

**ASSESSMENT OF QUALITY MANAGEMENT PRACTICES OF
LOCAL GOVERNMENT CIVIL ENGINEERING
DEPARTMENTS DURING EXECUTION OF CONSTRUCTION
PROJECTS IN TANZANIA**

By

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**M.Sc (Construction Economics and Management) Dissertation
Ardhi University, Dar es Salaam
February, 2020**

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**A Dissertation Submitted in Partial Fulfillment of the requirements for the
award of the degree of Masters Science in Construction Economics and
Management of Ardhi University**

**Ardhi University,
February, 2020**

CERTIFICATION

The undersigned certifies that she has read and hereby recommend for acceptance by the Ardhi University a dissertation entitled “**Assessment of quality management practices of local government civil engineering departments during execution of construction projects in Tanzania**” in fulfillment of the requirements for degree of MSc. in Construction Economics and Management, Ardhi University.

Dr. Harriet K. Eliufoo

(Dissertation Supervisor)

Date.....

DECLARATION AND COPYRIGHT

I, **Mwita Petro I.** hereby declare that the contents of this dissertation are the result of the my own study and findings, and to the best of my knowledge, they have never been presented elsewhere for a Diploma, Degree or any professional awards in any Institution of higher Learning.

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DEDICATION

I humbly dedicate this dissertation report to my beloved mother, who has constantly been the fountain of inspiration to my life and for her endless support. I also dedicate this dissertation to my beloved wife for her endless support, encouragement and guidance.

ABSTRACT

The research focused on the quality management practices assessment for projects in local government civil engineering departments in Tanzania. The following specific objectives were addressed by this research: to assess the conformance of local Government civil engineering departments to quality management practices in Tanzania, to determine the challenges encountered by local government civil engineering departments in implementation of quality management practices in carrying out projects in Tanzania, to suggest possible measures towards enhancement of quality management practices in carrying out construction projects by local government civil engineering departments in Tanzania. This study adopted a qualitative research design in which a total of 50 local government civil engineering departments were chosen as sample. Questionnaires were distributed to the 50 civil engineering departments, whereby 36 questionnaires were collected representing a 72% response rate. Descriptive and inferential statistics method was used while findings were shown in frequency tables, percentage and charts. Also the study findings showed, Lack of proper site supervision, Shortage or lack of qualified professionals in the department and Inadequate or lack training programs ranked highly significant challenges of quality management practices. The research recommended: Government should make sure that there enough professional workers in the department through employment or any other means and it should provides more grants for construction departments to undergo training in areas of Quality management. The study was limited only to the projects implemented under force account and supervised by local government civil engineering departments.

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LIST OF ABBREVIATIONS

ASCE	American Society of Civil Engineers
ATC	Arusha technical college
BSI	British Standard Institute
BTI	British Standard Institution
DIT	Dar es salaam institute of technology
Dr.	Doctor
ECI	European Construction Institute
ISO	International Standard Organization
LGAs	Local Government Authorities
Msc.	Masters of Science
MUST	Mbeya University of science and technology
PDCA	Plan Do Check Action
PM BoK	Project Management Body of Knowledge
QA	Quality Assurance
QC	Quality Control
QMP	Quality Management Practice

SPSS	Statistical Package for the Social Sciences
TANROAD	Tanzania Road Agency
TQM	Total quality management
UDSM	University of Dar es salaam
US	United States
USA	United States of America

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The construction sector is globally considered to be a basic industry on which the development of a country depends. To a great extent, the growth of a country and its development status is generally determined by the quality of its infrastructure and construction projects (Wasiu, Aliyu and Modupe, 2012).

The quality of construction project is obtained if the stated requirements are adequate, and it conforms to the requirements (Abdulrahim, 2016). Also quality can be defined in terms of professional liability, a legal concept that requires all professionals to know their trade and practice it responsibly. Architects, Engineers and Builders who offer his or her expertise to owners is subject to professional liability laws, however some design professionals believe that quality is measured by the aesthetics of the facilities they design (Abdulrahim, 2016).

Using the definition of quality as a conformance to requirements, a high quality project can be described by such terms as ease in understanding drawings, level of conflict in drawings and specifications, economics of construction, ease of operation, ease of maintenance, and energy efficiency (ASCE, 2005). Furthermore, in the construction industry, quality can be defined as meeting the requirements of the designer, builder and regulatory agencies as well as the owner.

According to an ASCE (2005), quality of the project can be said to be achieved if it the following conditions are attained.

- i. Meeting the requirements of the owner as to functional adequacy, completion on time and within budget, lifecycle costs and operation and maintenance.
- ii. Meeting the requirements of the design professional as to provision of well-defined scope of work, budget to assemble and use qualified, trained and experienced staff, budget to obtain adequate field information prior to design; provisions for timely decisions by owner and design professional, and contract to perform necessary work at a fair fee with adequate time allowance.
- iii. Meeting the requirements of the construction as to provision of contract plans, specifications, and other documents prepared in sufficient detail to permit the constructor to prepare priced proposal or competitive bid, timely decisions by the owner and design professional on authorization and processing of change orders, fair and timely interpretation of contract requirements from field design and inspection staff and contract for performance of work on a reasonable schedule with reasonable profit.
- iv. Meeting the requirements of regulatory agencies (the public) as to public safety and health, environmental considerations, protection of public property including utilities; and conformance with applicable laws, regulations, codes and policies.

For long time the Tanzanian construction industry has been criticised for its poor performance and productivity in relation to other industries (Haruna *et al.*, 2011). Many of the management practices used to support construction practitioners are being challenged. Tanzania as among the third world countries has put more efforts

to grow economically from where it is now, into industrial investment country with high provision of social services to its people throughout the country. The Government of Tanzania as among Clients of construction projects, demand improved service quality, faster building and innovations in technology within reasonable costs.

To achieve its goal of providing quality social services to its people throughout the country, it has put more investments in construction of buildings, water supply and road infrastructure. Most of construction projects are carried by specialized firms and some of them are carried by specialized personnel's under force account as method for procuring public building projects (Ernest, 2018).

Force account means a construction by the procuring entity itself or use of public or semi-public agencies or departments concerned, where procuring entity or the public or semi-public agency uses its own personnel and equipment or hired labour. (The public Procurement Regulations, 2013). Furthermore the definition of force account has been modified where In Public Procurement (Amendment) Regulations, (2016) it has been defined as a process where works are carried out by a public or semi-public departments or agencies by using its personnel and equipment or in collaboration with any other public or private entity.

According to Clause 167- (1) of Procurement Regulation 2013, the use of force account or direct labour may be justified if it meets any of the following conditions, the required works are scattered or are in remote locations for which qualified construction firms are unlikely to tender at reasonable prices, work is required to be carried out without disrupting ongoing operations, risks of unavoidable work

interruption are better borne by a procuring entity or public authority than by a contractor, there are emergencies which require a prompt attention, the procuring entity has qualified personnel to carry out and supervise the required works or the maintenance or construction is part of the routine activity of the procuring entity.

