCEs

The factors affecting the quality of the construction process are the components of construction inputs and processes. These factors affect the construction projects or express the defect and faulty work that occurred because of those factors, especially some have a great effect on construction projects that are the reason the relative importance index is high. These main factors affecting quality rank are extracted from the sub-factors affecting quality after calculating the grand mean from the sub-factors means as shown in the following table 31

Table 31: Main factors affecting quality practice

Rank	Item	Grand Mean Value	RII
1 st	SMMCE contractor related	4.27	0.854
2 nd	Labor related	4.21	0.846
3 th	Design Related	4.18	0.838
4 st	Material Related	4.16	0.832
5 th	Site supervision related	4.15	0.830
6 th	Project related factors	3.94	0.788
7 th	Client related factors	3.93	0.785
8 th	Contract Related	3.88	0.775
9 th	Legal and policy related	3.82	0.764

Source: Data collected by the researcher through Questionnaire, 2024

From the above ranking table 31, it can be inferred that SMMCE contractor related, labor, and design related issues are of very high significance in the overall construction activities in the projects undertaken by SMMCE, whereas contract related and legal-policy related issues are the least in the priority matrix. The first ranking factor is the design-related factor (RII=0.854), this indicates that seven sub-factors under this category impacted much the quality performance of projects executed by SMMCEs. Among these sub factors financial

conditions, quality training for staffs and understanding and team work between SMMCE members have more influence in priority matrix respectively, Secondly, labor-related factors are ranked with a relative importance factor of 0.846. This shows the labor force also affects the project. In this category availability of skilled labor affects the quality of construction projects the most. This is because of SMMCEs contractors cannot compete with bigger construction firms, since the SMMCEs have not such financial flexibility to secure good wage and intensives for good skilled daily labors. Thirdly, ranking factor is the design-related factor ($R_{II}=0.838$), this indicates design document, bill of quantities and specification documents should be prepared in detail and they should be consistent with each other. As stated in the literature review the level of effort taken by designers to make design full and consistent was very important for project success. The fourth main factor affecting quality practice is material- related factors (0.832). Shortage of construction material and price escalation, proper storage, handling and testing practice has a great effect on the quality of construction. The factors were subsequently followed by Site supervision related -related with $R_{II}= (0.788)$; Project-related (0.788); Client-related (0.785); contract-related (0.775); Legal and policy related (0.764).

4.4 Analysis of results from case study

The case study was done to observe the quality control practices of SMMCE contractors on some specific activities of the project and to compare with standard working procedures and requirements. To achieve this objective three building construction projects in East Shewa zone and Arsi Zone of Oromia regional state where there is ongoing concrete work is selected after discussion with site supervisors from urban development offices. According, the results from onsite observations, existing site records and open-ended questionnaires are recorded in data recording formats. The questions were developed based on requirements of MUDHC 2014 standard technical specifications.

Table 32: Documentation requirement on site

Projects	Design drawings		Standard Specifications Documents		Copy of approved Work schedule.		Health and Safety Plan and other Safety related documents.	
	Yes	No	Yes	No	Yes	No	Yes	No
Project -1 location East Shewa zone	Yes			No		No		No
Project -2 location East Shewa zone	Yes			No		No		No
Project-3 location Arsi Zone	Yes			No		No		No

Source: Data collected by the researcher through case study, 2024

Table 31. shows that all three projects have the necessary design drawings available on site or on the contractor documentation. None of the projects have the standard specifications documents available on site. Standard specifications documents outline the specific requirements and standards for construction materials, methods, and quality control procedures. The absence of these documents may hinder the ability to ensure compliance with industry standards and best practices.

None of the projects have a copy of the approved work schedule available on site. Having an approved work schedule is crucial for planning and coordinating construction activities, ensuring that work progresses efficiently and according to the project timeline. None of

the projects have the health and safety plan or other safety-related documents available on site. These documents are essential for promoting and maintaining a safe working environment, identifying potential hazards, and implementing appropriate safety measures to protect workers and mitigate risks.

In general, while all three projects have the necessary design drawings available on site, there are deficiencies in meeting other documentation requirements as per MUDHC 2014 standards. The absence of standard specifications documents, approved work schedules, and health and safety plans may pose challenges to ensuring compliance with industry standards, effective project planning, and maintaining a safe working environment. Addressing these documentation gaps is essential for promoting project quality, efficiency, and safety.

Table 32: Material quality test requirements

Projects	Sand quality test		Coarse aggregate quality test		Reinforcement quality test		HCB quality test		Backfill material test	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Project 1 location East Shewa zone		No		No		No	Yes			No
Project 2 location East Shewa zone		No		No		No		No		No
Project 3 Location Arsi Zone		No		No		No		No		No

Source: Data collected by the researcher through case study, 2024

Table 32: Indicates that None of the projects have conducted the required material quality tests as per the MUDHC 2014 standards, except for Project 1, which conducted the HCB quality test. Sand quality tests, coarse aggregate quality tests, reinforcement quality tests, and backfill material tests were not conducted for any of the projects. Conducting these material quality tests is essential to ensure that the construction materials meet the required standards and specifications.

