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ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE

**ASSESSMENT OF PROJECT QUALITY MANAGEMENT PRACTICES IN
GOVERNMENT MEGA PROJECTS IN ADDIS ABABA: THE CASE OF
MESKEL SQUARE SMART PARKING**

BY

Meron Tilahun

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of Arts in Project Management (MAPM)**

ADVISOR: Dr. Mengistu B.

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ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
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DEPARTMENT OF PROJECT MANAGEMENT

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Approved by Board of Examiners:

_____	_____	_____
Advisor	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date

Declaration

I formally affirm that the research presented in this thesis, titled “**Assessment of Project Quality Management Practices in Government Mega Projects in Addis Ababa: The Case of Meskel Square Smart Parking**” is my own unique work. It had never been seen or submitted anywhere else.

Meron Tilahun

Signature

Declaration

I formally affirm that the research presented in this thesis, titled “**Assessment of Project Quality Management Practices in Government Mega Projects in Addis Ababa: The Case of Meskel Square Smart Parking**” is done by Meron Tilahun with my own guidance. It had never been seen or submitted anywhere else.

Mengistu Bogale

Signature

Acknowledgement

First of all I would like to thank God for helping me in my journey yet again. I will like to give thanks for my advisor Dr. Mengistu Bogale for his guidance and support throughout my work. I would like to give thanks to all respondents of Meskel square smart parking project team for participating on my survey and helping me in my study.

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Abstract

Quality is one of the most important parameters to consider when embarking on any construction project, and it is a crucial component to consider, so this study will evaluate the quality management approach in Addis Ababa City Government mega project construction office: the case of Meskel square smart parking project in order to assess this component; quality management process, top management commitment, challenges faces while implementing quality management and the tools and techniques used were considered as variables. To achieve these goals, data collected using quantitative methods from a sample frame of 54 people, with a response rate of 90% of project staff and team members who are related to the project. The collected data was analyzed using descriptive statistics focusing on frequency, percentage and mean value and were generated using the statistical program for the social sciences (SPSS) version 26. According to the findings, the organization does not use all stages of the quality management process, policies, tools, and techniques. There is lack of proper trainings and skilled experts. It also identified both the internal and external challenges and obstacles faced throughout the project. The study recommended that the organization prepare well defined quality policies and guidelines as a base to sustain project quality and introduce quality management tools, techniques and trainings to develop the team's skills to enhance the success of mega project constructions.

Key word: Quality, Quality management, Project quality management process, Project, Mega project,

Acronyms

QM – Quality management

PM – Project management

PMI – Project management institution

TQM – Total quality management

MSSP – Meskel square smart parking

AACGMPCO – Addis Ababa city government mega projects construction office

MP – Mega project

PMBOK – Project management body of knowledge

CCCC – China Communication Construction Company

ISO – International Standards Organization

PDCA – Plan, Do, Check and Act

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Chapter One: Introduction

1.1. Background of the study

(PMI, 2017), defines a project as a short-term venture committed to create a one-of-a-kind product, service, or result. Projects are started in order to achieve goals by providing deliverables. These fulfillments provide a one-of-a-kind product, a one-of-a-kind service or capability to perform a service, a one-of-a-kind result, and a one-of-a-kind combination of one or more things, services, or outcomes. It has become the most essential single component in the survival and success of today's industries. Customers' needs for better products and services at the lowest possible cost have placed remarkable pressure on businesses to upgrade the quality of their goods, services, and processes in order to compete in the market and improve business outcomes. To meet the expectations of the owners, construction projects have to be more qualitative, competitive, and cost-effective (Rumane, 2010). According to (PMI, 2017), The procedures and activities of the performing organization that identify quality policies, objectives, and responsibilities in order for the project to satisfy the purposes for which it was undertaken are referred to as project quality management.

It is the process of incorporating the organization's quality policy in terms of project and product quality requirements planning, management, and control in order to satisfy stakeholders' objectives. It also supports actions for continuous process improvement carried out on behalf of the performing organization (PMI, 2017). Project Quality Management is concerned with both the project's management and the project's output. Failure to meet product or project quality criteria can have serious consequences for any or all project stakeholders in any circumstance. Quality management is the continuous monitoring and use of quality practices in all components of the work, rather than detecting and repairing faults after the fact. Even projects that are completed on time and within budget are not successful if the deliverables are of poor quality (ibid).

Quality management in project implementation includes the concepts of quality planning, quality assurance, and quality control. The Project Management Institute developed quality management strategies, and several tools and approaches were acknowledged as part of the implementation process which includes: benefit/cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts, pareto diagrams, statistical sampling, flow-charting, and trend analysis (ibid).

Many people are involved in construction projects, including the owner, designer, contractor, and a variety of other construction-related specialists. Each of these individuals is involved in ensuring that quality is implemented in building projects. In addition to the "other actors" participating in the construction process, these individuals are impacted by and reliant on one another. As a result, construction projects have gotten more complicated and technical, demanding significant efforts to decrease rework and associated costs in terms of time, materials, and engineering (Rumane, 2010). The project manager must use strong quality management methods in order to meet client goals on time and under budget. He or she will be concerned

about the following issues: both the project's delivered product/service/process and the project management process itself (Wysocki., 2014).

Poor quality is a significant priority in the construction sector, as it may be detrimental to both the contractors and the clients. In this sector, the client determines quality through a series of documents prior to the beginning of a project the specifications of these agreements reveal the client's expectations for the job at hand, which must be met by the contractor in order for the job to be considered quality (Rajendran, 2012).

In today's world, when competition is fierce, quality is not only a prerequisite, but it is also a means of survival for all enterprises. As a result, QM is a primary concern for construction project managers, as the entire project must be set in action in order to meet the needs of the customer.

1.2. Background of the organization

Project: Meskel square smart parking

Meskel square is the city's most iconic landmark that serves as public gathering space for different activities that take place in the city such as Meskel celebration and Eid al-Fitr mass prayers. Meskel square as formerly known as Abyot Adebabay was re-purposed for military parades by Derg between 1974 and 1991.

The Meskel Square to City Hall project is intended to provide state of the art public space at Meskel square with underground parking and connected active pedestrian ways. There are three main stakeholders on the project as a client, project consultant and project contractor. The client Addis Ababa City Government Mega project construction office (AACGMPCO) which basically answers to Addis Ababa City mayor. The Project consultant is BKW Consulting Architects, Planners and Engineers plc. The project contractor is China Communications Construction Company Ltd (CCCC).

Project client: Addis Ababa city government mega projects construction office

AACGMPCO was established by the Addis Ababa City Mayor's office as 'Beautifying Sheger Project' on February 2019 G.C. with the aim of renewing the Addis Ababa City. It is an institution that superiorly manages the megaprojects performed out by the Addis Ababa City Government in order to address the project's demonstrated performance problems and to use the designated resources more effectively, and also to enforce defined and quality projects that ensure the economic and social benefit of the citizens.

Proclamation No. 64/2019 is issued by the A.A. city cabinet in compliance with Article 95 of the Addis Ababa City Government Executive Organs re-establishment and to describe the power and responsibilities of the same.

- Complete projects on schedule, on budget, and with high quality.

- Lead projects in a cohesive and structured way.
- Ensure the existence of technical assistance in the project's building process.
- Assist in the establishment of work possibilities through projects.
- Make it easier to use the resources gained from charity or via donations for the intended purpose.

It is building 6 (six) existing projects working in partnership with the city administration. It aims to build 20 major projects by 2017 E.C. The existing projects are:

- Meskel square smart parking
- Mayor office renewal
- Addis Ababa city public library
- Transport Bureau head office
- Adwa zero- zero historical museum
- Great place smart parking

The projects are intended to give Addis Ababa a great outlook by enhancing and generating revenue by way of higher land values and urban tourism. They are the latest additions and greatest achievements to a skyline that has undergone dramatic changes in the past 20 years as a highlight. The projects are new but their delivery for some remains the same.

Project contractor: China Communications Construction Company Ltd

CCCC is a state owned publicly traded company. It's a multinational engineering and construction company mainly engaged in design, construction and operation of mega projects and infrastructures such as airports, railways, tunnels, highways, bridges, oil platforms, marine ports and other higher scale projects all over the world. In our country CCCC has worked on several landmark and higher scale construction projects such as: Addis Ababa - Adama toll expressway, Addis Ababa ring road project, Addis Ababa Bole International Airport extension and others.

Project consultant: BKW Consulting Architects, Planners and Engineers PLC

It is a company located in Addis Ababa working on Architectural and Engineering projects, mainly in design, planning and construction of buildings. They have been working on several projects in Ethiopia, West Africa and the US over the past 13years. In addition to the Meskel square project, the company is also working on the renovation project of Addis Ababa City hall and Mayor's office.

According to Office representative/ site supervisor, Engineer Tsgereda, the Meskel square smart parking project is set to supplement the Beautifying Sheger Project. Like the Sheger Project, this one is also being undertaken by the Chinese Communications Construction Company (CCCC) at a cost of close to 2.5 billion Br.

With an offer initiated by Addis Ababa City Administration, China Communication Construction Company (CCCC) is undertaking a design-build and refurbishment of steps at Meskel Square and street refurbishment on route Meskel Square-La Gare City-Hall respectively. The scope of works under the contract is finalized by negotiation between the employer and the contractor. Once finished, the project will provide thousands of work opportunities.

According to Deputy General Manager, Engineer Meresa, the old steps will be fixed and constructed as new to serve as a public gathering space just like before including parking spaces under the ground, and there will also be electric bike charging stations, in part to encourage electric bike ownership in the country. The Square will also have six LED screens and close to 30 shops. The first deck of the parking lot is designed to hold 80 toilet stalls, since lavatories have been a problem in the past whenever large events take place.

1.3. Statement of the problem

Quality management in construction projects, from the standpoint of a construction firm, should entail sustaining the needed level of construction work in order to acquire client satisfaction, resulting in lengthy competitiveness and economic sustainability for the organizations. (Rahman, & Keng., 2005).

Quality management is vital for the survival of a construction organization in today's highly competitive and tough construction market. According to (Harris and McCaffer., 2002), quality management must establish an environment in which relevant tools, techniques, and processes can be effectively deployed, resulting in operational success for an organization. In impoverished countries, poor quality management is widespread. (Joubert, Cruywagen & Basson, 2005), discovered that there is a disregard for quality management implementation in the South African construction business. (Said, 2009), identified several factors influencing quality management practice, including a lack of commitment to quality, insufficient managerial support, a lack of attention to quality issues, and a lack of quality planning.

As described in (Nega, 2008) research, building projects that are provided within the projected cost, defined quality, and calculated time will considerably please the customer, contractor, and consultant, and the project can be said to be delivered successfully. However, according to studies, the majority of building projects in the country are not completed satisfactorily for the client (Nega, 2008). (Temesgen, 2007), Highlighted three primary difficulties associated to failing projects and that contribute to project failures in Ethiopia's public sectors in his study. The first is a resource problem, which comprises a lack of suitably qualified and skilled human, financial, and material resources.

The need to assess the establishment of quality management in various construction sectors is an urgent concern. It should be acknowledged as a crucial component on the same as project scope, duration, and cost. If the stakeholders are dissatisfied with the project management quality or the performance targets, the project team should address the issue and evaluate quality assurance and quality control in order to meet the stakeholders' demands and expectations. This study aims to assess project quality management practices, top management commitment, and quality

management implementation problems with special focus on construction projects in Addis Ababa.

1.4. Research question

- What is the quality management processes, policies, tools and techniques frequently applied?
- How is the quality management plan prepared, implemented and controlled? How is the top management responsible?
- What problems are encountered in relation to the implementation of quality management?
- What are the training methods and workshops given to employees regarding project quality management implementation?

1.5. Objective of the research

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

1.5.1. General objective

- The overall goal of this study is to describe the practice of quality management in Meskel square smart parking project.

1.5.2. Specific objective

- To determine the quality management processes, policies, tools and techniques frequently applied in MSSP project.
- To determine the planning, implementation and control process of quality management and the responsibility of top management towards it.
- To determine the challenges faced in managing and implementation of quality managements on the mega project.
- To determine the trainings and participation of the employees in project quality management implementation and top managements involvement.