Currently in Tanzania, the government has been chosen force account as the most appropriate method of carrying different projects under local government such as hospital, health centre, school, office building and dispensary maintenance and renovation projects. Force account procurement method is used as a way of empowering local artisans(local technical labours within the area) and facilitating attainment of best value for money however they must be full commitment to quality and meeting required satisfactions (Ernest, 2018).

Lack of proper quality management procedures result into significant expenditure of time in which money and resources are wasted in construction projects. In addition, the lack of quality due to deficient construction quality management is detected through non conformance to established requirements. This calls for builders and other construction stakeholders to strive for competitive strategies to survive in handling building construction projects under force account procurement method (Magesa 2003). To achieve this, there is a need for builders and other stakeholders in building construction projects to adopt continuous improvement strategies.

The primary purpose of Quality Management practice is to provide excellence in customer satisfaction through continuous improvements of products and processes by the total involvement and dedication of each individual who is in any way, a part

of that product/process. Quality management practices include all the means employed by managers or supervisors in an effort to implement their quality policies. These activities include quality planning, quality control, quality assurance and quality improvement.

1.2 Statement of the Problem

According to the Tanzania National Bureau of Statistics (2016), Construction industry contributed 13.6% to Tanzania's GDP during 2015, reaching almost USD 6 billion. The growth rate of the Tanzanian construction sector was 4.3% in 2016, compared to 23.2% in 2015. Also Tanzania National Bureau of Statistics (2017) reported a high growth rate of the construction industry (8.4%) in the quarter of 2017 making it the third growing industry in Tanzania. As a result, the construction activities grew up to 15.7% making the construction industry one of the huge contributors to the Tanzania national income.

To ensure output of quality construction projects, Quality management is one of the most important areas in construction industry in which much consideration must be given out. It entails the sum of all management activities, including planning, organization, implementation, inspection, monitoring and auditing in order that the quality of construction projects can satisfy the updating quality requirements.

The international organization for standardization (ISO), defines quality as the totality of characteristics of an entity that bears on its ability to satisfy stated or implied needs". Hence quality is a distinguishing characteristic of products or services, which satisfy the customer (Rumane, 2011). As a result of this, it is very

important to show out how quality can be controlled and assured in the construction industry.

Lack of proper quality management procedures result into significant expenditures of time in which money and resources are wasted on construction projects. In addition, the lack of quality due to deficient construction quality management is detected through non-conformance to established requirements. In construction, non-conformance occurs when the finished state of a project and its components deviates from the established requirements.

Construction projects are usually capital intensive such that time and resources play a very essential role in determining the cost factor of every project, likewise defects and failures in constructed facilities can result in delays and costs increases where re-construction may be required and facility operations impaired. In the worst case, failures may cause personal injuries or fatalities (Sanni and Windapo, 2008).

In general, there has been complains, delay and financial losses in local government construction departments due to the problem of quality performance in the construction projects in Tanzania (Haruna, 2011)

This study will assess in detail quality management practices of local government construction departments for building construction projects in Tanzania and gives suggestion on the area of improvement.

1.3 Research objectives

1.3.1 Main objective

This research is aimed to assess the quality management practices for projects in local government civil engineering departments in Tanzania.

1.3.2 Specific Objectives

- i. To assess the conformance of local Government civil engineering departments to quality management practices in Tanzania
- ii. To determine the challenges encountered by local government civil engineering departments in implementation of quality management practices during the execution of projects in Tanzania
- iii. To suggest possible measures towards enhancement of quality management practices during the execution of projects by local government civil engineering departments in Tanzania

1.4 Research questions

- i. How local Government civil engineering departments conform to quality management practices for projects in Tanzania?
- ii. What are the challenges encountered by local government civil engineering departments in implementation of quality management practices during the execution of projects in Tanzania?
- iii. Which measures should be used to alleviate challenges facing local government civil engineering departments in implementation of quality management practices during the execution of projects?

1.5 Significance of Study

Through thorough assessment of quality management practices of local government civil engineering departments during execution projects in Tanzania, the study will help the departments who wish to know how to conform to quality management practices, challenges in implementing quality management practices and the area of improvement to enhance the quality of projects.

1.6 Scope and Limitations of the Study

This research is aimed to assess the quality management practices of local government civil engineering departments during execution of construction projects. The study has limited its assessment to assessment of the quality management practices for the projects carried under force account procurement method in Tanzania. This study was conducted to local Government civil engineering departments who execute construction projects under force account procurement method under their supervision due to the reason that nowadays many of public building projects like schools, hospitals, offices etc, are executed under force account.

1.7 Organization of the Dissertation

The study is presented in a five chapter document. Details of these chapters are as follows:

Chapter one: The first chapter provides a brief background of this research work, statement of the problem, objectives of this research, the significance and scope of this study.

Chapter two: Contained an extensive review of literature on quality management practices in the construction projects.

Chapter three: Explained the methodology used in the research. It focused on the research method used to achieve the objectives of this research.

Chapter four: Contained data collected through questionnaires and analyzed into useful information. Discussions made from data obtained from questionnaires distributed with subsequently inferences made from the results.

Chapter five: Involved conclusion and recommendation.

1.8 Summary

This chapter gives a brief overview of what had been done in this study. It commences with a background of the research, statement of the problem, objectives, significance, scope and limitation of the study. Lastly, the organization of the dissertation is given with each chapter giving a context of the discussion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents concepts relevant to QMP and related areas for example Quality Assurance, Quality Control. It commences by defining quality as given by various writers. Also provides the concepts of implementation of QMP and Force account as used in this study.

2.2 Concept of Quality

The concept of quality was started as early as possible when man started producing goods. Before the early twentieth century, quality management defined as inspecting products to ensure that they met specifications (Ian *et al.*, 2014). This is evident in the Egyptian wall painting from around 1450BC which showed proof of measurement. Stones used in the pyramids which were cut so well that a knife could not go between them. According to Ian *et al.*, (2014) around 1940s, during World War II, quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. In the 1960s, with the help of so-called “quality gurus,” the concept took on a broader meaning. Quality began to be considered as something that involved the entire organization, not only the production process. All functions were responsible for product quality and shared the costs of poor quality.

During the World War II, two major forces emerged that have a deep impact on quality. The first force was the Japanese revolution in quality. Proceeding to World

War II, many Japanese products were professed all over the world to be in quality. To ensure Japanese selling their products in international markets, these are some of their revolutionary steps to improve quality:

- The upper managers individually took charge of leading the revolution.
- Training in quality disciplines were provided to all levels and functions.
- A continuous Quality improvement to projects were undertaken and insisted.

The second major force was the importance of the product quality in public mind. Several movements united to emphasize this importance. Example of those included the following; product liability cases, concern about the environment, pressure by consumers and the awareness of the role of quality in trade, weapons and other areas of international competition. These two major forces have resulted in quality to become a fundamental priority for most organizations (Juran and Gryna, 1999).

Furthermore, in the 1970s and 1980s many U.S. industries had to make changes to their quality policies when they lost market share to foreign competition particularly in the auto industry. Many hired consultants and instituted quality training programs for their employees (Ian *et al.*, 2014).