Table 33: concrete quality control requirements

Projects	Mix design for required concert grade		Concrete Cube samples during concrete casting		Ingredient proportioning tools(box)	
	Yes	No	Yes	No	Yes	No
Project 1 location East Shewa zone		No		No	Yes	
Project 2 location East Shewa zone		No		No		No
Project 3 Location Arsi Zone		No		No	Yes	

Source: Data collected by the researcher through case study, 2024

Table 33: - shows that None of the projects have conducted the mix design for the required concrete grade or taken concrete cube samples during concrete casting. However, Project 1 and Project 3 have used ingredient proportioning tools (box). These tools are essential for ensuring the correct proportioning of ingredients, which is crucial for maintaining the quality and strength of the concrete used in construction projects. Proper adherence to concrete quality control requirements helps in ensuring the structural integrity and durability of the constructed buildings.

Generally, from the above case study data it can be seen that on construction projects undertaken by SMMCEs the level of quality control practice is very poor. It doesn't comply with requirements on standard working document used widely referred for building construction projects in Ethiopia (MUDHC 2014). Moreover, the level of awareness of SMMCEs members on practical quality control and working on standard specification manuals is found to be low.

4.5 Framework for better Quality Management Practices of projects undertaken by SMMCEs

The above questioner survey, interview and case study results highlights several key areas where improvements can be made to enhance the quality practices in construction projects undertaken by Small and Medium-sized Construction Enterprises (SMMCEs). Based on the findings, the following improvement factors can be identified:

4.5.1 Strengthening Contractor-related Issues:

To bolster contractor-related issues, it is imperative to institute a multifaceted approach aimed at enhancing the capabilities and collaboration among SMMCE contractors. Firstly, comprehensive training programs should be developed and implemented to provide SMMCE contractors with in-depth knowledge and understanding of quality management principles and practices. These programs should cover various aspects of quality assurance, quality control, and quality improvement methodologies tailored to the construction industry context. Additionally, fostering a culture of collaboration and knowledge-sharing among SMMCE members is essential. This can be achieved through establishing platforms such as workshops, seminars, and online forums where contractors can exchange insights, experiences, and best practices. Encouraging the formation of collaborative networks and partnerships among SMMCEs can also facilitate the sharing of resources, expertise, and project opportunities, ultimately enhancing teamwork and efficiency in project execution. By investing in training and fostering collaboration, SMMCEs can strengthen their capacity to deliver high-quality construction projects effectively and efficiently.

4.5.2 Enhancing Labor-related Factors:

Addressing the challenges of labor availability and skills shortage requires a proactive and strategic approach from SMMCEs. Firstly, investing in training programs and workforce development initiatives is crucial. SMMCEs can collaborate with industry experts, consultants, or training organizations to design and implement customized training programs tailored to the specific needs of their workforce. These programs can encompass a wide range of skill development areas, including technical skills related to construction techniques, safety protocols, and the use of modern construction equipment, as well as soft skills such as communication, problem-solving, and teamwork. By providing continuous training and upskilling opportunities, SMMCEs can enhance the capabilities and competencies of their workforce.

Moreover, exploring partnerships with vocational training institutions presents another viable strategy to address labor shortages and skill gaps. SMMCEs can collaborate with these institutions to develop apprenticeship programs, internship opportunities, or vocational training courses specifically designed to equip individuals with the necessary skills and knowledge required for employment in the construction industry. These partnerships can also facilitate knowledge transfer and technology adoption, as vocational training institutions often possess expertise in emerging construction techniques and technologies. By tapping into the talent pool provided by vocational training institutions, SMMCEs can access a steady stream of skilled labor, thereby mitigating the impact of labor shortages and strengthening their workforce capacity for future projects.

4.5.3 Improving Design-related Practices:

Emphasizing the importance of detailed design documentation is critical for ensuring the success and quality of construction projects undertaken by Small and Medium-sized Construction Enterprises (SMMCEs). Detailed design documentation serves as the blueprint for the entire construction process, providing clear instructions and specifications for the implementation of the project. Consistency between design drawings, bill of quantities, and specifications is essential to avoid discrepancies, misunderstandings, and costly errors during construction. By ensuring consistency, SMMCEs can minimize the risk of rework, delays, and disputes, thereby enhancing project efficiency and reducing overall project costs.

To support this emphasis on detailed design documentation, SMMCEs should provide adequate support and resources to designers to enhance their capacity to produce high-quality design documents. This can involve investing in design software, tools, and training programs to enable designers to create accurate, comprehensive, and technically sound design drawings, specifications, and bill of quantities. Additionally, SMMCEs can foster collaboration between designers, engineers, and other stakeholders involved in the design process to ensure that all aspects of the project are considered and addressed effectively. By empowering designers with the necessary support and resources, SMMCEs can elevate the quality and accuracy of their design documentation, laying a solid foundation for successful project execution and delivery.

4.5.4 Addressing Material-related Challenges:

Implementing measures to mitigate the impact of material shortages and price escalations is essential for ensuring the smooth progress and quality of construction projects undertaken by Small and Medium-sized Construction Enterprises (SMMCEs). One effective strategy is to diversify suppliers by establishing relationships with multiple vendors for key construction materials. This helps reduce reliance on a single supplier, mitigating the risk of disruptions

due to shortages or fluctuations in prices.