1.6. Significance of the study

Quality is among the most important success markers that should be accomplished in order for a project to be deemed as success. In Ethiopia, previous studies have shown that quality is a big a problem in the building sector as a result, this research will be important to all stakeholders engaged in success factors. Also, this research work will aid to the advancement of the subsequent and contributes to the project management body of knowledge by giving extra information regarding the project.

1.7. Scope of the study

This paper assessed only project quality management strategies and construction project challenges that are confined to Meskel square smart parking project.

The scope of the study is confined to investigating the impact of process quality management in the project management process, tools and techniques, top management commitment, and problems or barriers encountered in implementing Quality management on a large scale on MSSP project.

1.8. Limitation of the study

Since there are only few people with the knowledge on PM and QM and the practice is not well known, some of the responses gathered were biased in some ways. There was also unwillingness to cooperate in some cases.

1.9. Organization of the study

The first chapter of the research provides the research's background, problem statement, research questions, research objective, scope, and limitations. The second chapter is devoted to a survey of related theoretical and empirical literatures as well as the study's conceptual framework. The third chapter covers research design and methodology, data sources, target population, sample frame, and data collection and analysis tools. The fourth chapter contains the data collected, analysis, and discussion of the findings. The fifth chapter contains a summary of the findings, as well as a conclusion and recommendations based on the findings.

1.10. Definition of key terms

Project: is a short-term activity intended to produce a one-of-a-kind outcome, product, or service. It is transitory in the sense that it has a specified starting and end point in time, as well as a specified purpose and means. (PMI, 2013)

Management: is the practice of accomplishing tasks by the use of personnel.

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

Quality: is defined as the capacity to fulfill customer expectations, the capacity for projects to stay on budget and on schedule, the reduction of errors and refinements, and project alignment to ISO 9000 quality criteria.

Quality management (QM): is to guarantee that activities are adequately planned and structured in order to reach the desired degree of quality for the product.

Project quality management: is the system and activities of the performing organization that assess quality policies, goals, and accountabilities in order for the project to fulfill the demands for which it was achieved. It seems to use policies and procedures to enact within the project's setting and supports continuous monitoring and evaluation implemented on top of the rest of the performing organization.

Quality assurance: is a set of procedures intended to ensure that a product under development meets specified requirements (PMI, 2013).

Quality control: is a set of procedure intended to ensure that a product or service meets the defined set of quality requirements (ibid).

Mega projects: are vast, complex projects that often cost a billion dollars or more. Can be viewed as untamed creations in the project world; they are difficult to tame and are noted for their complexity, massive size, high cost, and lengthy time frame. (Zidane; Johansen, 2013).

Chapter two: Review of related literature

Introduction

This chapter gives insight on various researches conducted and terminology descriptions related to project quality management. It includes an overview of literature by various writers and experts that has been evaluated in this area. It consists findings of diverse academics' conceptions connected to project quality management techniques, top management commitment to project implementation, and problems encountered It comprises a review of related literature taken from various secondary sources such as books, papers, journals, and websites for theoretical, empirical, and conceptual reviews.

2.1. Theoretical literature review

2.1.1. Project and Project management

Project

As described in (PMI, 2017), a project is a quick activity to generate a one-of-a-kind product, service, or outcome. The fulfillment of project objectives may produce one or more of the following deliverables:

- A one-of-a-kind idea that can be either an element of another thing, an upgrade or adjustment to another item, or a new end object in its own itself.
- Unique service or a competence to provide such a service
- A one-of-a-kind ending, such as a conclusion or declaration
- A unique combination of one or more products, services, or results.

Furthermore, one of the most widely accepted definitions of a project is a task completed by a periodic plan to achieve a certain aim. Projects are not restricted in terms of size or scope (number of participants). They are, however, always periodic and have a distinct beginning and finish. Projects could be used for a number of different objectives, although they are most typically utilized to achieve corporate objectives (Lund, 2011).

According to (Wysocki., 2014), A project is a series of distinct, complicated, and interconnected operations with a single objective or purpose that must be completed on schedule, within budget,

well according to criteria. Certain features distinguish a project from other initiatives. Some of the traits described by (Nicholas, et al., 2012) (Larison, 2011) are:

- A project has a distinct and well-defined goal.
- A project is of a transitory character, which means that it has a definite life span with a beginning and an end. Each is an informal structure of individuals, materials, and resources established to do a task within a certain time period; after the task is completed, the informal organization is dismantled.
- Projects transcend business and functional boundaries because they require skills and capabilities from a variety of roles, professions, and organizations.
- A project is one-of-a-kind because it seeks to do something that has not been performed before. A project is a yet another action which will never be fully duplicated.
- A project makes use of commodities and includes a set of parameters, as well as time, cost, and performance constraints.
- A project entails uncertainty and risk. It may include new technology or procedures, as well as major aspects of uncertainty and risk for the organization doing it.
- A project has a single, distinct goal and well-defined end-items, goals, or outputs, which are generally described in terms of cost, timing, and performance.

A project has a definite life span with a beginning and an end, and it is transient in nature. Each is a hastily put-together group of people, materials, and facilities. Because projects require skills and capabilities from many functions, professions, and organizations, they cut across organizational and functional divides. A project is a once-in-a-lifetime endeavor that will never be duplicated exactly. It might include new techniques or technologies.

Mega project

Megaprojects are vast, complex enterprises that usually cost a billion of dollars or more, take many years to plan and implement, involve multiple public and private stakeholders, are transformational, and impact hundreds of thousands of people. (Hirschman, 1995). Mega projects, according to (Flyvbjerg, 2014) are a completely distinct sort of project due to its high expense; stakeholder engagement, difficult borders, and lengthy planning process make its formation a significantly dangerous procedure. Megaprojects often cost billion dollars or even more. Yet, money should not be a constraint in developing megaprojects. (Flyvbjerg, 2014) established 'the iron law of Megaprojects,' saying that megaprojects are certain to suffer due to 'the iron triangle' criteria of time, budget, and scope causing over time, over budget over and over again. Megaprojects are a unique sort of project to manage due to its large scope of objectives, influence the society, the economy, and the environment, the required time and money, the complexities, and the stakeholder participation.

Project management

According to (PMI, 2004), the concept of project management is "the application of information, skills, tools, and procedures to project operations in order to achieve project criteria." Project management is a collection of methods, procedures, and knowledge that, when used together, aid in meeting the three basic constraint of scope, cost, and time. (Charvat, 2003). (PMI, 2017), project management is performed by implementing and integrating the project management processes that have been defined for the project. It allows businesses to carry out initiatives successfully and efficiently.

As described by (Mintzberg, 1983), since World War II, the majority of emerging sectors have been project-based. The increased use of projects in businesses necessitates the development of a strategy for efficiently managing these temporary activities that are critical to the organization's strategic objectives. This led the researchers and professionals of the field to devise an approach that can efficiently manage the projects. Managing a project is a challenging and time-consuming method that demands the identifying and allocation of resources in order to ensure completion of the project and, as a result, fulfillment of organizational objectives. (Soota, 2005)

Project management Book of Knowledge (PMBOK)

(PMI, 2017), as a knowledge area is indeed a specific area of project management which is defined by its functional elements, techniques, inputs, outputs, tools, and approaches and is determined by its knowledge needs. The ten Knowledge Areas identified and described as listed below:

Project Integration Management: Identifies, defines, combines, unifies, and coordinates the numerous processes and project management activities inside the Monitoring And controlling for Project Management.

Project Scope Management: Includes the processes necessary to guarantee that the project contains all of the work necessary and only the work necessary, to finish the project effectively.

Project Schedule Management: Include the steps necessary to manage the project's timely completion.

Project Cost Management: This term refers to the methods responsible for planning, estimating, budgeting, financing, funding, managing, and controlling expenditures to ensure that the project is finished within the agreed budget.

Project Quality Management: In order to fulfill the expectations of stakeholders, the methods for executing the organization's quality policy in terms of project and product quality planning, management, and control standards are included. **Project Resource Management:** Includes the procedures for identifying, acquiring, and managing the resources required for the project's successful completion.

Project Communications Management: Includes the procedures necessary to guarantee timely and suitable project information planning, acquisition, production, distribution, archiving, retrieving, monitoring, management, auditing, and final disposition are all steps in the process.

Project Risk management: planning, identification, assessment, reaction planning, response execution, and risk management are all aspects of project risk monitoring are all procedures that must be carried out on a project.

Project Procurement Management: Describes the procedures that must be followed in order to get products, services, or results from sources other than the project team.

2.1.2 Overview on Quality

Quality is a broad notion with several definitions and meanings (ISO 9000) Quality is defined as "the whole of a product's or service's characteristics and attributes impacting on its ability to fulfill declared or implied demands."

As described by (Gitlow, 2005), Quality has evolved beyond just meeting customer expectations to a phenomena in which a product or service may be delivered at a cheap cost while preserving reliability and consistency. Shen describes quality as fulfilling customers' criteria and expectations, and hence, to some extent, it is the consumer who ultimately determines a product's quality (Shen, 2000).

When we come to the dictionary meanings, (The Oxford dictionary (website))defines quality as "the standard of something as measured against other things of a similar kind; the degree of excellence of something", and the (Swedish Academy Dictionary, SAOL) (Swedish Academy Dictionary, SAOL)defines quality as type, grade, state and character in a positive aspect. Both approaches show that it's something's standard as judged against other objects of a comparable type; something's level of excellence. In order to successfully execute effective quality management, it is necessary to assess the present level of quality in the company. It is necessary to identify the existing level of quality.

The "International Organization of Standardization" ISO 9000 standards and the "Plan, Do, Check, Act" PDCA-cycle are regarded to form the foundation of the Total Quality Management Idea. (Kaufmann, & Wiltschko,, 2006).

ISO 9000 standards, International Standards Organization (ISO)

It is a global association of international standards bodies. This non-governmental organization is made of guidelines developed from over 160 nations in order to produce and enforce worldwide standards for technology, scientific experiments techniques, working environment, related impacts, and much more. (Tari, 2012)

SO 9001 is an ISO standard that sets the standards for a quality management system, which includes the construction sector, in order to standardize services and product quality.

PDCA-cycle

This cycle is a key quality management mentality, comprising all four elements of Plan, Do, Check, and Act (PDCA). It was invented in the 1930s by Walter Shewhart and thereafter adopted by W. Edward Deming. The cycle, which is a continuous four-step quality method, often lays the groundwork for the enhancement of a sequence of operations. (Kaufmann, & Wiltshcko., 2006)

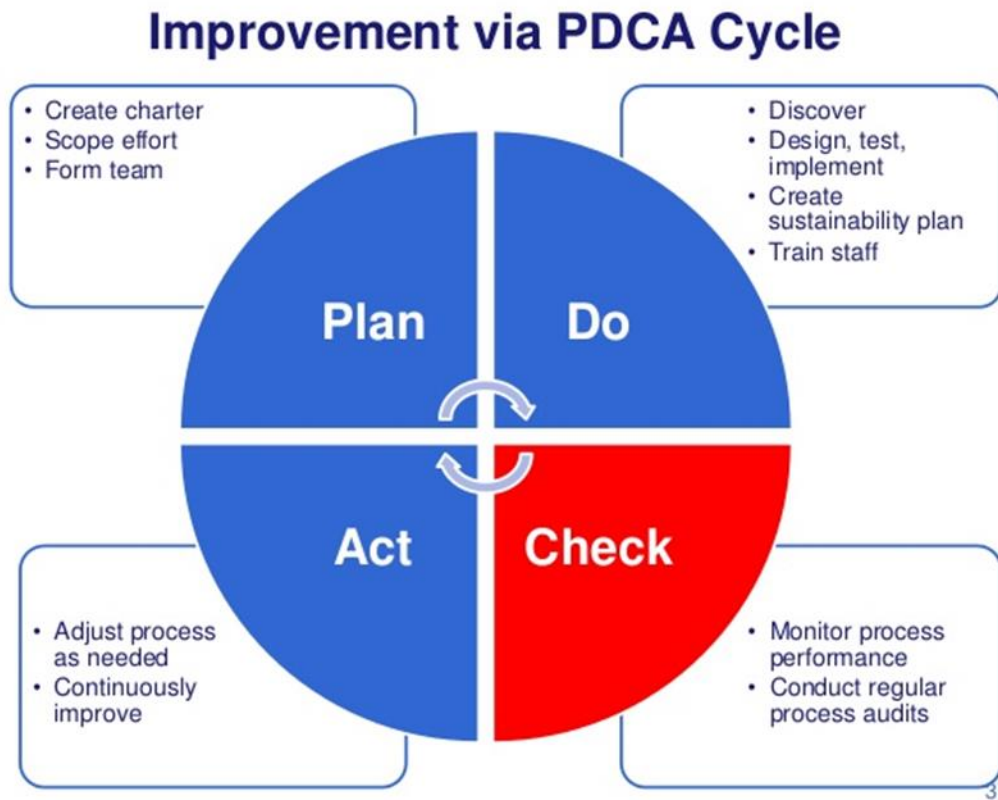


Figure 1:PDCA- cycle, source: quality management system, 2013

Both quality management systems: the Plan, Do, Check, and Act (PDCA) cycle, as well as the ISO 9001 standard deliberately analyzes procedures that are part of the quality system and the connections within them, and it can be implemented to all activities

2.1.3. Quality management system

A quality system is described by ANSI as "the organizational structure, roles, methods, techniques, and tools for quality management execution" Quality management systems, in other words, are a set of key processes which are involved in the creation of a product, process, or service, and include preventive and evaluation. (Burati, 1992). Quality tasks comprise determining the quality policy, objectives, and duties and executing them inside the quality management systems using quality planning, quality control, quality assurance, and quality improvement.