According to Hoonakker (2006) the management practices implemented by construction organizations are being challenged while the industry's clients are moving forward. Clients demand improved service quality, faster buildings and innovations in technology. Nowadays Quality Management concept is said to be structured in accordance to the "International Organization for Standardization" ISO

2.3 General definition of Quality

Definitions of quality are existing in large number depends on different researchers. For many years there have been tries to define the meaning of quality often in general terms. Some definitions result from reliable documentation, while others state experiences, opinions, and assumptions. Even if there is significant difference existing, there is also much common argument in the various definitions.

The BSI defines quality as “the totality of features and characteristics of a product or service that bear on its ability to satisfy stated and applied needs” (Mohammad *et al.*, 2002). According to this definition, there is a need to identify the characteristics of products and services that relate to quality and outline the basis for measurement and control. The “ability to satisfy applied needs” represent the value of the product or service to customer, including the economic value as well as safety, reliability and maintainability.

A product-based definition state that quality is accurate and measurable variable and that differences in quality imitate differences in quantity of some product characteristic. This definition incorrectly relates the quality to cost by prevails that the higher the cost, the higher the quality. A good or a service need not to be expensive to be regarded as a quality one (Evans & Lindsay, 1992).

Another definition is based on the assumption that quality is determined by what a customer wants and willing to pay for. Persons have different wants and needs and hence dissimilar quality standards. According to Juran this leads to a user-based definition stated as “Fitness for purpose/use” and adopted and explained in ISO 8402 as “That which relates to the evaluation of a product or service to its ability to satisfy

a given need” (El-Sawah, 1998). The “fitness for use” definition is determined by customer satisfaction and has turned into the main definition of quality in the manufacturing and service industries. According to different researchers, a customer is anyone who is impacted by the product where she/he can be regarded as external and internal customer. External customers contain not only the final users but also immediate processors as well as merchants.

Internal customers contain all functions impacted by the product at both the managerial and work levels. The internal customers obtain products and information from the groups of those within their organization. For supplying the final external customer with a quality product, the needs of internal customers should be satisfied as an important part of the process (Mohammad 2002).

A manufacturing based definition. This states that “Quality of product is an outcome of engineering and manufacturing process” According to Crosby, “Quality is a conformance to agreed and fully understood requirements”. He thinks that quality is not comparative and there is no such thing as high quality or low quality. The issue is product or service either conforms to requirements or not (Mohammad *et al.*, 2002).

2.4 Quality Management Systems in Construction

Quality management in construction projects means ensuring that things are done according to plan, specifications and meet requirements (Arditi, 2004). According to Abdulrahim *et al.*, (2016), they urge that one of the best ways of ensuring good construction projects is by using an inspector to familiarize him / her with plans,

specifications and permit conditions to ensure quality control during all construction phases.

There are many known quality management standards from different researchers, here are some of them; The ISO9000 series, ECI and BS 5750 of the BSI (Kado, 2011).

The main reason of standards and codes are to guard the public's health and safety therefore compliance with codes and standards should be a matter to be spoken out early during the design stage. If the suitable codes and standards are not early recognized, reworking plans and specifications can cause significant cost and delay.

Until beginning the design process, the design professional will ensure that they provide codes and guidelines because the building codes control directly the minimum standards of many building project components and are responsible for many of the final product quality (ASCE manual, 2012). Quality design starts not just with reasonable engineering and scientific concepts that must meet the requirements of relevant codes and standards but also the project specifications of the client.

2.5 Quality Assurance and Quality Control

According to Ferguson and Clayton (1998) “Quality Assurance (QA) is a program dealing with actions necessary to provide quality in the work to meet the project requirements”. Quality Assurance includes creating policies related to project, training, standards, procedures, guidelines and system required to produce quality. For all projects, the design professional and the contractor are responsible for setting

up a suitable system which provides protection towards quality concerns through advance warnings of the challenges ahead. Such early alerts play a significant role for avoiding internal as well as external problems.

Quality Control (QC) is the precise execution and related actions of the Quality Assurance (QA) programme. Good quality control removes or reduces the possibility of modifications, errors and omissions that could cause disagreements and disputes. Through history a problem can be somehow identified, for example during the first half of the 20th century, architects and engineers were fully in control throughout the design phase. They carried out a role explained as "supervision" during the construction stage which ensures the owner received the value of his money in terms of quality. Owners began to doubt prices, timetables and areas where design professionals did not provide good control especially between the 1950s and 1960s (Abdulrahim *et al.*, 2016). Throughout this time, focus continued to be put on the consistency and monitoring of liability exposure. 2.6 ISO 9000 Series

The word ISO describes the set of international standards concerning product design, manufacturing service delivery and testing. The ISO 9000 series includes two required standard types; one of which deals with quality assurance and another with quality management. According to British Standards Institution, (2008), quality assurance standards are intended for contractual and evaluation purposes, and are ISO 9001, ISO 9002 and ISO 9003. The quality management standard is intended to assist organizations or individuals in the development and implementation of quality

systems, and this standard is ISO 9004 (Doyle, 1994). Figure 2.1 shows an effective ISO 9001 Quality Management System

The company or entity needs that they demonstrate their ability to deliver goods that meet or exceed consumer expectations and loyalty by implementing effective processes for the continuous improvement of the quality management system and associated customer compliance guarantees and applicable regulatory requirements (Rumane 2011). Clearly, the promise of a successful application of the Quality Management System is to ensure that work is carried out according to requirements throughout the development and design processes, manufacturing and construction and servicing, and also to ensure that consumers are pleased with the products and services that result (Abdulrahim 2016).

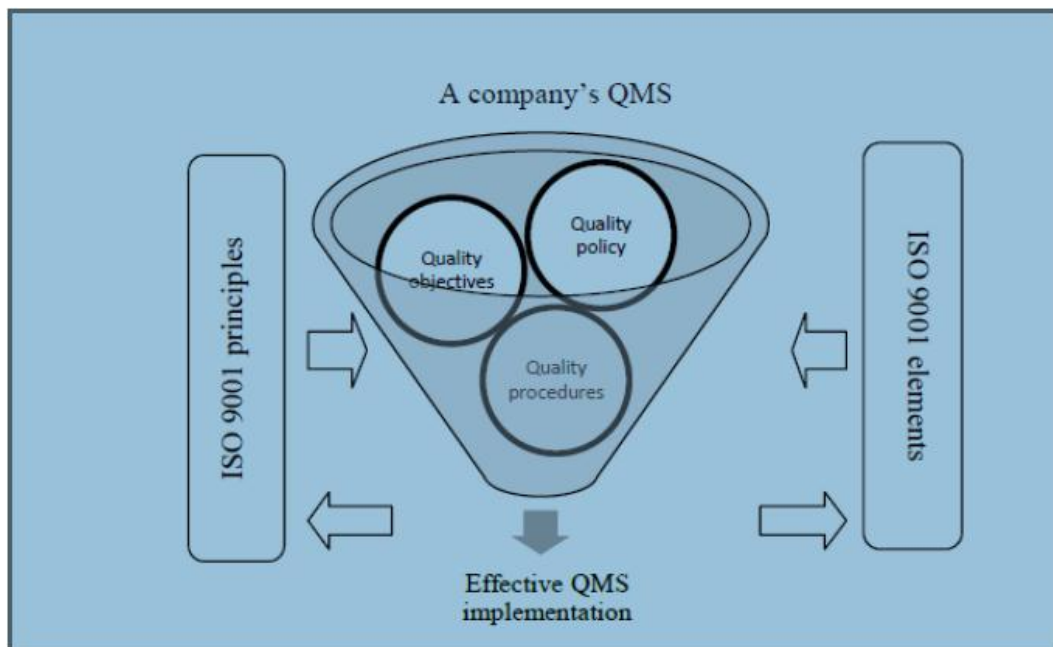


Figure 2.1 an effective ISO 9001 Quality Management System. Source: (Willar, 2012)