Furthermore, strengthening material testing and quality control processes is crucial to ensure that construction materials meet the required standards and specifications. SMMCEs should implement rigorous testing procedures to verify the quality and performance of materials before they are used in construction. This may involve conducting tests for properties such as strength, durability, and composition to ensure compliance with industry standards. Additionally, SMMCEs should invest in qualified personnel and equipment to carry out these tests accurately and efficiently. By enhancing material testing and quality control processes, SMMCEs can minimize the risk of using substandard materials, thereby improving the overall quality and durability of their construction projects.

4.5.5 Increasing Awareness of Legal and Policy Requirements:

Providing training and awareness programs on legal and policy requirements relevant to construction projects is crucial for Small and Medium-sized Construction Enterprises (SMMCEs) to ensure compliance and mitigate risks. These programs should cover various aspects such as building codes, safety regulations, and environmental standards. Through comprehensive training, SMMCEs can educate their staff about the legal framework governing construction activities, including relevant laws, regulations, and industry standards. This helps ensure that all personnel involved in construction projects understand their responsibilities and obligations, thereby reducing the likelihood of non-compliance and potential legal issues.

In addition to training, fostering partnerships with regulatory authorities can further support SMMCEs in navigating complex regulatory requirements. By collaborating with regulatory agencies, SMMCEs can gain access to valuable resources, guidance, and support to facilitate compliance with applicable laws and regulations. Regulatory authorities can provide assistance in interpreting and implementing regulatory requirements, offering advice on best practices, and conducting inspections to ensure compliance. Establishing these partnerships enables SMMCEs to stay informed about changes in regulations and proactively address compliance issues, ultimately reducing the risk of penalties, fines, and project delays. Overall, by providing training and fostering partnerships with regulatory authorities, SMMCEs can enhance their compliance efforts, mitigate legal risks, and promote a culture of regulatory compliance within their organizations. This proactive approach not only helps ensure the success of individual construction projects but also contributes to the long-term sustainability and reputation of SMMCEs in the construction industry.

4.5.6 Strengthening Documentation and Record-keeping Practices:

Establishing robust documentation and record-keeping systems is essential for Small and Medium-sized Construction Enterprises (SMMCEs) to effectively manage project information and ensure accountability. These systems should encompass various aspects of project documentation, including contracts, design drawings, specifications, permits, change orders, and correspondence. By maintaining comprehensive documentation, SMMCEs can track project progress, monitor compliance with requirements, and resolve disputes or claims that may arise during construction.

To ensure the availability and accessibility of essential project documents, SMMCEs should implement procedures for organizing, storing, and retrieving documents in a systematic manner. This may involve digitizing documents and utilizing document management software to centralize project information and facilitate easy access for project stakeholders. Furthermore, SMMCEs should establish procedures to regularly review and update documentation to reflect changes in project requirements and specifications. This includes documenting any modifications, revisions, or deviations from the original project plans and ensuring that all stakeholders are informed of these changes. By maintaining accurate and up-to-date documentation, SMMCEs can minimize the risk of errors, omissions, or misunderstandings that may impact project quality, schedule, or budget.

Overall, by implementing robust documentation and record-keeping systems and regularly reviewing and updating project documentation, SMMCEs can enhance transparency, accountability, and project management efficiency. This proactive approach not only helps mitigate risks and ensure compliance with project requirements but also facilitates effective communication and collaboration among project stakeholders, ultimately contributing to the success of construction projects undertaken by SMMCEs.

4.5.7 Promoting a Culture of Quality Excellence:

Cultivating a culture of continuous improvement and quality excellence within Small and Medium-sized Construction Enterprises (SMMCEs) is essential for driving excellence in project delivery and ensuring long-term success. This begins with leadership commitment to quality, where company leaders set the tone for prioritizing quality in all aspects of operations. Leadership should actively champion quality initiatives, allocate resources for training and development, and lead by example in demonstrating a commitment to continuous improvement.

Employee engagement is equally vital in fostering a culture of quality excellence. SMMCEs should involve employees at all levels in quality improvement efforts by encouraging

feedback, soliciting ideas for process enhancements, and empowering employees to take ownership of quality outcomes. This can be achieved through regular communication, training programs, and creating a supportive work environment where employees feel valued and motivated to contribute to quality objectives.

Additionally, recognizing and celebrating achievements in quality management is key to reinforcing positive behaviors and motivating employees to strive for excellence. SMMCEs can establish recognition programs to acknowledge individuals or teams that demonstrate outstanding commitment to quality practices or achieve significant quality milestones. Celebrating successes not only boosts morale but also reinforces the importance of quality in achieving project success.

Furthermore, SMMCEs should actively participate in industry-wide quality initiatives and pursue relevant certifications to benchmark their performance against industry standards and best practices. By engaging with industry peers, attending conferences, and participating in professional associations, SMMCEs can stay informed about emerging trends, technologies, and quality management practices. Pursuing certifications such as ISO 9001 for quality management systems demonstrate a commitment to excellence and can enhance the credibility and reputation of SMMCEs in the marketplace. By addressing these improvement factors and fostering a culture of continuous improvement, quality excellence, and employee engagement, SMMCEs can elevate their quality practices, deliver superior project outcomes, and establish themselves as leaders in delivering high-quality construction projects.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Conclusions are drawn from the study by combining the gathered data, discussions, and remedial measures to what should be done to the problems. The following conclusions are drawn from the investigation undertaken in the study based on the research objectives.