Modern quality management systems attempt to decrease inconsistency and provide results that meet stated standards in the pursuit of managing ISO certification.

2.1.4. Project quality

According to (Turner, 2009), it is common to remark that a project is successful if it is completed on time, on budget, and with high quality. The project is regarded to be of high quality if its output:

- Meets the specification
- Is fit for purpose
- Meets the customer's requirements
- Satisfies the customer

(Wysocki., 2004), described projects with the following constraints:

- scope,
- cost,
- time,
- resource,
- quality and
- Risk



Figure 2: Project constraints (Robert K. Wysocki, 2014)

Because these limitations are interconnected in terms of risk, any change in one of them will almost certainly influence at least one other constraint. The scope triangle effectively illustrates the project's factors and their interrelation. (PMI, 2004), also describes the notion of the triple constraint project scope, time, and money is used to improve project quality. The balance of these three interconnected criteria affects project quality. The link between these elements is such that if any of the three changes, at least one other component is likely to be impacted.

2.1.5. Project Quality and the triple constraints

The triple constraints of a project include Time, Cost and Scope. For a project's success, all of the parts are equally crucial. A fourth and equally crucial restriction is quality. Because it is dependent on the client's needs, it is mainly related with scope, and quality is also linked to customer needs. Project managers often aim to balance these three limitations while fulfilling their project's goal, but they may have to make trade-offs in order to accomplish the goals and please consumers. However, a project manager should never compromise quality throughout the execution of a project. (Kenneth, 2005)

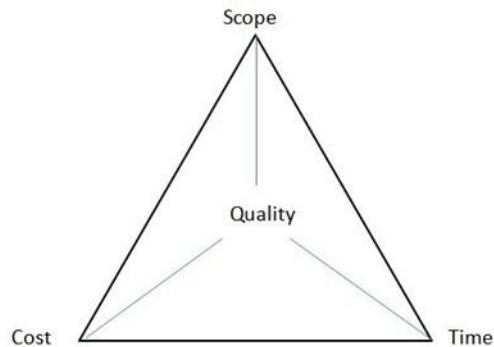


Figure 3: Triple constraints (Robert K. Wysocki, 2014)

The Relationship of Quality with Costs, Time and Scope

Quality and Costs

- As the quality of design increases, cost increases.
- As the quality of conformance increases, cost decreases.

Quality and Time

- The time to complete the activities is the key parameter.
- Quality improvement efforts will reduce time.

Quality and Scope

- $\text{Scope} = \text{Quality} / \text{Price}$
- Organizations must evaluate the scope they provide, relative to the competition.

2.1.6. Project Quality Management

Crawford states that the ultimate aim of quality management is to gratify the clients, comply to standards, ensure appropriateness, and ensure the product is fit for usage. Quality management is defined as a collection of actions or tasks that must be completed to guarantee that the project satisfies all of the needs for which it was created, as recorded in the state of work, and includes an emphasis on quality management. (Crawford, 2002)

According to (PMI, 2008), Project Quality Management encompasses the procedures and actions of the implementation team that set quality policies, objectives, and responsibilities so that the project will meet the purposes at which it was performed. It applies the QMS through guidelines and policies, with quality improvement activities carried out as needed all around. The procedures and actions of the project team that set quality policies, objectives, and responsibilities are referred to as Project Quality Management. It strives to verify that the project's and product's requirements are met and confirmed.

2.1.7. Project Quality Management Process Flow

According to Hoyle, quality management is divided into four primary parts or pillars: these are planning, control assurance and improvement.



Figure 4: Quality management process (Newton & Bristol)

And also, according to Joseph Juran's "quality trilogy" is made up three components: (1) quality planning, (2) quality control, and (3) quality improvement. This trilogy of quality process leads to successful framework for achieving quality objectives (Juran, & Godfrey,, 1999). The quality trilogies are described as:

1. Quality Planning

- Determine who the customers are
- Identify customers' needs.
- Develop products with features that respond to customer needs.
- Develop systems and processes that allow the organization to produce these features.
- Deploy the plans to operational levels.

2. Quality Control

- Assess actual quality performance.
- Compare performance with goals.
- Act on differences between performance and goals.

3. Quality Improvement

- Develop the infrastructure necessary to make annual quality improvements.

- Identify specific areas in need of improvement, and implement improvement projects.
- Establish a project team with responsibility for completing each improvement project.
- Provide teams with what they need to be able to diagnose problems to determine root causes, develop situations, and establish control that will maintain gains made

Quality planning

Quality planning, as described by (Harris and McCaffer., 2002), is a set of actions aimed at determining quality system policies, objectives, and demands as well as to describe how these policies will be implemented, objectives reached, and requirements satisfied. The primary advantage of this method is to provide advice and recommendations on how quality should be monitored and assessed all across the project. This method is now only performed once or at specific times during the project (PMI, 2017). It states "quality is the degree to which a collection of intrinsic qualities fulfills standards."

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

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

(PMI, 2017) Also states that Quality planning should take place concurrently with all the other planning procedures.

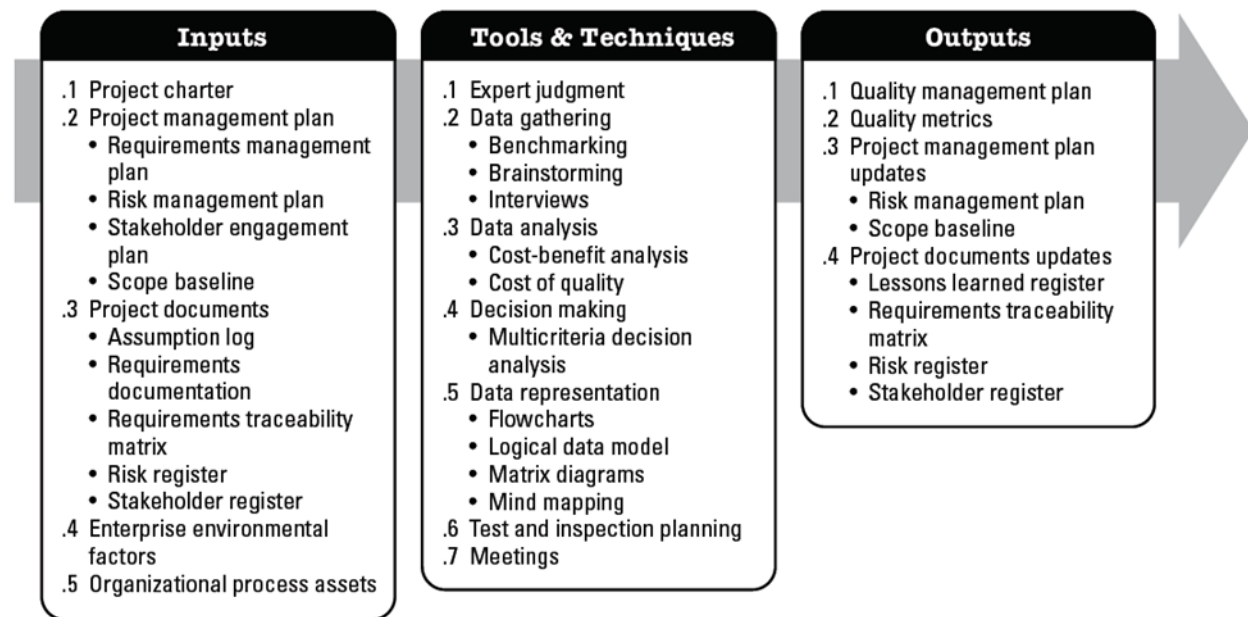


Figure 5: Quality planning procedure (PMBOK)

Quality assurance

Quality assurance, as described by (Harris and McCaffer., 2002), is a series of steps meant to prove that an entity meets all acceptance criteria. Quality assurance procedures are followed to still trust in both clients and management must be pleased that certain standard requirements have been met. Per the Euro Roads (2006), the primary purpose of quality assurance systems in organizational structures is to accomplish a specified level of quality. One may examine current processes and find existing quality gaps within these processes by utilizing the specified probabilistic model and cause and effect diagram. Because quality ensures its occurrence during the project's implementation phase and includes the evaluation of the project's overall performance, as well as the occurrence and usefulness of workflow and operation tools, and measures are taken to achieve the expected results levels of quality will be reached to produce quality deliverables.

Quality assurance is involved with building and planning the technical and management expertise required to attain the intended outcomes. It's really about mindsets, of both management and of people for those they are accountable.



Figure 6: Quality assurance procedures (PMBOK)

Quality control

Quality control, as described by (Harris and McCaffer., 2002) is a collection of actions or processes whose objective is to guarantee that all quality criteria are satisfied. Processes are monitored and performance issues are resolved in order to reach this goal. According to the ISO definition, quality also governs the operational processes and activities utilized to meet quality criteria. This definition might indicate that any action aimed at quality improvement, control, management, or assurance is a quality control activity.

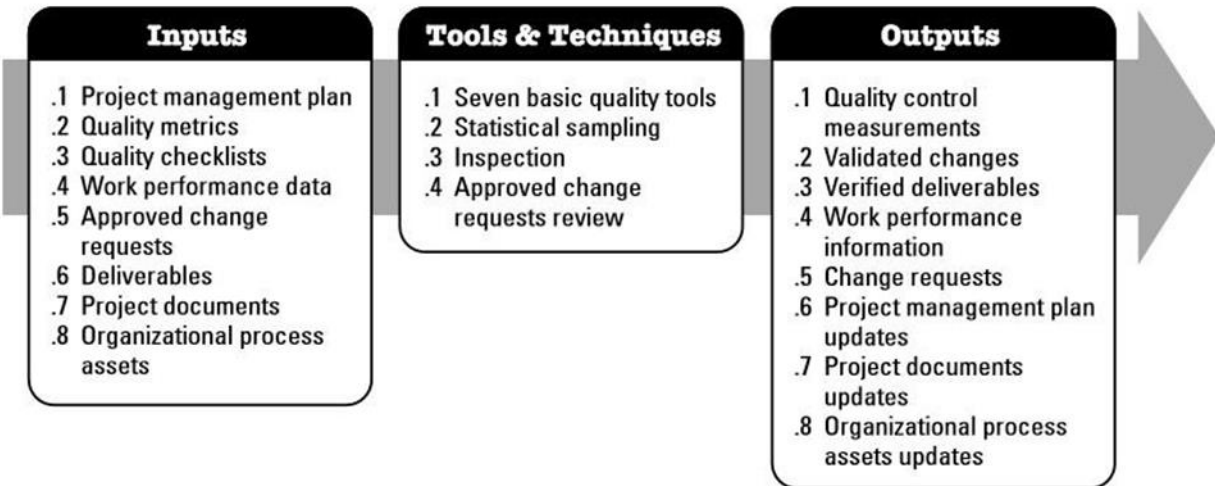


Figure 7: Quality control procedures (PMBOK)

Although it is usually stated that quality assurance functions as both identification and detection, a control established to infliction before it arises also functions as protection, including lowering the tolerating band to well inside the acceptance criteria. In other words, quality management can aid in the prevention of failure, although quality assurance is the outcome of an inspection, whereas control creates the outcome.