2.7 Total Quality Management Factors

According to Artidi and Gunaydin (1997), determination of project quality requirements starts at the start of the project and a careful balance should be struck between the client's project cost and schedule expectations, desired operating characteristics and construction materials. Throughout the design stage, design professionals also need adequate time and budget to meet requirements. In addition, owners must balance their requirements against financial considerations and the likelihood of failure. In view of the final completed project the design professional is obliged to protect public health and safety. During the construction process, the builder is responsible for the means, techniques, processes, series, and construction and safety precautions and programmes. Quality in the construction process is defined by project requirements as one of the key factors and the construction process can be divided into main three phases that are;

- Planning and design phase,
- Construction phase and
- Operation and maintenance phase.

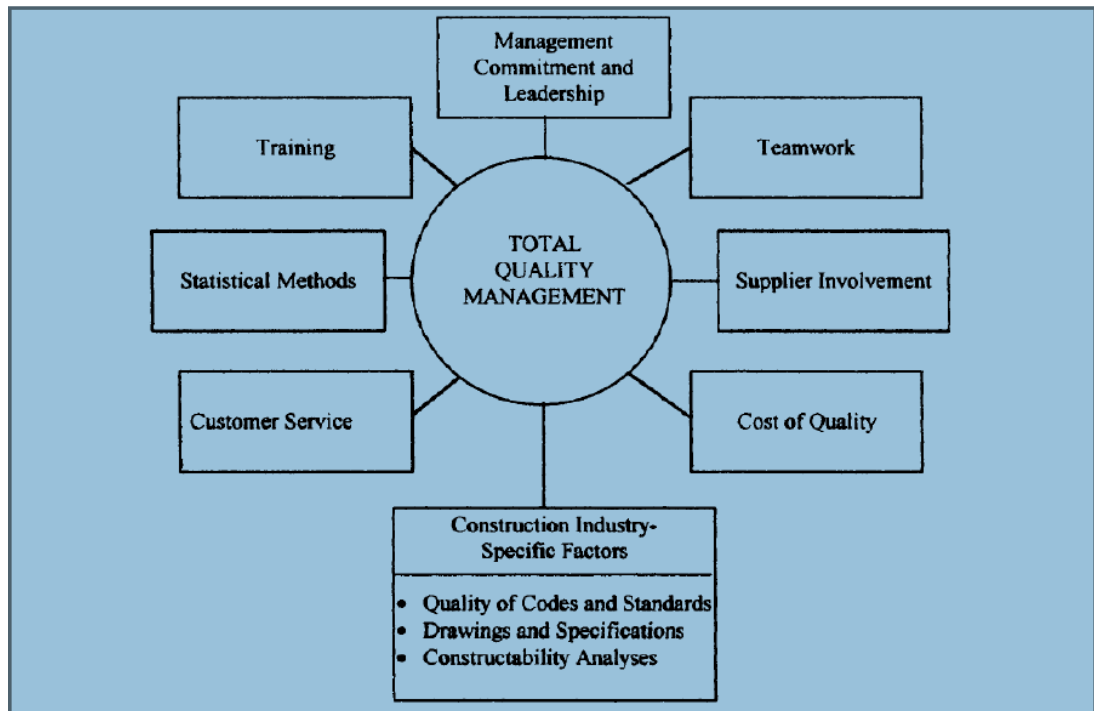


Figure 2.2: Total Quality Management in Construction Process

Source (Artidi and Gunaydin 1997)

2.7.1 Employee Training on Quality

Employee training on quality is very importance as urged by many quality expert since quality management becomes the responsibility of everyone and this training should be aimed at every company or institution level. The training should include management plans, engineers, technicians, home and field office employees, support staff and field labour (Smith, 1988). In the real situation, temporary work work force in construction is somewhat distinct from the relatively stable work force in manufacturing. This temporary nature may make it more difficult for the construction industry to train workers, especially craft labour (Abdulrahim *et al.*, 2016). If quality management ideas are widely accepted across the construction

industry, workers moving from one organization to another should require less quality management training, as in their previous employment all workers would have received basic quality awareness (Abdulrahim *et al.*, 2016). The training effort should be focused more on quality management concepts, analysis of causes and effects, team problem solving, interpersonal communication and interaction, basic statistical processes and quality measurement costs.

The demands on these communication skills grow as the technological structures become more complex and more challenging. According to Gunaydin's (1997) analysis of TQM in U.S. construction projects, the training of workers in the design stage was discovered to be not very significant, relatively important in the construction stage, and very important by the respondents in that study during the service process. The study goes further by demonstrating that the key beneficiary of the training activities should be operation and maintenance teams working in built facilities. These results are in line with ISO 9001, which stresses the importance of training and highlights the need to recognise activities requiring acquired skills and the necessary training (Abdulrahim *et al.*, 2016).

2.7.2 Management and Leadership

Most of quality researchers particularly in construction industry urge that the main causes for the direct or indirect decrease in construction production involve poor management practices (Burati, Michael and Satyanarayana 1992). In quality management practices, the first stage for management is to acknowledge a problem and look for the way forward since achievement of quality output depends on

management practices. If they maintained in this understanding and commitment, management can direct the business toward the apprehension of advanced quality in its accomplishments.

In the United States today, the important management process used in the construction industry is management by control and not by participation. Because of the international rise in demands for quality products and services, companies are reassessing management competence by means of controls. According to Abdulrahim *et al.*, (2016), the organizational diagram and main control points within the system is what they emphasis in this style of management. All managers are given some goals for the next level, starting at the top where in construction works possibly quality goals, cost and schedule are recognized for each project. If Project managers meet these goals, they are rewarded accordingly. Control management favors an organization to look at the client and the client's needs inward rather than outward (Abdulrahim *et al.*, 2016). The management moves to the second step when the problem is found, which is to establish a good understanding of the fundamental principles and components of quality management and then show its commitment to quality by practice. Without this knowledge, the intervention of the management will most likely be against quality management, reinforcing the labour force's suspicions and ending the failure effort (Oberlender, 1993). The results of a survey done by construction managers, designers, contractors and facility managers to examine quality management in the design, construction and operation stages of projects conducted in the United States revealed that the degree of management dedication to

continuous improvement in quality was considered one of the most important factors affecting the quality of the constructed facility (Gunaydin, 1995).