- SMMCE contractors perceive quality management systems (QMS), as too costly to implement and doubts their feasibility for small firms.
- There is no implementation of formal quality management process is reported. The main reasons stated highlighting the perceived costliness of implementing formal quality management frameworks. Additionally, factors such as lack of awareness (6.52%) and less demand from customers/owners (6.52%) further contribute to the low adoption rate of quality management systems among surveyed organizations.
- The practice and understanding of standard specification documents are low on SMMCEs. Among respondents, the majority (48%) relied on the Bill of Quantities and Design Drawings only as the bases of specification requirements. This underscores the importance of clear and comprehensive documentation in conveying project requirements and standards to stakeholders.
- The project quality control practice across surveyed projects undertaken by SMMCE is poor and it doesn't comply with standard quality control procedures. Moreover, a finding from case study reveals that most SMMCE members are not familiar with requirements of concrete mix design and concrete cube conformance tests.
- The SMMCE firms do not provide trainings on quality and other skill related courses and don't have an assigned person responsible for implementing quality control manager for quality control and there is a rare stakeholder communication engagement for quality improvement
- SMMCE contractor-related factors, labor-related factors, and design-related factors found to be the primary influencers in building construction projects undertaken by Small and Medium-sized Construction Enterprises (SMMCEs). With relative importance indices (RII) of 0.854, 0.846, and 0.838 respectively, these factors underscore the critical aspects of contractor capabilities, labor management, and design precision.

- Implementation of training and capacity-building initiatives for SMMCEs, addressing challenges associated with labor availability and skills shortages and working on the quality of design documents are the suggested improvement factors.

5.2 RECOMMENDATIONS

The study findings underscore the critical need for enhancing quality practices in construction projects undertaken by Small and Medium-sized Construction Enterprises (SMMCEs). To address this, the following recommendations emerge.

- It's essential to provide comprehensive training and support to SMMCE contractors, enabling them to grasp and implement effective quality management principles. Additionally, fostering collaboration and good understanding among SMMCE members can significantly enhance teamwork and project efficiency. Also, emphasis should be given to improve financial capacity of SMMCEs by facilitating early payments and credit facility lines.
- Tackling challenges related to labor availability and skills shortage requires proactive measures, including investing in training programs and forging partnerships with vocational training institutions to bolster the skilled labor pool.
- Cultivating a culture of continuous improvement and quality excellence within SMMCEs, supported by leadership commitment and government engagement, is paramount. Recognizing achievements in quality management and encouraging participation in industry-wide quality initiatives can further drive improvements.
- Emphasizing the importance of detailed design documentation and providing support to designers to produce high-quality documents are crucial for ensuring project success.

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Appendix-A

Questionnaires

Adama Science and Technology
University School of Civil Engineering and Architecture
Office of Graduate Studies
Department of Civil Engineering

This questionnaire is filled by selected respondents from professionals who have been participated on public building construction projects undertaken by **Small, medium and micro construction enterprises (SMMCE) in Arsi and East Shewa zones of Oromia Regional State.**

Dear Respondents:

This questionnaire is designed to collect information regarding to the Quality Management practice of SMMCEs and on public building construction projects undertaken by Small, medium and micro construction enterprises (SMMCE) in the Arsi and East Shewa zones of Oromia Regional State. Moreover, the study will contribute towards the fulfillment of the researcher's Degree of Masters of Construction Technology and Management. I kindly ask you in all regard to fill the questionnaire carefully at your best knowledge. The accuracy of information you provide determines the ultimate reliability of the study.

Note: All information provided in this survey will be treated as strictly confidential, no companies or individuals will be identified in any subsequent research report, and all information collected will be used purely for the purposes of academic research.

Contact Address: Yassin Kedir Hussein

Tel: - +251 906321435

Mail: - miccituu@gmail.com

Thank you in advance for your cooperation and timely response!

SECTION I: Demographic Information's

This section helps the researcher to know educational background and work experience profile of the participants

Please put a tick mark “√” the one that represents you most appropriately.

1. Which of the following best describes your role in the construction project?

- ☐ Project manager
- ☐ Site Engineer
- ☐ Other members of SMMCE
- ☐ Site supervisor (from government offices)
- ☐ Resident engineer

2. Gender

- ☐ Male
- ☐ Femele
- ☐ Prefer not to say

3. Educational background

- ☐ Architect
- ☐ Civil engineering
- ☐ Construction management
- ☐ Surveyor
- ☐ Hydraulic/Irrigation
- ☐ Others (please specify)

4. Highest level of qualification

- ☐ Collage diploma
- ☐ First Degree
- ☐ Master's degree and above
- ☐ High school complete
- ☐ TVET Level
- ☐ Other (please specify)

5. Your total work experience in construction industry

- ☐ Less than 5 years
- ☐ 6-10 years
- ☐ 11-15 years
- ☐ 16 years and above

SECTION II: Basic Information Regarding Quality concept and Quality Management implementation practice

This section helps the researcher to identify basic information regarding to **perception on concepts of quality management** and **the level of its implementation** on construction projects undertaken by SMMCEs.

Please put a tick mark “√” the one that represents you most appropriately.