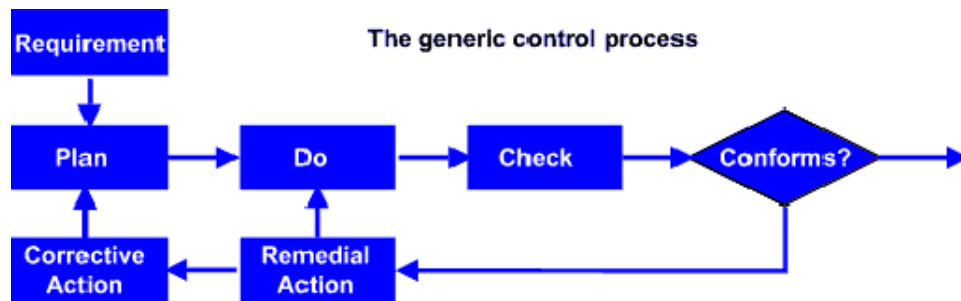


Figure 8: The generic control processes (Quality management system, 2013)

Quality improvement

There is really no uniform definition of quality improvement, according to the Heath Foundation (2009), and one methodology seems to become more efficient than another. However, many studies define quality improvement as a structured approach to quality improvement that incorporates specific techniques.

Quality improvement, according to ISO 9000:2000, is "a component of quality management aimed at strengthening the capacity to meet quality criteria." Quality improvement is the adoption of tactics and procedures to narrow the gap amongst present and intended levels of quality by recognizing and discussing system flaws and advantages in order to enhance, and even in some cases, re-design company objectives.

Quality improvement is a structured method to process management that seeks to eliminate waste, loss, rework, and dissatisfaction in order to improve the performance, productivity, and appropriateness of work processes.

2.1.8. Roles of top management in Project quality management

According to (Juran, & Godfrey., 1999), it is difficult to attain quality leadership without the top manager carrying out the following non-delegable roles.

- Serving on the quality council will assist in bringing greater attention and priority to the rest of the company.
- Acquire quality management training: Top managers risk losing credibility if they attempt to lead while missing quality management training.
- Approve the vision and policies for quality.
- Approve the primary quality objectives: The quality objectives included in the business plan must be delegated to lower levels in order to determine the tasks to be completed and the resources required. Upper management becomes critical players in the deployment process.
- Provide resources: Availing necessary resources with proper time and quality have a great impact on project quality. The top management has a greater role in this process.
- Evaluation progress: A fundamental problem in top management personal engagement has been the inability to keep a frequent review of progress in implementing quality improvements. Project quality management would be extremely challenging without regular and adequate progress reviews from senior management.
- Serve on project teams: When senior management members serve on project teams, they pay greater attention to the project and have a better grasp of it.

Overall top management should participate on the quality council. This will aid in drawing the attention and priorities of the rest of the company. Should receive and provide training in quality management to avoid losing credibility if they attempt to lead while untrained. The primary quality objectives must also be approved. The quality targets incorporated into the business strategy must be deployed to lower levels in order to determine the actions to be taken.

2.1.9. Total Quality management in construction project

Total quality management is an organizational management style that is built on member engagement, focuses on quality, and attempts to achieve long-term success via fulfillment and aids to all members of the company and society (ISO 8402, 1994).

Total quality management (TQM) itself is a strategy for combining many organizational factors within design and production operations in order to provide cost-effective goods or services that are totally acceptable to the end user. It is more consumer-focused and generates more significant consumer pleasure. Internally, TQM lowers bottlenecks in production lines and

operational expenses, hence boosting product quality while raising organizational morale (Kerzner, 2015).

Total quality is not just one individual concept. It is a number of related concepts pulled together to create a comprehensive approach to doing business (Goetsch and Davis 2003). The major contributors to this concept are W. Edwards Deming, Joseph M. Juran, Philip B. Crosby and Kaoru Ishikawa. (Deming, 2000) (Juran, & Godfrey,, 1999).

ISO certification is nowadays a trend in most industries including construction industry. The ISO 9001 standard is now on its year 2006 revision. Its application has received much attention from researchers. The five clauses for its implementation are:

- quality management system,
- management responsibility,
- resource management,
- product realization, and
- measurement, analysis, and improvement.

In general, the construction sector has trailed behind other industries in terms of TQM implementation. The fundamental cause for this was the misconception that TQM was solely for manufacturing (Chase, 1992), another big misconception was that TQM was expensive and took a long time to adopt. One feature of TQM that has most irritated the building sector is "measuring" (Hayden, 1996)

In 1992, the Construction Industry Institute in Austin, Texas, published Guidelines for Implementing Total Quality Management in the Engineering and Construction Industry. They show that TQM has resulted in improved customer satisfaction, reduced cycle times, documented cost savings, and more satisfied and productive work forces (Burati & Oswald,, 1992)

To achieve quality management systems (QMS) in the construction business, several management variables such as senior management support, suitable leadership style, cultivating employee passion and engagement, open communication and feedback must be appropriately handled. Planning, engineering design, and construction sometimes entail "one-of-a-kind" projects that require a QMS that prioritizes successful management methods.

A construction contractor usually has three quality documents for running a quality management system. The three quality documents are as follows:

1. Quality Manual

This is a company-wide document setting out the general quality policies, procedures and practices of the organization. (Tang & Chen, 2005)A quality manual usually comprises the following:

- Company policy statement which includes a statement, a summary of activities undertaken and the firm's policy objectives towards implementing a quality system in accordance with the requirements of a standard.
- General statement to amplify the company's commitment to implementing a quality system.
- Amendment re-issue and distribution.
- Authority and responsibility included in the firm's organization.
- Summary of different procedures.

2. Quality Procedures

These are documents describing the activities involved in conducting business which are essential to the achievement of quality, e.g., instructions for the production of concrete would require a quality procedure (Tang & Chen, 2005)) They are in fact method statements which make reference to relevant specification documents. The quality procedures include the following:

- Scope and purpose of the procedures.
- Sequence of actions.
- Persons responsible in the execution of duties and for ensuring that requirements are met.
- Remedial actions if non-conformance is detected.

The construction company should already have a number of in-house procedures in place for managing its work while creating the quality processes. As a result, gathering, documenting, and systematizing current processes, instructions, and practices constitutes a significant portion of the quality document preparation process. Quality documentation should be based on current practices as long as they adhere to the established rules.

3. Quality Plan

(Tang & Chen, 2005) Aside from the quality manual and quality processes that apply to the whole firm, there is also a quality plan that applies exclusively to a specific project (or construction contract) executed by the organization. As a result, depending on the number of unique projects that a firm is pursuing, it may have a number of quality plans.

A quality plan is a document created from the quality system that specifies the precise quality practices, resources, and activities applicable to a specific contract or project. A quality plan often includes an organization's quality handbook, any applicable standard quality processes, and any extra customized quality processes.

2.1.10. Challenges in Quality Management Implementation

Based on the objectives of the research, quality is among the primary considerations in project management, particularly in developing nations such as Ethiopia. Leadership issues, an

inadequate policy and strategy, ineffective resource management, unproductive process management, poor client focus, and poor company performance, according to (Birhanu, 2011) are the root causes of quality problems that contributed to Ethiopia's poor quality management practices.

Some of the problems faced by the whole construction industry

- Short term profit.
- Low priority on quality.
- Tendering at lowest price.
- Multi-layered subcontracting.
- Adversarial relationship in construction industry.
- Lack of training.
- Poor site conditions.
- Complexity and variability of construction process.
- Necessity and ineffectiveness of policing quality.

Some of the problems faced by an individual in construction industry

- Expensive to develop and implement the scheme.
- Lack of right decision by top management.
- Substantial documents and verification.
- Lack of qualified staff.

All in all, depending on the nature of the project, quality is one of the most important considerations in project management. Leadership issues, a lack of policy and strategy, inefficient resource management, inefficient process management, and a lack of skilled employees are the fundamental causes of quality issues in construction.

2.1.11. Management Commitment in Quality Management Implementation

(Taylor, et al., 2003), stated that top managers' engagement, comprehension, and customer focus are critical preconditions for TQM success. According to (Samson, et al., 1999), leadership and human resource management are major determinants of TQM performance.

(Low, et al., 2004) said in their construction-related research that top management commitment is one of the components that will reflect TQM performance metrics in construction enterprises. According to (Chin, et al., 2003) senior management commitment is the most important aspect in the effective implementation of ISO 9000. As TQM is used on building sites, (Haupt, et al., 2004) claim that high levels of management activities will result in a lower occurrence of difficulties. (Arditi, et al., 1997), stressed the need of management commitment to quality and ongoing quality improvement at each phase of the building process. (Biggar, 1990), advocated for management to thoroughly comprehend and support the TQM process, as well as actively engage in its execution, rather than delegate it.

2.2. Empirical literature review

According to a study to evaluate and improve the value of project management practices and also the key performance indicators for projects in Ghana, top management commitment, efficient leadership, clearness of project objectives and mission, and stakeholder participation are critical factors that contribute to project success. (Ofori's, 2013).

(Chan, et al., 2012), demonstrated the conclusions for finding and assessing the major elements that caused construction delays in Hong Kong. They detected 83 delay factors, which were subsequently classified into eight major categories. The findings revealed that the five key principles and elements producing delays are: 'poor site management and needy management,' 'unforeseen soil conditions,' 'decision making authority was too limited, including every project member,' 'diversity in client-initiated 'and 'unnecessary adjustments of duties.'

(Hoonakker, et al., 2010) examined the problems in the construction sector in defining quality, the advantages of quality implementation, and the hurdles to quality implementation in construction. They used a questionnaire to collect data. They demonstrated growth, which may aid in overcoming failure. According to the findings, contractors understand the need of quality, yet there are barriers to execution.

(Chin-keng, et al., 2011), investigated the various approaches of quality management, the commitments in the quality area, and the barriers to quality implementation. According to (Tang, et al., 1999), one of the most difficult jobs is implementing ISO 9001. They proposed quality inspection reports as well as an interview survey of a quantitative analysis utilizing statistical methods. The sample strategy is chosen throughout the sample procedure.

(Al-Ani, et al., 2011), advocated for a Quality Management System (QMS) for Construction Site to improve project quality and communication between personnel at various Management levels. According to the research, there are two key causes for worse quality in the construction industry: non-use of building materials and bad construction procedures. He remarked that there is a misunderstanding about quality management.

A study by (Agbenyega, 2014), states in Ghanaian construction firms' quality performance with the goal of removing potential barriers: commitment, interaction between leaders and staff, teamwork, detailed and logical job training program, proper maintenance, quality financial statement, lack of team member learning and development, and assessment.

According to Mahadik et al. (2014), quality management is a managerial style that perceives and the major goals of this work are basically to maintain and improve quality standards and to achieve customer satisfaction. Through a questionnaire survey, this study explored the requirement and advantages of widespread adoption of quality control in the construction sector.

(Joy, 2014), emphasized the construction industry's role as the most significant economically and in terms of obtaining excellence in building. Quality is essential for long-term success and customer pleasure. Quality is defined as "meeting the customer prospect," and the purpose of this study is to provide clients, project managers, designers, and contractors with the information they need to effectively manage the quality of construction building projects by characterizing and

ranking the factors that affect process quality of construction projects. Variables were discovered using a relative index, and recommendations were made to improve their quality for businesses.