2.7.3 Teamwork among professionals

Quality teams provide the supportive environment that is necessary for the successful execution and consistent delivery of the quality management process to stakeholders. Nonetheless, quality assurance is carried out but continuous improvement should be carried out through a well-planned team of professionals in which everyone, including architects, designers, suppliers, subcontractors and owners, will engage in quality management practices (Abdulrahim, 2016). If all parties mentioned above works together as a team, it may help to achieve higher customer satisfaction in construction projects by working with the common goals, plans and controls.

Teamwork activities include understanding the needs of all decision-making groups and organizations, finding approaches that will help all concerned and sharing responsibility and credit (Pheng and Teo, 2004). Establishment of modern training to everybody encourages employees to speak up, break down barriers between departments, places everyone within the company to work towards the transition (Haruna *et al.*, 2011).

You can use the same team approach on project level. In Gunaydin's (1997) study of TQM in construction projects, "Extent of teamwork of parties participating in the design phase" was found to be the most significant factor affecting quality. In the same study this factor was ranked by construction managers and designers as the

most important factor. This result shows that teamwork between parties such as civil engineers, structural, electrical, architects, environmental and owners is critical to achieving the quality design goals. Throughout the construction stage, "extent of teamwork of parties involved in the construction process" was found to be very necessary and ranked 2nd by the builders and 4th by the building managers (Gunaydin, 1997). The importance of teamwork in the design phase seems to have been relatively more pronounced than in the construction stage.

2.7.4 Statistical Methods

According to Abdulrahim *et al.*, (2016) Statistical models provide quality management teams with techniques to identify the causes of quality issues and communicate in a defined language that can be understood, confirmed, repeated and forwarded by all team members on the basis of data. Also provide resources to assess the past, current, and to a lesser extent, the future status of a work process and to make decisions on evidence based on data rather than person or group views and preferences.

2.7.5 Cost of Quality

According to Crosby, (1976) and Juran, (1988) quality costs are considered the primary measurement tool for quality through following effective Quality management process, and provide cost rationalization to doubters. Cost of quality includes costs of re-evaluate, testing, inspection and rework. Also it consists of the cost of appraisal, deviation cost and prevention cost. Appraisal costs are costs incurred as a result of the procedures to determine if a product, process or service

complies with established requirements while Prevention costs are those incurred as a result of actions taken to avoid errors or deviations. A study of US companies reveals that the major barrier to using the ISO 9000 standards is the additional costs incurred in changing work processes and deviating from meeting the requirements. Many deviation costs of non-compliance include defect detection costs, scrapping, rework, re-inspection, manufacturer mistake or price reduction due to non-compliance (Abdulrahim *et al.*, 2016).

2.7.6 Supplier Involvement

Mostly it depends on the relationship between the parties involved in the process to produce a quality product. The part involves the customer, the supplier and the processor. The project quality built by the constructor is directly related to the quality of the designer's plans and requirements, the quality of the materials and equipment supplied by the suppliers and the quality of the work carried out by the subcontractors. The close relationship among these vendors and the construction method is needed for the contractor to obtain the best efficiency and quality (Oberlender, 1993).

2.7.7 Customer Service

According to Haruna *et al.*, (2011) management of quality is a process that requires total involvement of all parties including customer to be successful. The demands for quality improvement grow as much as consumers become interested in the quality management process. Customers can be in-house or out. The final customer should be pleased by maintaining quality at minimum rework costs in each stage of the

construction process, as well as other costs and the quality of the final products. According to Juran (1988), supplier, processor, and customer as parties involved in quality process have a "triple role". Figure 2.3 shows "triple role" concept applied to construction. The designer is the owner's client, since the designer must obtain the project specifications from the owner to provide a feasible design (Abdulrahim *et al.*, 2016). The designer supplies the builder with plans and specifications; in this scenario the builder is the customer of the designer since the builder uses the plans and specifications of the designer, then performs the building process and finally supplies the finished building to the owner. The shareholder is now the client of the constructor. Quality in each process is influenced by the performance in the preceding phases. Therefore customer service is essential for the overall quality performance of the procedure in each step.

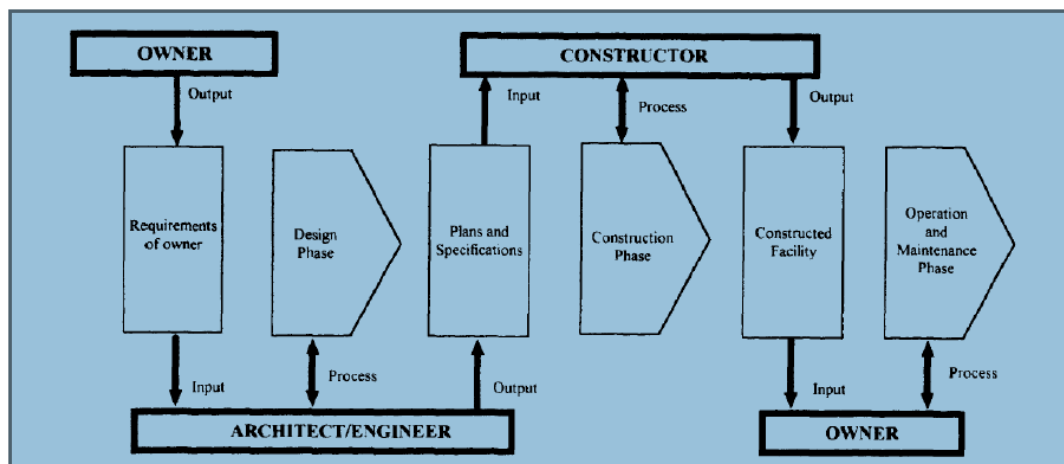


Figure 2.3: Construction Process, Source: Arditi and Gunaydin (1997)

2.7.8 Builder Performance

According to Yasamis, Arditi and Mohammadi (2002) claim that contractors have quality performance measures divided into corporate levels as developed from manufacturing sectors and project level indicators comprised of the key general instruments used in project management. Corporate-level quality management is a method used by a company to achieve leadership qualities such as: empowerment of workers, continuous improvement, information and analysis on the creation of relationships and customer attention. Such procedures at the corporate level helped owners determine whether they will be pleased with the construction company's quality performance. Furthermore Project level quality performance is tools and processes an organization uses to attain product quality and service quality attributes. Product quality attributes include; conformance, aesthetics, serviceability, durability and supposed quality while the service quality attributes include: time, completeness, timeliness, accessibility and convenience, consistency, accuracy and responsiveness. According to Yasamis *et al* (2002), such dissection of construction activities promotes the creation of approaches to identify, operationalise, assess and improve the quality of construction. According to Smallwood and Rossouw (2008) report, it shown that majority of general contractors do not put into action written documented quality management systems.