1. In your perspective, which one of the following words can best define Quality?

☐ Conformance to specifications	☐ Meeting customer expectation
☐ Doing without defect	☐ Luxury
☐ Beauty	☐ Others _____
2. What is your organization ‘s perception of quality management system?

☐ A useful management system for success of any construction activity but expensive to implement in Small sized construction firms like SMMCEs
☐ A useful management system for success of any construction activity which can be implemented reasonably in any construction firms.
☐ Others (please specify): _____
☐ Prefer not to say
3. Please put a **tick mark** “√”in the appropriate column according to the degree of Priority given for the following factors in your construction project

Factors		Very Low	Low	Medium	High	Very High
1.	Meeting Project Cost Budget					
2.	Meeting Quality Requirements					
3.	Meeting Project Time / Deadline					

4. Did you implement a formal quality management system (like ISO-9001, Total QMS and etc.) in your organization/ construction project?

☐ Yes	☐ Prefer not to say
☐ No	
5. If **no**, what is the reasons for not implementing formal quality management system in your organization/ construction projects?

☐ it is not something expected in SMMCEs and smaller construction projects
☐ It is too expensive
☐ Lack of knowledge on implementation
☐ Lack of awareness about its importance
☐ Less demand from customers /owners
☐ Prefer not say

6. When working on your construction projects, did you use quality plans?

☐ Yes

☐ Prefer not say

☐ No

7. What is the standard specification document referred on your construction project?

☐ MUDHC 2014

☐ Bill of quantities and Design drawings

☐ ERA 2014

☐ Prefer not to say

☐ BaTCoDA

☐ Other

8. Please put a tick mark “√” the **Yes** or **No** that represents you most appropriately?

No.	Description on Some quality control mechanisms	Yes	No	Comment
1	Have you ever used inspection check lists in your construction project			
2	Have you ever conducted material quality tests on samples before delivering to site.			
3	Did you prepare mix design for concrete before concrete casting			
4	Did you take concrete cube samples during casting to check the quality conformance of concrete.			

9. Is there a quality manager who is responsible for executing Quality Plans and Checklists on your construction project?

☐ Yes

☐ No

☐ Prefer not to say

10. Have you ever been discussed about quality improvement with stake holders in your current project?

☐ Yes

☐ No

☐ Prefer not to say

11. Have you ever taken trainings in any form of quality management system

☐ Yes

☐ No

☐ Prefer not to answer

SECTION III: Main Factors affecting construction quality management practice in projects undertaken by SMMCEs

This section helps the researcher to identify the **major factors affecting quality management practice** on construction projects undertaken by **SMMCE**.

Please identify the degree of factors affecting quality management practice in your construction project by ticking (✓) the appropriate box. Very high = 5 High = 4 Medium =3 Low =2 Very Low = 1

A. Project related factors		Very Low	Low	Medium	High	Very High
1	Complexity of project					
2	Location of the project (Difficulty to access the project site)					
B. Design related factors		Very Low	Low	Medium	High	Very High
1	preparation of drawings, bill of quantities and specification document in full detail					
2	Incompleteness and Inconsistency of design documents and bill of quantities					
C. Contract related factors		Very Low	Low	Medium	High	Very High
1	Fixed rate tendering approach affects SMMCEs quality performance					
2	Wrong doing in tendering and bad relationship between contracting parties					
D. Material related factors		Very Low	Low	Medium	High	Very High
1	Shortage of construction material and price escalation					
2	Poor material storage and handling system					
3	Poor material quality testing practice					
E. SMMCE contractor related factors		Very Low	Low	Medium	High	Very High
1	Awareness of SMMCEs of (founding members) towards Quality management					
2	Lack of technical experience of members of SMMCEs.					
3	Limited Financial conditions of SMMCEs					
4.	Lack of well-defined organizational structure of SMMCEs					
5.	Dispute and lack of mutual understanding between members of SMMCE					
6.	communication skill of SMMCEs members with other stake holders,					
7.	Lack of training for staffs on quality and other project/contract related topics					

F. Labor related		Very Low	Low	Medium	High	Very High
1	Shortage of experienced skilled labors					
2	Lack of labors communication Skills					
3	Motivation and trainings on quality and construction skills					
G. Legal and policy factors		Very Low	Low	Medium	High	Very High
1	Gaps on existing manpower Requirements(criteria) for professional licensing at Construction authority					
2	Targeted Procurement method of SMMCEs during tendering limits fair competition and better-quality performance					
3	Wrong doing, kickbacks and fraud practice in process of SMMCEs formation and licensing					
4	Lack of motivations, trainings and capacity building programs for SMMCEs by concerned authorities.					
H. Owner/Client related factors		Very Low	Low	Medium	High	Very High
1	The client's less focus on quality for projects undertaken by SMMCE					
2	The client's delay in contractor payments and on decisions like approval of variations and change in modifications etc.					
3	Lack of good communication and understanding between client and other stakeholders					
4	Poor Monitoring and feedback					
5	Excessive tolerance of client on SMMCEs contract non- performance (time and Quality)					

I. Site supervisory/consultant related factors		Very Low	Low	Medium	High	Very High
1	Inadequate site inspection, feedback and consultation					
2	Lack of experience of site supervisors on quality control practice					
3	Lack of good on-site communication skill of site supervisor					