(Mane, et al., 2015), discussed the importance of quality management in a construction firm. The author stated that a Quality Management System (QMS) may be used regardless of the size of the business or the size of the project. The significance of a five-point scale is discussed in the paper regarding rating qualities. Following that, in the following stage, interviews with persons involved in the construction project were conducted.

Quality management practices in Ethiopia are underdeveloped across all sectors, according to (Birhanu, 2011)'s research on Quality Management and Engineering Practice and Obstacles in Ethiopia, along with management, strategy, resource management, systems integration, product quality, business performance, and societal impact. The quality management approach of the service sector is lower than that of the industrial sectors, according to all quality indices.

According to the findings, the causes of poor quality practice are: a lack of understanding of basic quality principles and a lack of consumer understanding about quality. So far, there is no planned intervention to build customer knowledge, which would most likely contribute to quality improvement in the industries, based on the findings of this research.

2.3. Conceptual framework

The conceptual framework of the study level factors that affect implementation of project quality management which can be summarized based on the literatures above.

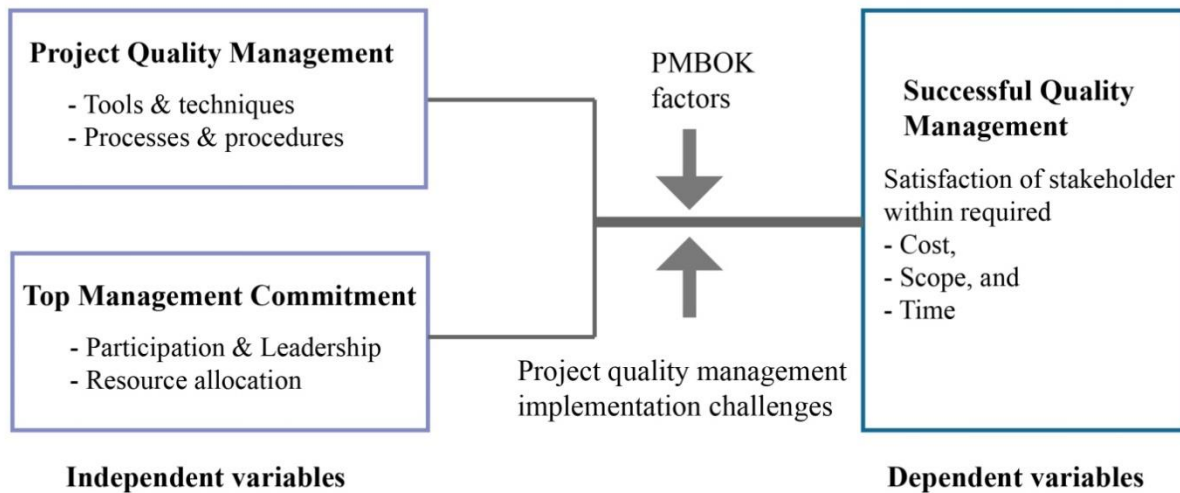


Figure 9: Conceptual framework (self-constructed, 2021)

Chapter three: Research Methodology

Introduction

This chapter provides a full overview of the methodological technique employed; it describes how the research was performed based on the study's objectives. It describes the research design, sampling strategy, data collecting sources, instruments, and methods, as well as the data analysis method for the research, along with the essential reasons.

3.1. Research design

A descriptive research technique was employed by the researcher in this study in order to evaluate the attributes specified in the research question. It employed a quantitative research technique because this is a method for evaluating objective ideas by analyzing the connection between variables.

It used project quality management processes to extract variables for measuring the consistency procedures and processes used while implementing the use of acceptable quality standards in meeting the project requirements.

3.2. Research approach

Quantitative research is a method for putting realistic hypotheses to the test by investigating the connection between variables. These factors can then be analyzed, often with tools, and the resulting numeric data may be examined statistically. (Creswell, 2009)

Employees participating in project activity were used as primary data sources, including technical specialists and support workers, high level executives, and internal papers that might provide information on the project's project management approach. Secondary data were gathered from related journals, papers, books, and project papers.

3.3. Population of the study

Population does not always refer to a specific number of individuals; rather, it is a generic term that refers to the total number of things (cases) like the one that are the subject of the investigation. There will most likely be just a few groups of people in this demographic that are of interest to the research. The sample frame is the chosen category (Nicholas, et al., 2012). The target population of the study consist the employees of the three stakeholders AACGMPCO, CCCC, and BKW at different divisions and functional levels that participated on the Meskel square smart parking project hence the sampling frame is the internal (primary) project team.

3.4 Sampling techniques

Purposive (subjective or selective) sampling was employed by the researcher to choose questionnaire respondents, based on one's judgment when selecting individuals of the population to participate in the study.

Purposive sampling allows us to utilize our discretion to choose samples that will allow us to best answer our research questions and fulfill our goals. This type of sample is frequently employed when we want to identify situations that are very revealing. (Neuman, 2005)

It enables attention on a small number of informants chosen from different functional levels to obtain the necessary information in order to complete the research in a short amount of time while gaining optimal perspective. Respondents will be chosen based on their field of work, expertise, and knowledge of project quality management implementation on Meskel square smart parking project.

3.5. Source of data

The research collected both primary and secondary data in order to get enough and relevant information to answer the research questions and satisfy the research objectives. Primary data will be gathered from individuals and professionals working on projects and at the organizational level while secondary data for the study was gathered from relevant publications, text books, journals, and other available documents included in the literature review. Furthermore, accessible organizational papers including project identities, accessible project papers such as contracts, plans, and reports will be monitored.

3.6. Data collection tools

The researcher used quantitative data collection methods so questionnaires were conducted as survey instruments to the employees: contractors, consultants and internal team of the project. The main tools used to gather the primary data from the primary sources included questionnaire guides. The questionnaire was created by consulting several literatures and adjusting it to meet the aims of this study and was held in English. It included different parts in order to collect information on quality management practice in Meskel square smart parking project.

Questionnaires have been delivered to the project coordinator, project manager, project team members, and project site support staff. Furthermore, as a secondary source of data, the study employed firm papers, project reports, papers, journals, research, and books.

3.7. Procedure of data collection

To collect relevant data for the purpose of this study the above-mentioned major instruments were applied. The researcher chose those methods assuming that it was cost and time effective. Data was analyzed after the questionnaires were distributed to each respondent.

3.8. Methods of data analysis and presentation

The acquired data was compiled by editing processes such as checking the raw data to discover mistakes, omissions, classifications, and aggregation.

The data gathered by the researcher was examined quantitatively. Statistical procedures were carried out using SPSS software version 26 to evaluate the data acquired by questionnaires in accordance with the general goal of the research.

3.9. Validity of Reliability

The research's validity was ensured by the use of many relevant and proven methodologies in scientific research. The questionnaire responses were also closely connected to the fields of study. The researcher employed several data gathering methods, such as triangulation, to improve the validity and accuracy of the information.

As a result, data gathering tools such as surveys and observation were utilized in combination to cover the gaps left with on another. These elements, when combined, guarantee the study's validity and reliability. The adviser reviewed the researcher's data and study instrument for confusing, ambiguous, and ineffective questions.

The adviser also reviewed and approved the instrument's usefulness in meeting the study goal. The research's reliability was ensured by running a statistical test with SPSS version 26 and analyzing the results of the Cronbach's alpha test to determine its acceptance.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.839	.838	25

Table 1: Reliability statistics of Quality management process (quality planning, quality assurance, and quality control) (Own survey, 2021)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.671	.680	6

Table 2: Reliability statistics Top management commitment (own survey, 2021)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.864	.881	19

Table 3: Reliability statistics of Quality management implementation challenges and problems (own survey, 2021)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.711	.727	11

Table 4: Reliability statistics of quality management tools and techniques applied (own survey, 2021)

The cronbach's alpha of all the four variables are shown in the above table for are 0.838, 0.68, 0.88 and 0.72, this indicates that all four variables have sufficient internal consistency because they are all more than the appropriate percentage.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.694	.659	61

Table 5: Over all reliability statistics (own survey, 2021)

3.9. Ethical considerations

Throughout the research process, the researcher adhered to ethical research protocols. Prior to collecting study data, permission was gathered from study participants to assure the study's ethical quality. The goal of the study was conveyed to participants in order to help them feel more at ease in responding.

Respondents were told about the ambiguous nature of their participation as well as the option to avoid the question if they did not have clear understanding about the problems presented by the researcher. The respondents' confidentiality was ensured.

Chapter four: Data findings and discussion

Introduction

This chapter presents the analysis, discussions and findings on the practice of quality management in Addis Ababa city government mega projects in Addis Ababa on the case of Meskel square smart parking project.

4.1. Primary data analysis

Quantitative data was analyzed by employing descriptive and explanatory statistics using statistical package for social science (SPSS) version 26. Three areas of the elements impacting project quality management were investigated; Project quality management processes, tools and techniques; top management commitment along with leadership and participation, and allocation of resources; and other factors.

Distribution method	No. of distributed	No. of returned	Overall response rate
Hard copy	40	36	60%
By email & telegram	20	18	30%
Total	60	54	90%

Source: own survey, 2021

The researcher used both soft and hard copies to distribute 60 questionnaires among the selected employees within the sample frame. From the distributed, 54 questionnaires were returned with the response rate of 90%.

4.1.1. Demographic information of respondents

The demographic information included in the questionnaire is gender, age, education level, position and years of experience.

No.	Description	Freq.	%	Total		
				Freq.	%	
1	Gender	Female	16	29.6	54	100
		Male	38	70.4		
2	Age	Below 30	28	51.9	54	100
		31-40	19	35.2		
		41-50	5	9.3		
		Above 50	2	3.7		

3	Education level	PHD			54	100
		MA/MSc	7	13		
		BA/Bsc	47	87		
		Diploma				
		High school				
4	Position on the project	Resident Engineer	16	29.6	54	100
		Project consultant	9	16.7		
		Project manager	4	7.4		
		Project team member	11	20.4		
		Quality management team member	3	5.6		
		Technical team member	11	20.4		
5	Years of experience	Less than 5 years	26	84.1	54	100
		6-10 years	17	31.5		
		11-15 years	7	13		
		16 and above	4	7.4		

Source: own survey, 2021

As shown in the figure above, only 16 (29.6%) of the respondents were female while the remaining 38 (70.4%) were male. This clearly indicates that the sample population was dominated by male respondents.

According to the respondents' educational backgrounds, 47 (87%) have only a bachelor's degree, while 7 (13%) have a master's degree. The majority of respondents have a Bachelor's or first-year degree.

While considering the position of respondents on the given project, there were 16 resident engineers, 9 project consultants, 4 project managers, 11 project members, 3 QM team members, and 11 technical or support staff members conducted on the study.

The researcher chose to take into account the respondent's years of project experience, since it is essential for project management understanding. 26 (48.1%) of the respondents have less than 5 years' work experiences, 17 (31.5%) have between 6-10 years, and only 11 (20.4%) of them have 11 years and above of experiences. This profile shows that there is lack of more experienced employee in the organization.

4.2.1. Assessing the project quality management using the variables

As mentioned above on the literature review and conceptual framework the researcher considered project quality management process (quality planning, quality assurance, quality control), top management commitment regarding quality, quality management challenges/problems) faced and the quality management tools and techniques applied as variables affecting success of quality in the project.

No.	Description			Respondent		Total	
				Frequency	%	N	%
1	Have you ever taken project management course?	Yes	1 week course	3	5.55	54	100
			2 weeks course	2	3.7		
			Weekend course	4	7.4		
			Higher education	1	1.85		
			other	2	3.7		
			No response	4	7.4		
		No	38	70.4			

Source: own survey, 2021

On the general question about project management out of 54 respondents 16 with response rate of 29.6 agreed to having taken project management course before. Out of these, 3 respondents have taken 1 week course, 2 respondents have taken 2 weeks course, 4 respondents have taken week end course, 1 respondent has a MA in project management, 2 respondents have taken other course program and 4 respondents gave no response.