2.7.9 Drawings and Specifications

Drawings and specifications are the two essential collections of documents containing technical information on materials, construction performance and quality standards and these documents have to be given to the builder/constructor. Drawing

documents are prepared by designer and have to be given to the builder. This reveals the project's design approach, size and scope, number and size of materials, and how they are incorporated into a final project. Oberlender (1993) goes further by highlights that a collection of contract documents (drawings and specifications) for directing the physical construction of the project are the final product of the design work. Achieving the correct standard often becomes a big challenge when there is an inconsistency between the drawings and requirements. Hence drawings should be simple, brief and consistent (Ferguson and Clayton, 1998).

2.7.10 Constructability of Design

According to Abdulrahim *et al.* (2016), constructability is one of the most critical factors influencing the quality of the design and the design professional should also ensure that the planned project is constructible by those who are expected to construct it. Also construction professionals should take into account that planning and building methods vary in different geographical areas. According to Kubal (1994) shows that for reliability and compliance with local conditions such as initial construction and post-construction activities, designs and constructability must also be checked. Furthermore, design professionals must clearly and adequately communicate the design objective to the builder through the contract documents which includes both plans and specifications. It should be noted that quality design is done during the construction stage of the project.

2.7.11 Continuous Improvements

According to Deming (1986), idea of continuous improvement is achieved through a specific step-by-step process. Deming's Plan-Do-Check-Action (PDCA) illustrates these steps as shown in the diagram in Figure 2.4. The PDCA diagram stresses identifying the root cause of the problems and constantly setting new requirements and revising them.

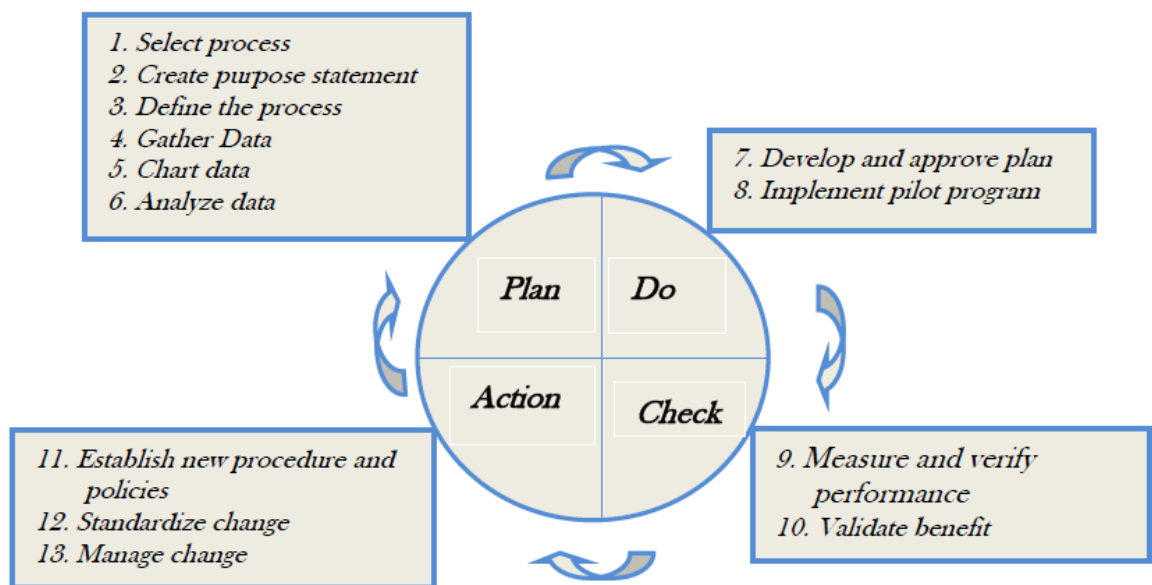


Figure 2.4: The PDCA Diagram (PM BoK 2004)

2.8 Quality Management Practices

According to Abdulrahim *et al.*, (2016), quality management practice is characterized as procedures for realizing planned activities and achieving planned results. Successful execution of Quality Management Practices (QMP), as implemented in the applicable ISO 9001 standard, includes proactive planning,

execution and analysis, as well as continuous system improvement at all organizational levels.

ISO 9001 Principles ISO 9001 Clauses	Customer focus	Leadership	People involvement	Process approach	Systems approach	Continual improvement	Factual approach to decision making	Mutually beneficial supplier
4.0 Quality Management System								
4.1 General requirements								
4.2 Documentation requirements								
5.0 Management Responsibility								
5.1 Management commitment								
5.2 Customer focus								
5.3 Quality policy								
5.4 Planning								
5.5 Responsibility, authority and communication								
5.6 Management review								
6.0 Resource Management								
6.1 Provision of resources								
6.2 Human resources								
6.3 Infrastructure								
6.4 Work Environment								
7.0 Product Realization								
7.1 Planning of product realization								
7.2 Customer-related processes								
7.3 Design and development								
7.4 Purchasing								
7.5 Production and service provision								
7.6 Control of monitoring and measuring devices								
8.0 Measurement, Analysis and Improvement								
8.1 General								
8.2 Monitoring and measurement								
8.3 Control of nonconforming product								
8.4 Analysis of data								
8.5 Improvement								

Figure 2.5: Matrix of the Five Clauses and Eight Management Principles of ISO 9001 Standard, (Source Luke, 2006).

The following are some quality management practices as derived from Matrix of the Five Clauses and Eight Management Principles of ISO 9001 Standard: On site supervision of the construction process, Proper planning, Quality appraisal, Education of employees on quality, Compliance to quality standards, Budgetary allocation, Customer satisfaction, Motivation of employees, Adequacy of employee training, Staff training, Personnel management, Qualification of employees, Team work among professionals, Attention to clients' needs and Administration of change order (Abdulrahim *et al.*, (2016).

2.9 Force Account

Force Account as used in this study means a construction by the procurement entity itself or use of public or semi-public agencies or departments in question where the procurement entity or public or semi-public agency uses its own staff and equipment or hired labour (Tanzania Public Procurement Regulations, 2013). In Public Procurement (Amendment) Regulations, (2016) Force Account has been explained as a mechanism in which work is carried out by public or semi-public departments or agencies using their staff and equipment, or in conjunction with any other public or private body.

Force Account can also be used as a method of payment for additional work if the contractor and the customer can not negotiate on a lump sum amount or unit price (Ernest *et al.*, 2018). In this case, the works are undertaken and the client will pay the contractor according to the cost of their labour, materials and equipment, with an additional percentage for overheads and profit (Ernest *et al.*, 2018).

In Tanzania under Clause 167- (1) of Procurement Regulation 2013, the use of force accounts or direct labor may be justified where the work required is dispersed or in remote areas where eligible construction firms are unable to bid at reasonable prices. Even when work is required without affecting ongoing operations and the risks of inevitable disruption of work are best borne by a procuring agency or public authority than by a contracting entity. When emergencies need immediate attention, the procurement entity has qualified staff to conduct and supervise the necessary works or the repair or building is part of the procurement entity's regular operation, then force account type of procurement will be used.