Appendix-B

List of active building construction projects undertaken by SMMCEs in East Shewa zone

No.	Name of project	project cost	SMMCE Size
1	Ij/W/dhimmaa Dub fi Daa'immaanii ,Komiikeeshinii fi W/Maallaqa	27,007,886.00	Small
2	Basic Health post	18,469,221.00	Small
3	Ijaarsa Keellaa Fayyaa Dhalootaa 2ffaa	18,299,221.34	Small
4	Basic Health Post	18,299,221.34	Small
5	Basic health post	18,299,221.34	Small
6	Basic health post	18,116,642.20	Small
7	Sheedi lukku lot 3	17,968,368.00	Small
8	Ijaarsa Galma Walgahii	12,599,475.00	Small
9	Ij/Galma Guddaa Aanaa Dugdaa	6,100,000.00	Micro
10	Dallaa City Paarkii	5,810,295.00	Micro
11	Sheedii Beekarii	5,687,616.00	Micro
12	Ijaarsa Daree Dabalataa Barnootaa	5,345,416.00	Micro
13	Daree Dabalata	4,915,166.00	Micro
14	Daree Dabalata	4,915,166.00	Micro
15	Daree Dabalata	4,915,166.00	Micro
16	kutaa dabalataa m/b/ Gooroo	4,875,165.13	Micro
17	Dallaa B/Fayyaa	4,618,024.00	Micro
18	mana Baumsa Bu'uura Booru	4,618,023.75	Micro
19	M/J/B/Basaqaa	4,599,972.00	Micro
20	Ijaarsa Sheedii Gabaa block 1	4,458,240.00	Micro
21	Ijaarsa Sheedii Gabaa 2	4,458,240.00	Micro
22	Ijaarsa Furdisaaa fi sheedii lukku	4,334,000.17	Micro
23	Mana jireenya	3,213,006.00	Micro
24	Mana jireenya	3,213,006.00	Micro
25	Ijaarsa Dallaa M/Qopheessaa Eelaa	3,010,929.00	Micro
26	ijaarsa compiherensive health post	2,164,979.88	Micro
27	Suphaa Faarmaasii	2,110,001.00	Micro
28	Manaa Fincaanii	1,985,040.00	Micro
29	Ijaarsa Sheedii block 7	1,914,131.00	Micro
30	Ijaarsa Sheedii block 7	1,914,131.00	Micro
31	Sheedi lukku lot 2	1,725,071.52	Micro
32	Suphaa waajjira fayyaa	1,461,303.73	Micro
33	ijaarsa sheedii kutaa sadii fi tirazoo	1,461,088.41	Micro
34	Sheedi kuta	1,430,866.12	Micro
35	ijaarsa sheedii kutaa jahaa	1,426,503.67	Micro
36	Ij/Mana Fincaanii W/ra Bulchiinsaa	1,423,593.00	Micro
37	Sheedi lukku lot 1	1,335,094.46	Micro
38	Ijaarsa God-Ambaa suphaa	1,321,545.00	Micro
39	Wajjira dhimma dubartii fi da'immanii	1,281,279.34	Micro
40	Cattle Crush Karfee fi Kataba	1,244,312.48	Micro
41	Suphaa waajjira Poolisii	1,167,529.09	Micro
42	Cattle Crush Baqale Girisaa fi Xeephoo Corroqee	1,134,991.47	Micro
43	Daree dabalaata MB sad Haafaa Raasa	1,000,000.00	Micro
44	Ijaarsa Dallaa fi suphaa waajjira AbbaaAalangaa	979,006.92	Micro
45	ijaarsaa dallaa wajjiraa	919,047.00	Micro
46	Ijaarsa Sheedii	800,000.00	Micro
47	Sheedi lukku lot 4	764,057.95	Micro
48	Suphaa Mooraa Gabaa Loonii	698,079.00	Micro
49	dallaa fi kutaa waardiyyaa waajjira maallaqaa aanaa Lumea	606,530.25	Micro
50	Sheedi kuta 2	600,000.00	Micro
51	ijarsaa dalla qeeraa	400,000.00	Micro

Appendix-C

Cronbach Alpha values

a) SMMCE contractor related factors

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.754	.714	7

```
GET
FILE='C:\Users\User\Desktop\Yssin
kedir.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
RELIABILITY
/VARIABLES=Smnc Smex Smfin Smtrain Smdisp
Smorg Smawer
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=CORR
/SUMMARY=MEANS VARIANCE.
```

b) Design- related factors

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.732	.733	2

```
RELIABILITY
/VARIABLES=DZful Dinco
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
CORR
/SUMMARY=MEANS.
```

c) Material- related factors

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.939	.945	3

```
RELIABILITY
/VARIABLES=MT1 MT2 MT3
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE CORR
/SUMMARY=MEANS.
```

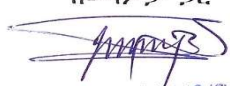
d) Labor- related factors

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.716	.725	3

```
RELIABILITY
/VARIABLES=LB1 LB2 LB3
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
CORR
/SUMMARY=MEANS.
```