38 respondents with the rate of 70.4% replied that they have never taken project management course before. This means the majority of the respondents haven't taken any official course.

Respondents were asked to rate Meskel square smart parking project on all of the variables used to assess the project quality management of the project. By using a 5 Point Likert scale, respondents were asked to rate each question on the variable as listed below.

- 1= strongly disagree,
- 2= disagree,
- 3= neutral,
- 4= agree,
- 5= strongly agree

The means values of each questions question and variable as a whole is rated using 5 Point Likert scale as listed below.

(1-1.79) = strongly agree

(1.80- 2.59) = agree

(2.60-3.39) = neutral

(3.40-4.19) = disagree

(4.20-5) = strongly disagree

Variable one: Quality management process

- **Quality planning**

	strongly disagree		disagree		neutral		agree		strongly agree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
QP1	2	3.7%	8	14.8%	11	20.4%	22	40.7%	11	20.4%	3.59
QP2	7	13.0%	17	31.5%	10	18.5%	13	24.1%	7	13.0%	2.92
QP3	5	9.3%	16	29.6%	8	14.8%	16	29.6%	9	16.7%	3.14
QP4	1	1.9%	14	25.9%	14	25.9%	17	31.5%	8	14.8%	3.31
QP5	0	0.0%	10	18.5%	7	13.0%	20	37.0%	17	31.5%	3.81
QP6	0	0.0%	17	31.5%	11	20.4%	15	27.8%	11	20.4%	3.37
QP7	4	7.4%	12	22.2%	19	35.2%	17	31.5%	2	3.7%	3
QP8	6	11.1%	10	18.5%	17	31.5%	14	25.9%	7	13.0%	3.11
QP9	2	3.7%	12	22.2%	19	35.2%	15	27.8%	6	11.1%	3.2
QP10	2	3.7%	15	27.8%	15	27.8%	12	22.2%	10	18.5%	3.24
QP11	4	7.4%	11	20.4%	15	27.8%	17	31.5%	7	13.0%	3.22
QP12	0	0.0%	17	31.5%	9	16.7%	14	25.9%	14	25.9%	3.46
QP13	12	22.2%	12	22.2%	11	20.4%	2	3.7%	17	31.5%	3
QP14	0	0.0%	10	18.5%	16	29.6%	12	22.2%	16	29.6%	3.62
QP15	1	1.9%	8	14.8%	23	42.6%	10	18.5%	12	22.2%	3.44
QP16	9	16.7%	7	13.0%	18	33.3%	19	35.2%	1	1.9%	2.92
QP17	11	20.4%	8	14.8%	17	31.5%	17	31.5%	1	1.9%	2.79

Source: own survey, 2021

The first project quality management process aspect considered was quality planning. As shown in the figure above 54 respondents gave response to all 17 questions regarding quality planning in their respective organization and the project specifically. The responses are:

QP1 - Brief project description:

Based on the response, 3.7% of the respondents strongly disagreed while 14.8% disagreed. 20.4% of the respondents gave a neutral response where as 40.7% of them agreed and 20.4% strongly agreed making the mean value 3.59.

QP2 - Project quality objectives:

Accordingly, 13.0% of the respondents strongly disagreed while 31.5% disagreed. 18.5% of the respondents gave a neutral response where as 24.1% of them agreed and 20.4% strongly agreed making the mean value 2.92.

QP3 - Responsibilities and authorities of project staff:

On the specific question, 9.3% of the respondents strongly disagreed while 29.6% disagreed. 14.8% of the respondents gave a neutral response where as 29.6% of them agreed and 16.7% strongly agreed making the mean value 3.14

QP4 - Site organization chart, with named personnel:

Based on the response, 1.9% of the respondents strongly disagreed while 25.9% disagreed. 25.9% of the respondents gave a neutral response where as 31.5% of them agreed and 20.4% strongly agreed making the mean value 3.31.

QP5 - List of contract documents and drawings:

Accordingly, 0.0% of the respondents strongly disagreed while 18.5% disagreed. 13.0% of the respondents gave a neutral response where as 37.0% of them agreed and 31.5% strongly agreed making the mean value 3.81.

QP6 - Site layout plan:

On the specific question, 0.0% of the respondents strongly disagreed while 31.5% disagreed. 20.4% of the respondents gave a neutral response where as 27.8% of them agreed and 20.4% strongly agreed making the mean value 3.37

QP7 - Construction program and sub-programs:

Accordingly, 7.4% of the respondents strongly disagreed while 22.2% disagreed. 35.2% of the respondents gave a neutral response where as 31.5% of them agreed and 3.7% strongly agreed making the mean value 3

QP8 - Schedules for subcontractor nomination, material, and equipment:

Based on the response, 11.1% of the respondents strongly disagreed while 18.5% disagreed. 31.5% of the respondents gave a neutral response where as 25.9% of them agreed and 13.0% strongly agreed making the mean value 3.11.

QP9 - Procurement based on the construction program:

On the specific question, 3.7% of the respondents strongly disagreed while 22.2% disagreed. 35.2% of the respondents gave a neutral response where as 27.8% of them agreed and 11.1% strongly agreed making the mean value 3.2.

QP10 - List(s) of materials and appliances used for the project, showing the verification requirement of each:

Accordingly, 3.7% of the respondents strongly disagreed while 27.8% disagreed 27.8% of the respondents gave a neutral response where as 22.2% of them agreed and 18.5% strongly agreed making the mean value 3.24

QP11 - List of quality procedures and work instructions applicable to project by making reference to the company's Quality Manual and Procedures:

Based on the response, 7.4% of the respondents strongly disagreed while 20.4% disagreed. 27.8% of the respondents gave a neutral response where as 31.5% of them agreed and 13.0% strongly agreed making the mean value 3.22.

QP12 - List of project-specific procedures, work instructions and inspection:

On the specific question, 0.0% of the respondents strongly disagreed while 31.5% disagreed. 16.7% of the respondents gave a neutral response where as 25.9% of them agreed and 25.9% strongly agreed making the mean value 3.46

QP13 - List of quality records to be kept, including appropriate quality records from subcontractors:

Accordingly, 22.2% of the respondents strongly disagreed while 22.2% disagreed. 20.4% of the respondents gave a neutral response where as 3.7% of them agreed and 31.5% strongly agreed making the mean value 3

QP14 - Inspection and test plans, or list thereof:

Based on the response, 0.0% of the respondents strongly disagreed while 18.5% disagreed. 29.6% of the respondents gave a neutral response where as 22.2% of them agreed and 29.6% strongly agreed making the mean value 3.62.

QP15 - Checklists, or target dates for their provision:

Accordingly, 1.9% of the respondents strongly disagreed while 14.8% disagreed. 42.6% of the respondents gave a neutral response where as 18.5% of them agreed and 22.2% strongly agreed making the mean value 3.44.

QP16 - Frequency or provisional dates, if possible, of internal quality audits:

Based on the response, 16.7% of the respondents strongly disagreed while 13.0% disagreed. 33.3% of the respondents gave a neutral response where as 35.2% of them agreed and 1.9% strongly agreed making the mean value 2.92.

QP17 - Frequency of updating the quality plan:

On the specific question, 20.4% of the respondents strongly disagreed while 14.8% disagreed. 31.5% of the respondents gave a neutral response where as 31.5% of them agreed and 1.9% strongly agreed making the mean value 2.79.

The analysis and aggregation of data from the respondents on the above 17 questions on quality planning are summarized on the table below.

	Frequency	Percent	Valid percent
Strongly disagree	66	7.2%	7.2%
Disagree	204	22.2%	22.2%
Neutral	240	26.15%	26.15%
Agree	252	27.45%	27.45%
Strongly agree	156	17.01%	17.01%
Total	918	100%	100%
Mean	3.24		

Source: own survey, 2021

From the above responses project quality planning is computed by taking average of rating of each question. As a result, mean of the overall questions is 3.24 being rated as neutral.

- **Quality assurance**

	strongly disagree		disagree		neutral		agree		strongly agree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
QA1	10	18.5%	16	29.6%	9	16.7%	11	20.4%	8	14.8%	2.83
QA2	6	11.1%	18	33.3%	6	11.1%	13	24.1%	11	20.4%	3.09
QA3	0	0.0%	7	13.0%	20	37.0%	19	35.2%	8	14.8%	3.51
QA4	3	5.6%	17	31.5%	9	16.7%	16	29.6%	9	16.7%	3.2

Source: own survey, 2021

The second project quality management process aspect considered was quality assurance. As shown in the figure above 54 respondents gave response to all 4 questions regarding quality assurance in their respective organization and the project specifically. The responses are:

QA1 - Selects the appropriate quality management system requirements for each contract:

Accordingly, 18,5% of the respondents strongly disagreed while 29.6% disagreed. 16.7% of the respondents gave a neutral response where as 20.4% of them agreed and 14.8% strongly agreed making the mean value 2.83.

QA2 - Clearly specifies the quality management system requirements in tender and contract documents:

Based on the response, 11.1% of the respondents strongly disagreed while 33.3% disagreed. 11.1% of the respondents gave a neutral response where as 24.1% of them agreed and 20.4% strongly agreed making the mean value 3.09.

QA3 - Evaluates and selects subcontractors on their ability to satisfy specified requirements:

Based on the response, 0.0% of the respondents strongly disagreed while 13.0% disagreed. 37.0% of the respondents gave a neutral response where as 35.2% of them agreed and 14.8% strongly agreed making the mean value 3.51.

QA4 - Appropriate checking, measurement or testing of products and keeping proper records:

Accordingly, 5.6% of the respondents strongly disagreed while 31.5% disagreed. 16.7% of the respondents gave a neutral response where as 29.6% of them agreed and 16.7% strongly agreed making the mean value 3.2.

The analysis and aggregation of data from the respondents on the above 4 questions on quality assurance are summarized on the table below.

	Frequency	Percent	Valid percent
Strongly disagree	19	8.8%	8.8%
Disagree	58	26.85%	26.85%
Neutral	44	20.38%	20.38%
Agree	59	27.33%	27.33%
Strongly agree	36	16.68%	16.68%
Total	216	100%	100%
Mean	3.15		

Source: own survey, 2021

From the above responses project quality assurance is computed by taking average of rating of each question. As a result, mean of the overall questions is 3.15 being rated as neutral.

Quality control

	strongly disagree		disagree		neutral		agree		strongly agree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
QC1	7	13.0%	12	22.2%	7	13.0%	19	35.2%	9	16.7%	3.2
QC2	0	0.0%	20	37.0%	12	22.2%	10	18.5%	12	22.2%	3.25
QC3	5	9.3%	16	29.6%	10	18.5%	13	24.1%	10	18.5%	3.12
QC4	3	5.6%	12	22.2%	15	27.8%	13	24.1%	11	20.4%	3.31

Source: own survey, 2021

The third project quality management process aspect considered was quality control. As shown in the figure above 54 respondents gave response to all 4 questions regarding quality control in their respective organization and the project specifically. The responses are:

QC1 - Select what to control and set standards that provide the basis for decisions regarding possible corrective action:

Based on the response, 13.0% of the respondents strongly disagreed while 22.2% disagreed. 13.0% of the respondents gave a neutral response where as 35.2% of them agreed and 16.7% strongly agreed making the mean value 3.2.

QC2 - Establish the measurement methods used, compare the actual results to the quality standards:

On the specific question, 0.0% of the respondents strongly disagreed while 37.0% disagreed. 22.2% of the respondents gave a neutral response where as 18.5% of them agreed and 22.2% strongly agreed making the mean value 3.25.

QC3 - Act to bring nonconforming processes and material back to the standard based on the information collected:

Based on the response, 9.3% of the respondents strongly disagreed while 29.6% disagreed. 18.5% of the respondents gave a neutral response where as 24.1% of them agreed and 18.5% strongly agreed making the mean value 3.12.

QC4 - Monitor and standardize measuring devices, include detailed documentation for all processes:

Based on the response, 5.6% of the respondents strongly disagreed while 22.2% disagreed. 27.8% of the respondents gave a neutral response where as 24.1% of them agreed and 20.4% strongly agreed making the mean value 3.31.