2.10 Summary

This Chapter has looked into key definitions and concepts to Quality management practices. The parts forming literature review described briefly and discussed. Quality process and general embracement of performance and management philosophies construction industry and Tanzania in particular covered with review indicating that construction departments can benefit from enhancing strategies such as quality management practices. Also Total Quality Management factors are covered. Practices of quality management as adopted in the relevant ISO 9001 standard indicated that customer focus process approach, leadership, people involvement, system approach, continuous improvements, supplier Involvement, factual approach to decision making are the key issues in implementing Quality Management practices. Lastly, Force Account as a method of procuring public projects is also covered in this chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter emphasizes on the methodology used for this study, data collection and interpretation, research tools and sample size. Methodology of research is a systematic way of solving a problem. Essentially, the methods by which researchers describe, explain and forecast phenomena are called research methodologies (Dawson, 2013).

3.2 Research Methods

According Kothari (2004), the research methods are the different approaches, systems, algorithms, etc. used in the analysis. This includes analytical methods, experimental studies, numerical schemes, mathematical approaches, etc. Methods of research help researchers classify samples, collect and analyze data, and find a problem solution. Kombo and Tromp (2009), argued that basic and applied methods to research could be either quantitative or qualitative approaches. In this study, qualitative research was adopted since it involves employing different researchers' knowledge, insights or opinions based on the justification that subsequently explained although the use of a qualitative approach which always constitutes some underlying quantitative approach patterns (Burns and Grove, 2003). Evidences for qualitative analysis are gathered according to a specific plan in which structured methods are used to gather the information needed. This knowledge is converted into numerical data and analyzed using statistical methods (Kombo and Tromp, 2009).

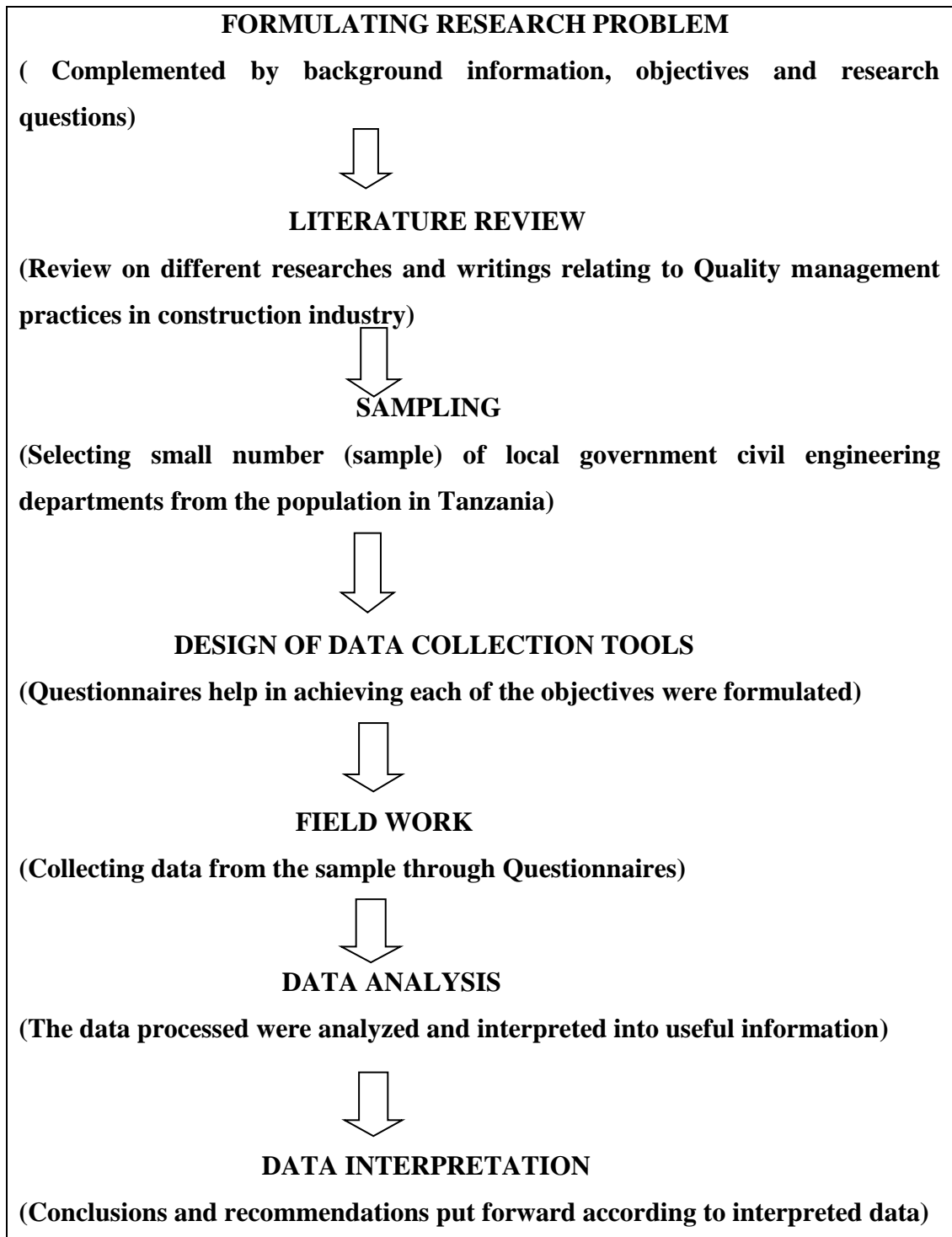


Figure 3.1: Research methodology framework

3.3 Research design

Research design can be described as a conceptual structure within which research would be conducted. Also Research design refers to the blue print you are creating using the chosen research method, which describes the steps you need to take and informs what to do at what time. It tells us how to achieve the goals of a research project (Burns and Grove, 2003).

This research was carried out in five stages with each of the stages representing each of the chapters one to five. The stages are highlighted and explained below;

Step 1: The first step involved introducing the dissertation; it included Preliminary reading, selection of topic, recognition of research problem(s), research objective and determining of research.

Step 2: This stage of research involved a full review of the literature on quality management practices in the building construction.

Step 3: This stage explained the research methodology. It focused on the research method employed to attain the research objectives.

Step 4: In this stage data was collected through questionnaires and analyzed into useful information. Discussions were made from data obtained from questionnaires distributed; subsequently inferences were made from the results.

Step 5: Involved conclusion and recommendation. Summary of the key findings of the research, conclusions were drawn from the various results and recommendations made on how the problems identified by the research could be addressed.

3.4 Approach to data collection

According to Kombo and Tromp (2009), there are two approaches of collecting data namely; desk study (secondary data collection) and fieldwork (primary data collection). Collecting of data is the most critical stage of any research, the quality of data collected will determine the quality of the research. For this study structured questionnaires were used to collect primary data. The questionnaires were designed in such a way that the researcher could collect all the necessary data concerning Quality management practices of local government building construction departments from the sample. Use questionnaires in data collection has benefits such as; retaining confidentiality; saving time; gathering information from a large sample; and finding an individual that can not be reached easily.