Appendix-D

Recommendation letter

P.o.Box1888 Tele:0222110140 Fax:251-221-110038 Email: mesfinbenti@yahoo.com	
	ADAMA SCIENCE & TECHNOLOGY UNIVERSITY አዳማ ሳይንስና ቴክኖሎጂ ዩኒቨርሲቲ
አዳማ - ኢትዮጵያ Adama - Ethiopia ቀን <u>ጳጉሜ 22 2016</u> ቁጥር <u>712-1-214-74/7864</u>	
ለ ሚ መ ለ ከ ተ ው ሁ ሉ	የሲቪል ኢንጅነሪንግና አርክቴክቸር ት/ቤት ዲን ዶ/ር መስፍን በንቲ
ጉዳዩ:- ትብብር መጠየቅን ይመለከታል፤	
ተማሪ ያሲን ከድር በአዳማ ሳይንስና ቴክኖሎጂ ዩኒቨርሲቲ የሲቪል ኢንጅነሪንግ እና አርክቴክቸር ት/ቤት የሲቪል ምህንድስና ት/ክፍል የኮንስትራክሽን ኢንጅነሪንግ እና ማኔጅመንት የ2ኛ ዓመት የMSc ተማሪ ሲሆን የመመረቂያ ጽሑፉን ለመስራት የጽሁፉ ርዕስ “Quality Management Practice: Challenge and Implementation Assessment on Construction Projects Undertaken by Micro, Small and Medium Enterprises in Oromia Regional State” በሚል እየሰራ ስለሆነ አስፈላጊው ትብብር እንዲደረግለት ይህን የድጋፍ ደብዳቤ ሰጥተነዋል፡፡	
	ከሰላምታ ጋር  መስፍን ገብረ (ዶ/ር) የሲቪል ኢንጅነሪንግና አርክቴክቸር ት/ቤት ዲን
ግልባጭ//	
- ለሲ/ኢ/አ/ት/ቤት ዲን - ለያሲን ከድር ኢ.ሳ.ቴ.ዩ	
We are Dedicated to Innovative Knowledge	

Appendix-E

Data From East Shewa construction Authority-Page -1

Pirojektota Bara 2016 Hojjechudhaaf Karoofamee fi Raawwatamee kan Kilaastara Misooma Magaalaa						
T.L	Maqaa Guutuu Pirojektii	Abbaa Pirojektii	Maqaa Mana Hojii Abbaa Pirojektichaa	Turtii Pirojektii		Hanga Baajata Pirojektii(OAR)
				Bara Jalqabame	Yeroo Xumuramu	
						Mootummaa
1	ij/W/dhimmaa Dub fi Daa'immanii	Dhimma Dubartoota fi Daa'immanii	Dhimma Dubartoota fi Daa'immanii	2016	2016	12,599,475.00
2	Basic Health post	Fayyaa	Fayyaa	2016	2016	18,299,221.34
3	Baarsa Dallaa M/Qorbaasaa Ebla	M/Q Waajii	M/Q Waajii	2016	2016	3,010,929.00
4	dallaa fi kutaa waardiyyaa waajjira maallaqaa	Maalaqa	Maalaqa	2016	90	606,530.25
5	aanaa Lume	Barnoota	Barnoota	2016	120	4,875,165.13
6	kutaa dabalataa m/b/ Gooroo	wajjira dhimma dubartii fi da'immanii	wajjira dhimma dubartii fi da'immanii	2016	2016	1,281,279.34
7	Wajjira dhimma dubartii fi da'immanii	Fayyaa	Fayyaa	2016	2016	18,299,221.34
8	Basic health post	Fayyaa	Fayyaa	2016	2016	18,299,221.34
9	Basic health post	Fayyaa	Fayyaa	2016	2016	27,007,886.00
10	Ijaarsa Keellaa Fayyaa Dhaloota 2ffaa	Poolisii	Poolisii	2016	2016	1,167,329.09
11	Suphaa waajjira Poolisii	W/ra Abbaa Alangaa	W/ra Abbaa Alangaa	2016	2016	979,006.92
12	Ijaarsa Dallaa fi suphaa waajjira	M/Q Qooqaa	M/Q Qooqaa	2016	2016	1,426,503.67
13	Ijaarsa sheedii kutaa jahaa	Barnoota	Barnoota	2016	2016	5,345,416.00
14	Ijaarsa Daree Dabalataa Barnootaa	M/Q Qooqaa	M/Q Qooqaa	2016	2016	1,461,088.41
15	Ijaarsa sheedii kutaa sadii fi tirazoo	M/Q Boote	M/Q Boote	2016	2016	800,000.00
16	Ijaarsa Sheedii	Bulchiinsa	Bulchiinsa	2016	2016	890,790,397.00
17	Ijaarsa Gamoo Waajjira Bulchiinsaa	Barnoota	Barnoota	2016	2016	4,915,166.00
18	Daree Dabalata	Barnoota	Barnoota	2016	2016	4,915,166.00
19	Daree Dabalata	Barnoota	Barnoota	2016	2016	4,915,166.00
20	Mana jireenya	Barnoota	Barnoota	2016	2016	3,213,006.00