The analysis and aggregation of data from the respondents on the above 4 questions on quality control are summarized on the table below.

	Frequency	Percent	Valid percent
Strongly disagree	15	6.98%	6.98%
Disagree	60	27.75%	27.75%
Neutral	44	20.38%	20.38%
Agree	55	25.48%	25.48%
Strongly agree	42	19.45%	19.45%
Total	216	100%	100%
Mean	3.22		

Source: own survey, 2021

From the above responses project quality control is computed by taking average of rating of each question. As a result, mean of the overall questions is 3.22 being rated as neutral. This is further shown by the graph below.

Variable two: Top management commitment to Quality Management

	strongly disagree		disagree		neutral		agree		strongly agree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
TMC1	8	14.8%	8	14.8%	8	14.8%	23	42.6%	7	13.0%	3.24
TMC2	10	18.5%	20	37.0%	9	16.7%	8	14.8%	7	13.0%	2.66
TMC3	13	24.1%	22	40.7%	7	13.0%	7	13.0%	5	9.3%	2.42
TMC4	5	9.3%	22	40.7%	5	9.3%	15	27.8%	7	13.0%	2.94
TMC5	6	11.1%	11	20.4%	16	29.6%	16	29.6%	5	9.3%	3.05
TMC6	3	5.6%	4	7.4%	14	25.9%	26	48.1%	7	13.0%	3.55

Source: own survey, 2021

The other variable considered was Top management commitment to quality management. As shown in the figure above 54 respondents gave response to all 6 questions regarding quality control in their respective organization and the project specifically. The responses are:

TMC1 - Communicate the importance of meeting customer requirements:

Based on the response, 14.8% of the respondents strongly disagreed while 14.8% disagreed. 14.8% of the respondents gave a neutral response where as 42.6% of them agreed and 13.0% strongly agreed making the mean value 3.24.

TMC2 - Setting quality policies:

Accordingly, 18.5% of the respondents strongly disagreed while 37.0% disagreed. 16.7% of the respondents gave a neutral response where as 14.8% of them agreed and 13.0% strongly agreed making the mean value 2.66.

TMC3 - Providing proper training:

Based on the response, 24.1% of the respondents strongly disagreed while 40.7% disagreed. 13.0% of the respondents gave a neutral response where as 13.0% of them agreed and 9.3% strongly agreed making the mean value 2.42.

TMC4 - Conduct management reviews on project quality:

Accordingly, 9.3% of the respondents strongly disagreed while 40.7% disagreed. 9.3% of the respondents gave a neutral response where as 27.8% of them agreed and 13.0% strongly agreed making the mean value 2.94.

TMC5 - Seek to have more financial resources:

Based on the response, 11.1% of the respondents strongly disagreed while 20.4% disagreed. 29.6% of the respondents gave a neutral response where as 29.6% of them agreed and 9.3% strongly agreed making the mean value 3.05.

TMC6 - Seek to have more human resources

Accordingly, 5.6% of the respondents strongly disagreed while 7.4% disagreed. 25.9% of the respondents gave a neutral response where as 48.1% of them agreed and 13.0% strongly agreed making the mean value 3.55.

The analysis and aggregation of data from the respondents on the above 6 questions on top management commitment are summarized on the table below.

	Frequency	Percent	Valid percent
Strongly disagree	15	13.9%	13.9%
Disagree	60	26.83%	26.83%
Neutral	44	18.22%	18.22%
Agree	55	29.32%	29.32%
Strongly agree	42	11.77%	11.77%
Total	216	100%	100%
Mean	2.99		

Source: own survey, 2021

From the above responses top management commitment is computed by taking average of rating of each question. As a result, mean of the overall questions is 2.99 being rated as neutral.

Variable three: Quality Management Implementation Problems /challenges

	strongly disagree		disagree		neutral		agree		strongly agree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
QMC1	2	3.7%	12	22.2%	8	14.8%	19	35.2%	13	24.1%	3.53
QMC2	5	9.3%	4	7.4%	12	22.2%	28	51.9%	5	9.3%	3.44
QMC3	3	5.6%	10	18.5%	9	16.7%	28	51.9%	4	7.4%	3.37
QMC4	0	0.0%	26	48.1%	12	22.2%	10	18.5%	6	11.1%	2.92
QMC5	5	9.3%	20	37.0%	3	5.6%	22	40.7%	4	7.4%	3
QMC6	5	9.3%	9	16.7%	7	13.0%	33	61.1%	0	0.0%	3.25
QMC7	0	0.0%	6	11.1%	28	51.9%	20	37.0%	0	0.0%	3.25
QMC8	11	20.4%	17	31.5%	7	13.0%	19	35.2%	0	0.0%	2.62
QMC9	0	0.0%	0	0.0%	5	9.3%	27	50.0%	22	40.7%	4.31
QMC10	0	0.0%	1	1.9%	6	11.1%	37	68.5%	10	18.5%	4.03
QMC11	0	0.0%	1	1.9%	5	9.3%	36	66.7%	12	22.2%	4.09
QMC12	0	0.0%	0	0.0%	10	18.5%	25	46.3%	19	35.2%	4.16
QMC13	8	14.8%	4	7.4%	5	9.3%	22	40.7%	15	27.8%	3.59
QMC14	0	0.0%	1	1.9%	14	25.9%	18	33.3%	21	38.9%	4.09
QMC15	0	0.0%	7	13.0%	1	1.9%	15	27.8%	31	57.4%	4.29

QMC16	1	1.9%	7	13.0%	0	0.0%	36	66.7%	10	18.5%	3.87
QMC17	0	0.0%	6	11.1%	0	0.0%	22	40.7%	26	48.1%	4.25
QMC18	0	0.0%	0	0.0%	2	3.7%	27	50.0%	25	46.3%	4.42
QMC19	2	3.7%	9	16.7%	0	0.0%	34	63.0%	9	16.7%	3.72

Source: own survey, 2021

The other variable considered was problems or challenges faced on quality management implementation. As shown in the figure above 54 respondents gave response to all 19 questions regarding the challenges in their respective organization and the project specifically. The responses are:

QMC1 - Inadequate management support:

Based on the response, 3.7% of the respondents strongly disagreed while 22.2% disagreed. 14.8% of the respondents gave a neutral response where as 35.2% of them agreed and 24.1% strongly agreed making the mean value 3.53.

QMC2 - Unwillingness of project staff to accept the quality system:

Based on the response, 9.3% of the respondents strongly disagreed while 7.4% disagreed. 22.2% of the respondents gave a neutral response where as 51.9% of them agreed and 9.3% strongly agreed making the mean value 3.44.

QMC3 - Difficulties in understanding the quality system:

Accordingly, 5.6% of the respondents strongly disagreed while 18.5% disagreed. 16.7% of the respondents gave a neutral response where as 51.9% of them agreed and 7.4% strongly agreed making the mean value 3.37.

QMC4 - Problem with more paper works:

Based on the response, 0.0% of the respondents strongly disagreed while 48.1% disagreed. 22.2% of the respondents gave a neutral response where as 18.5% of them agreed and 11.1% strongly agreed making the mean value 2.92.

QMC5 - Problem with documentation:

Accordingly, 9.3% of the respondents strongly disagreed while 37.0% disagreed. 5.6% of the respondents gave a neutral response where as 40.7% of them agreed and 7.4% strongly agreed making the mean value 3.

QMC6 - Difficulties in measuring results:

Based on the response, 9.3% of the respondents strongly disagreed while 16.7% disagreed. 13.0% of the respondents gave a neutral response where as 61.1% of them agreed and 0.0% strongly agreed making the mean value 3.25.

QMC7 - Problems with contractors' performance:

Based on the response, 0.0% of the respondents strongly disagreed while 11.1% disagreed. 51.9% of the respondents gave a neutral response where as 37.0% of them agreed and 0.0% strongly agreed making the mean value 3.25.

QMC8 - Problems with consultant's performance:

Based on the response, 20.4% of the respondents strongly disagreed while 31.5% disagreed. 13.0% of the respondents gave a neutral response where as 35.2% of them agreed and 0.0% strongly agreed making the mean value 2.62.

QMC9 - Ineffective communication:

Based on the response, 0.0% of the respondents strongly disagreed while 0.0% disagreed. 9.3% of the respondents gave a neutral response where as 50.0% of them agreed and 40.7% strongly agreed making the mean value 4.31.

QMC10 - Increase of cost:

Accordingly, 0.0% of the respondents strongly disagreed while 1.9% disagreed. 11.1% of the respondents gave a neutral response where as 68.5% of them agreed and 18.5% strongly agreed making the mean value 4.03.

QMC11 - Increase of time:

Based on the response, 0.0% of the respondents strongly disagreed while 1.9% disagreed. 9.3% of the respondents gave a neutral response where as 66.7% of them agreed and 22.2% strongly agreed making the mean value 4.09.

QMC12 - Inadequate information:

Based on the response, 0.0% of the respondents strongly disagreed while 0.0% disagreed. 18.5% of the respondents gave a neutral response where as 46.3% of them agreed and 35.2% strongly agreed making the mean value 4.16.

QMC13 - Inadequate technical expertise/skills:

Accordingly, 14.8% of the respondents strongly disagreed while 7.4% disagreed. 9.3% of the respondents gave a neutral response where as 40.7% of them agreed and 27.8% strongly agreed making the mean value 3.59.

QMC14 - Problem with Government bureaucracy:

Based on the response, 0.0% of the respondents strongly disagreed while 1.9% disagreed. 25.9% of the respondents gave a neutral response where as 33.3% of them agreed and 38.9% strongly agreed making the mean value 4.09.

QMC15 - Problem with raw materials shortage due to inflation:

Accordingly, 0.0% of the respondents strongly disagreed while 13.0% disagreed. 1.9% of the respondents gave a neutral response where as 27.8% of them agreed and 57.4% strongly agreed making the mean value 4.29.

QMC16 - Problem with Right of way:

Based on the response, 1.9% of the respondents strongly disagreed while 13.0% disagreed. 0.0% of the respondents gave a neutral response where as 66.7% of them agreed and 18.5% strongly agreed making the mean value 3.87.

QMC17 - Problem with scope change:

Based on the response, 0.0% of the respondents strongly disagreed while 11.1% disagreed. 0.0% of the respondents gave a neutral response where as 40.7% of them agreed and 48.1% strongly agreed making the mean value 4.25.

QMC18 - Lack of standardized quality management guidelines:

Based on the response, 0.0% of the respondents strongly disagreed while 0.0% disagreed. 3.7% of the respondents gave a neutral response where as 50.0% of them agreed and 46.3% strongly agreed making the mean value 4.42.

QMC19 - Employee turnover:

Accordingly, 3.7% of the respondents strongly disagreed while 16.7% disagreed. 0.0% of the respondents gave a neutral response where as 63.0% of them agreed and 16.7% strongly agreed making the mean value 3.72.

The analysis and aggregation of data from the respondents on the above 19 questions on quality management implementation problems /challenges are summarized on the table below.

	Frequency	Percent	Valid percent
Strongly disagree	42	4.11%	4.11%
Disagree	140	13.65%	13.65%
Neutral	134	13.07%	13.07%
Agree	478	46.59%	46.59%
Strongly agree	233	22.61%	22.61%
Total	1026	100%	100%
Mean	3.69		

Source: own survey, 2021

From the above responses quality management implementation problems/challenges is computed by taking average of rating of each question. As a result, mean of the overall questions is 3.69 being rated as neutral.

Variable four: Quality Management Tools and Techniques Applied

	strongly disagree		disagree		neutral		agree		strongly agree		Mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
QMT1	4	7.4%	13	24.1%	17	31.5%	12	22.2%	8	14.8%	3.12
QMT2	2	3.7%	15	27.8%	13	24.1%	16	29.6%	8	14.8%	3.24
QMT3	3	5.6%	8	14.8%	20	37.0%	18	33.3%	5	9.3%	3.25
QMT4	3	5.6%	21	38.9%	13	24.1%	17	31.5%	0	0.0%	2.81
QMT5	4	7.4%	28	51.9%	9	16.7%	12	22.2%	1	1.9%	2.59
QMT6	2	3.7%	21	38.9%	13	24.1%	17	31.5%	1	1.9%	2.89
QMT7	1	1.9%	6	11.1%	12	22.2%	24	44.4%	11	20.4%	3.7
QMT8	0	0.0%	19	35.2%	19	35.2%	16	29.6%	0	0.0%	2.94
QMT9	0	0.0%	25	46.3%	15	27.8%	14	25.9%	0	0.0%	2.79
QMT10	1	1.9%	19	35.2%	11	20.4%	19	35.2%	4	7.4%	3.11
QMT11	3	5.6%	14	25.9%	21	38.9%	16	29.6%	0	0.0%	2.92

Source: own survey, 2021

The other variable considered was quality management tools and techniques applied. As shown in the figure above 54 respondents gave response to all 11 questions regarding the tools and techniques applied in their respective organization and the project specifically. The responses are:

QMT1 - Benefit/ cost analysis:

Based on the response, 7.4% of the respondents strongly disagreed while 22.2% disagreed. 13.0% of the respondents gave a neutral response where as 35.2% of them agreed and 16.7% strongly agreed making the mean value 3.2.

QMT2 - Benchmarking:

Based on the response, 3.7% of the respondents strongly disagreed while 24.1% disagreed. 31.5% of the respondents gave a neutral response where as 22.2% of them agreed and 14.8% strongly agreed making the mean value 3.12..

QMT3 - Flowcharting:

Based on the response, 5.6% of the respondents strongly disagreed while 14.8% disagreed. 37.0% of the respondents gave a neutral response where as 33.3% of them agreed and 9.3% strongly agreed making the mean value 3.25.

QMT4 - Design of experiments:

Based on the response, 5.9% of the respondents strongly disagreed while 38.9% disagreed. 24.1% of the respondents gave a neutral response where as 31.5% of them agreed and 0.0% strongly agreed making the mean value 2.81..

QMT5 - cost of quality:

Based on the response, 7.4% of the respondents strongly disagreed while 51.9% disagreed. 16.7% of the respondents gave a neutral response where as 22.2% of them agreed and 1.9% strongly agreed making the mean value 2.59.

QMT6 - quality audits:

Based on the response, 3.7 % of the respondents strongly disagreed while 38.9% disagreed. 24.1% of the respondents gave a neutral response where as 31.5% of them agreed and 1.9% strongly agreed making the mean value 2.89.

QMT7 - Inspection:

Based on the response, 1.9% of the respondents strongly disagreed while 11.1% disagreed. 22.2% of the respondents gave a neutral response where as 344.4% of them agreed and 20.4% strongly agreed making the mean value 3.7.

QMT8 - control chart:

Based on the response, 0.0% of the respondents strongly disagreed while 35.2% disagreed. 35.2% of the respondents gave a neutral response where as 29.6% of them agreed and 0.0% strongly agreed making the mean value 2.94.

QMT9 - Pareto diagrams:

Based on the response, 0.0% of the respondents strongly disagreed while 46.3% disagreed. 27.8% of the respondents gave a neutral response where as 25.9% of them agreed and 0.0% strongly agreed making the mean value 2.79.

QMT10 - statistical sampling:

Based on the response, 1.9% of the respondents strongly disagreed while 35.2% disagreed. 20.4% of the respondents gave a neutral response where as 35.2% of them agreed and 7.4% strongly agreed making the mean value 3.11.

QMT11 - trend analysis:

Based on the response, 5.6% of the respondents strongly disagreed while 25.9% disagreed. 38.9% of the respondents gave a neutral response where as 29.6% of them agreed and 0.0% strongly agreed making the mean value 2.92.

The analysis and aggregation of data from the respondents on the above 11 questions on quality management tools and techniques applied are summarized on the table below.

	Frequency	Percent	Valid percent
Strongly disagree	23	3.89%	3.89%
Disagree	189	31.83%	31.83%
Neutral	163	27.45%	27.45%
Agree	180	30.45%	30.45%
Strongly agree	38	6.41%	6.41%
Total	594	100%	100%
Mean	3		

Source: own survey, 2021

From the above responses quality management tools and techniques applied is computed by taking average of rating of each question. As a result, mean of the overall questions is 3 being rated as neutral.

4.2.2. Discussion

The study's findings indicate that a lack of sufficient training and engagement in project management may be the primary source of difficulties (shortcomings) in project quality. This is because of not allocating specialist with knowledge of PM and TQM on the projects and also by not providing training for the employees every now and then. It shows that this affects the project quality management process because of the lack of proper QM policies, standards, objectives, evaluations, frequent updates, and monitoring.

The data shows that there are both internal and external QM challenges faced on the project. Internal such as Inadequate information, lack off QM guidelines, scope change, Unwillingness of project staff to accept the quality system. Externally like increase of cost, Problem with Government bureaucracy, Problem with raw materials shortage due to inflation.

The findings of the study shows that there is lack of proper us of quality management tools and techniques as well such as pareto diagrams, trend analysis, design experiments, cost of quality and such.

Chapter five: Summary, Conclusion and Recommendations

Introduction

This chapter presents the major summaries of the findings, conclusions derived from the analysis and the recommendations that can help AACGMPCO in future projects regarding project quality management.

5.1. Summary of major findings

Based on the analysis, the following findings were recognized:

- According to the response of the respondents, the project more or less lacks good project quality management. The findings show that there are only very few people who took project management course (training), the number of people with MSc/MA education background is very low. Most of the employees rely on experience only rather than combining it with higher education.
- The response shows lack of project quality management training (workshop) access for employees. The respondents replied there isn't any training given specifically for project management. Few of them claimed they took the training personally,
- The findings show that there are only a few people QM technical skills, the usage of PMBOK is also not well known
- There was a time gap between project design and project implementation, this could be due to scope modification. As a result of the change in scope, the project has incurred more costs, time, and will be phased out.
- As for communication system and information exchange, lack of experience on mega project has been a challenge
- Based on the finding, working with quality management tools and techniques is not well known and hasn't been practiced by the employees.

5.2. Conclusion

The study assessed project quality management practices in government mega projects in Addis Ababa: the case of Meskel square smart parking. AACGMPCO is a good start in higher scale construction as a new ERA for development. Meskel project is one of the projects the Office is currently working on with AACGMPCO as a client, BKW as a project consultant and CCCC as project contractor.

According to the study's key findings and as mentioned in detail in the literature review of this study, successful project management increases the likelihood of successfully completing projects within time, cost, scope, and quality restrictions.

Due to the lack of proper QM training and skills, project team was not fully familiar with the concept of project quality management. The project quality management practice at the organization is challenged by various factors mainly; insufficient skills, problems with accepting quality management practices, change of scope and lack of quality management policy and guideline. Quality management tools and techniques such as pareto diagrams, trend analysis, design experiments, and cost of quality are not being used properly.

Finally, it has been understood that, the practice of project quality management would have helped the project to be more effective if it was implemented properly and thoroughly resulting significant changes.

5.3. Recommendation

The researcher offers the following possible recommendations to improve project quality management in mega projects and to reduce the problem of the gap between actual theory and project implementation.

- Since most of the members of the project team are on first degree educational level, the organization should update the skills of the employees. Lack of specific specialists might imply the lack of concern for quality management and project management as a whole
- The organization should provide different trainings and workshops in a given interval in order to help employees develop their skills and also cultivate good working relationship.
- There should be a well-defined quality policy in order to serve as a base or reference for the team to work with. This policy will set a standard and guideline that will shape the project towards project quality success.
- Because top management's direction is critical to the project's success, they should focus on identifying gaps that require their strong support and strengthening quality-focused initiatives.
- Project quality management process (quality planning, assurance and control) must be implemented on every project in order to prevent shortcoming and failures of a project or cure these issues at the earliest stage in order to achieve a successful project.
- In order to avoid construction project problems and challenges, the organization should also focus on project management body of knowledge areas, and at least one project manager professional should be assigned at the organizational level.
- Construction project quality management needs collaboration among stakeholders, including clients, contractors, and consultants, based on their stated roles and duties. As a result, the organization should focus on forming partnerships and collaborations with its stakeholders.
- In order to have a successful project team, the organization needs to create an efficient means of communication, and transfer of information to minimize misunderstandings while working on higher scale projects.
- There should be proper introduction to use of quality management tools and techniques to minimize errors and provide recorded materials (data) so that to learn from past mistakes and help a project succeed.

As a result, the organization can use the findings of this study to identify areas for development in order to manage the project's quality in accordance with other publications, allowing it to be managed more effectively and efficiently.

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Appendix A: Questionnaires



Seek Wisdom, Elevate your Intellect and Serve Humanity



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

Dear respondent,

The purpose of this questionnaire is to collect data for the study on Assessment of Quality management practices in government mega projects in Addis Ababa: The case of Meskel square smart parking project for partial fulfillment of a degree Masters of Art in project Management.

I would like to request you give proper response for the questions included on this questionnaire. I can assure you everything you say will stay anonymous so I hope you will give honest and sincere responses. Your willingness and cooperation will have a great impact on the study. I would like to thank you in advance for your participation in this initiative.

Meron Tilahun

Moblie: +251973068949

Email address: merontilahun44@gmail.com

Part one: Demographical Information

Please put a “X” mark to all your responses in or (next) to the box provided beside each statement.

1. What is your role in the project you are involved in?

- Project Manager Project team member Project Consultant
 Resident engineer Quality management team member Technical team member

2. Your total work experience in construction projects

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

Part two: This sub-section covers questions related to quality management process, tools and techniques, top management commitment, and problems encountered in Meskel square smart parking project.

No.	Description		Respondent		Total		
			Frequency	%	N	%	
1	Have you ever taken project management course?	Yes	1 week course				
			2 weeks course				
			Weekend course				
			Higher education				
			other				
			No response				
	No						

The scale rating description: 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree

Quality planning: Does your quality plan contain the following?

Descriptions	1	2	3	4	5
Brief description of the project					
Project quality objectives					
Responsibilities and authorities of project staff					
Site organization chart, with named personnel if known					
List of contract documents and drawings					
Site layout plan					
construction program and sub-programs					
schedules of subcontractor nomination, material and equipment					
procurement, based on the construction program					
list(s) of materials and appliances used for the project, showing the verification requirement of each					
List of quality procedures and work instructions applicable to project by making reference to the company's Quality Manual and Procedures					
List of project-specific procedures, work instructions and inspection					

list of quality records to be kept, including appropriate quality records from subcontractors					
Inspection and test plans, or list thereof					
checklists, or target dates for their provision					
frequency (or provisional dates if possible) of internal quality audits					
Frequency of updating the quality plan					

Quality Assurance: Do you consider the following factors in your quality assurance mechanism?

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

Quality control: Do you consider the following factors in your quality control mechanism?

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

Top Management Commitment to Quality Management

Descriptions	1	2	3	4	5
Communicate the importance of meeting customer requirements					
Setting quality policies.					
Conduct management reviews on project quality.					
Seek to have more financial resources.					
Seek to have more human resources.					

Quality Management Implementation Problems /challenges

List of Quality Management Implementation Problems	1	2	3	4	5
Inadequate management support					
Unwillingness of project staff to accept the quality system					
Difficulties in understanding the quality system					
Problem with more paper works					
Problem with documentation					
Difficulties in measuring results					
Problems with contractors' performance					
Problems with consultant's performance					
Ineffective communication					
Increase of cost					
Increase of time					
Inadequate information					
Inadequate technical expertise/skills					
Problem with Government bureaucracy					
Problem with raw materials shortage due to inflation					
Problem with Right of way					
Problem with scope change					
Lack of standardized quality management guidelines					
Employee turnover					

Quality Management Tools and Techniques Applied

The organization applied	1	2	3	4	5
Benefit/ cost analysis					
Benchmarking					
Flowcharting					
Design of experiments					
cost of quality					
quality audits					
Inspection					
control charts					
Pareto diagrams					
statistical sampling					
trend analysis					
Any other Quality tools and techniques? Please mention					