Data From East Shewa construction Authority-Page -2

21	Mana jireenya	Barnoota	Barnoota	2016	2016	3,213,006.00
22	Basic Health Post	Fayyaa	Fayyaa	2016	2016	18,469,221.00
23	I/A Jara Fincanii W/m Bulchiinsa	Bulchiinsa	Bulchiinsa	2016	2016	1,423,593.00
24	Sheedii Beekarii	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	5,687,616.00
25	Manaa Fincanii	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	1,985,040.00
26	Dejjaa B/Fayyaa	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	4,618,024.00
27	Suphaa Paarmansii	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	2,110,001.00
28	Sheedii lalla qeeraa	M/Q Godhoo	M/Q Godhoo	2016	2016	20,500.00
29	Sheedii an callaa wajjira	M/Q Godhoo	M/Q Godhoo	2016	2016	5,000.00
30	Sheedii an callaa wajjira	M/Q Beekaa	M/Q Beekaa	2016	2016	17,500.00
31	Sheedii lalla qeeraa	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	1,423,593.00
32	Sheedii lalla qeeraa	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	1,423,593.00
33	Ijaarsa Sheedii Gabaa 2	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	4,458,200.00
34	Suphaa Mooraa Gabaa Loomi	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	698,079.00
35	Ijaarsa God-Ambaa suphaa	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	1,321,545.00
36	Manaa Baamsa Bu'uura Booru	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	4,618,023.75
37	Sheedii lukku lot 1	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	1,335,094.46
38	Sheedii lukku lot 2	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	1,725,071.52
39	Sheedii lukku lot 3	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	18,116,642.20
40	Sheedii lukku lot 4	M/Q Matahaaraa	M/Q Matahaaraa	2016	2016	764,057.95
41	Ijaarsa Sheedii block 7	M/Q Maqii	M/Q Maqii	2016	2016	1,914,131.00
42	Ijaarsa Sheedii block 7	M/Q Maqii	M/Q Maqii	2016	2016	1,914,131.00
43	Ijaarsa Furdisaana fi sheedii lukku	Qonna	Qonna	2016	2016	4,334,000.17
44	Ij/Galma Guddaa Aanaa Dugdaa	Bulchiinsa	Bulchiinsa	2016	2016	6,100,000.00
45	Darce dabalaata MB sad Haafaa Raasa	Barnoota	Barnoota	2016	2016	1,000,000.00
46	M/I/B/Basaqaa	Barnoota	Barnoota	2016	2016	4,599,972.00
47	Ijaarsa compihensive health post	Fayyaa	Fayyaa	2016	2016	2,164,979.88
48	Sheedii kuta 2	M/Q Biyyoo Bisiqee	M/Q Biyyoo Bisiqee	2016	2016	600,000.00
49	Suphaa wajiirra fayyaa	Fayyaa	Fayyaa	2016	2016	1,461,303.73
50	Sheedii kuta	M/Q/B/M Olaancitii	M/Q/B/M Olaancitii	2016	2016	1,430,866.12
51	Cattle Crush Karfee fi Kataba	Qonna	Qonna	2016	2016	
52	Cattle Crush Baqale Girisaa fi Xeephoo	Qonna	Qonna	2016	2016	
52	Corroqee	Qonna	Qonna	2016	2016	



Data From East Shewa construction Authority-Page -3

2					
a	2015 E.C				
no					
	Name Of project		project cost		Grade/type
1	Qeera				
2	Ija. Ke.Fayyaa 2nd Jen		2,925,627.00		Micro Interprisi
3	Compresive Health Post		12227733.88		Small Interprizi
4	Sheedii IMX Ijaaruu		18434822.76		Small Interprizi
5	Ijaarsaa Keella Fayyaa Dhaloota Lam		1,389,346.72		Micro Interprisi
			12227733.88		Small Interprizi

[Handwritten signature]



Appendix-F

Sample case study data collection

Case study data collection format

Date of Visit: Mizara 19/12/16
 Project Name: Code (3)
 Location/Project Site: Arsi-hexosa woreda-
 Contractor (SMMCEs name): Code (C1) - Micro
 Client: _____
 Supervisor: Regulator - Arsi Zone Construction Authority

A. Documents required on project site/ existing contractor documentation

Documents	Yes	No	Comment
Design drawings	☒	☐	on project manager / project
Specifications	☒	☐	not-familiar with
Bill of quantities	☒	☐	on-project manager / project
Copy of approved Work schedule.	☒	☐	
Request for inspection	☒	☐	we have seen no recording
Health and Safety Plan and other Safety related documents.	☒	☐	not familiar with this document

B. Quality control

1. Concrete quality

Description	Yes	No	Comment
1. Mix design for required concert grade	☒	☐	in familiar with requirement
2. Ingredient proportioning tools(box)	☒	☐	scale/Alaska is used
3. Concrete Cube samples during concrete casting	☒	☐	in-familiar with the requirement

Observed defects

- poor workmanship / Building of formwork
 - on rebar casted - curve stone - Honer could formwork

2. Material Quality

Description	Yes	No	Comment
1. Sand quality test	☒	☐	The contractor representative have awareness about the requirement
2. Coarse aggregate quality test	☒	☐	
3. Reinforcement quality test	☒	☐	
4. HCB quality test	☒	☐	Then
5. Masonry stone quality test	☒	☐	
6. Backfill material test	☒	☐	

3. Other Remarks

- we have observed Hand for such class of concrete
 - vibrator is used.

Kutaa Galmee
 Chasapan Jeenson
 hoo rukutannuuf

Data collector Vassu Ice