3.4.1 Questionnaire Design

The questionnaire was constructed in such a way as to include questions in each part of the questionnaire that helped accomplish each of the objectives. The questionnaire was divided into three parts. The first part focuses on the profile of respondent, it was targeted at gathering useful information regarding the respondent's Profession, the educational background, position they have in their departments and years of experience to the construction departments they belongs to. The second section focuses on the respondent's knowledge and involvement in the quality management

practices. It gathered information concerning: i) department's material testing for construction, ii) way of managing workers on site during construction phase and iii) factors provides the need for conducting close site supervision While the quality assurance practices included: i) the carrying out of periodic reviews of work quality systems, ii) Information to be established and known to the procurement unit to ensure that materials purchased conforms to specification , iii) Actions taken to mitigate quality risks and cost involved in sourcing of materials, iv) Work method statements for construction project in department, v) management of Department's change order (variation order), vi) Department's implementation of Quality appraisal for construction projects, vii) Department's top management commitment in the quality issues, viii) Department's management of corrective and preventive action for Quality, ix) Department's obedience to standards of pertinent agencies, x) Regularly provision of Staff training, xi) Internal and external Customer Satisfaction, xii) Proper project and work planning, xiii) Budgetary allocation, xiv) Involvement of Suppliers, xv) Continuous improvement (Learning and innovation) and xvi) Procedure for resources management at site during construction. Furthermore the section inquired quality management professional units/divisions that exist in the construction department and some words that best summarize the meaning of quality. Lastly, respondents were asked if their department have a quality management plan in all projects and who developed it to be used.

The third section gathered information about the challenges and measures for implementing effective quality management in local government construction departments for projects.

3.5 Population Size and Sample Design

According to Kombo and Tromp (2009), population is the collection of people, objects, or items in which samples are collected for measurement. It's the whole set of goals and events or group of people that the researcher needs to set out some characteristics. Population for this study must possess some common characteristics which are participating or participated in force account projects in order to see how they deals with practices of quality management.

The population of this study is local government civil engineering departments in Tanzania. According to Regional and local government administrative authority (2018), Tanzania mainland has 184 districts in which every district has civil engineering department. Therefore, the population size of the study was 184 civil engineering departments.

Sample design is a specific plan for a particular population to obtain a sample. It refers to the technique or procedure that the researcher would adopt when selecting sample items. According to Kothari (2004), the researcher shall identify the population, obtain a precise and total list of population units and obtain a reasonably large sample to reflect the character of the population.

3.5.1 Sample Size

Purposive sampling has been used which is also known as non-probability sampling. This method of selection requires purposeful or deliberate collection of specific population units to constitute a sample representing the population. In many cases, purposeful sampling is used to access knowledgeable people, departmental top

management staff or those with in-depth knowledge of specific issues may be by nature of their professional role, access to networks, power, experience or expertise (Kado, 2011). The sample size for departments was calculated with Kothari (2004) formula based on equation for 95% confidence level.

$$n = \left[\frac{z^2 pqN}{[e^2(N-1) + Z^2 pq]} \right]$$

Where:

‘N’ represents the total number of population, ‘Z’ represents the confidence level, ‘n’ represents sample size, ‘e’ represents margin/sampling error, ‘q’ Stands for 1-p, and ‘p’ represents degree of variability, which is 2%.

Data used in sampling are margin or sampling error (e) - 5% with confidence level (Z) - 95% (1.96) and these values are very economical to be used.

$$n = \left[\frac{1.96^2 * 0.02 * 0.98 * 184}{[0.05^2(184 - 1) + 1.96^2 * 0.02 * 0.98]} \right]$$

$$n = 29.8 \approx 30$$

Adding 20 to compensate for non-response of questionnaire, thus this study considered 50 departments. Kothari (2004) stated that a sample size covering at least 15% of the study population is reliable for making conclusion, in which for this study a sample size of 50 local government civil engineering departments is reliable covering 27.2% of the population.

3.5.2 Selection of 50 civil engineering departments

In making the decision on whom to give a questionnaire, fish bowl draw technique was used to pick 50 departments from 184 departments because the total number of the population is small.

3.6 Data Analysis Methods

In assessing the conformance to quality management practices, challenges and measures towards enhancement of practices of quality management during the execution of projects by local government civil engineering departments in Tanzania, the data collected basing on literature coverage in different quality management practices derived from quality factors includes: employee training on quality, management and leadership, teamwork among professionals, cost of quality, supplier Involvement, customer service, builder performance, drawings and specifications, constructability of design and continuous improvements. The following parameters based quality management factors were investigated in this study: i) department's material testing for construction, ii) way of managing workers on site during construction phase and iii) factors provides the need for conducting close site supervision While the quality assurance practices included: i) the carrying out of periodic reviews of work quality systems, ii) Information to be established and known to the procurement unit to ensure that materials purchased conforms to specification , iii) Actions taken to mitigate quality risks and cost involved in sourcing of materials, iv) Work method statements for construction project in department, v) management of Department's change order (variation order), vi) Department's implementation of Quality appraisal for construction projects, vii)

Department's top management commitment in the quality issues, viii) Department's management of corrective and preventive action for quality, ix) Department's obedience to standards of pertinent agencies, x) Regularly provision of Staff training, xi) Internal and external Customer Satisfaction, xii) Proper project and work planning, xiii) Budgetary allocation, xiv) Involvement of Suppliers, xv) Continuous improvement (Learning and innovation) and xvi). Descriptive statistics were used for simplicity and clarity. Frequency tables, percentage and charts were used to present the results.

3.7 Summary

This chapter has described two important approaches to research, namely, the qualitative and quantitative approach. In this study, quantitative research was adopted. Elements of the study methodology are described; data required to achieve objectives, data analysis, sampling and sample design. The questionnaire has been used to facilitate the process of data collection. The structure of questionnaire has briefly described to allow the respondents to recognize and answer the questionnaire correctly. Fish bowl draw technique was used to pick the sample and it provided the credible or valid results. Descriptive statistics were employed and results presented by using frequency tables, percentage and charts.

CHAPTER FOUR

DATA COLLECTION AND ANALYSIS

4.1 Introduction

This chapter focuses on collection and analysis of data as obtained from the field survey. Also it goes further in discussion of findings relative to the specific objectives. Furthermore the chapter elaborates on the respondents' profile and the surveyed departments, how these departments conform to practices of quality management in construction or building projects, challenges and measures for effective quality management practices implementation in local government civil engineering departments during execution of the projects.

4.2 Response rate

To accomplish this research objectives, 50 questionnaires were spreaded out through email to 50 local government Authorities civil engineering departments. These include District councils, Town and Municipal council's construction departments. In making the decision on whom to give a questionnaire, fish bowl draw technique was used to pick the sample because the total number of the population is small. Only 36 completed filling questionnaires which represent 72% of questionnaires were returned as indicated in the table 4.1.

Table 4.1 Distribution and Collected Questionnaires

Total Questionnaires Sent	Total Questionnaires Returned	Response rate
50	36	72%

(Source; Author, 2019)

From the table 4.1 which shows that 72% of total questionnaires returned it can be regarded appropriate and an adequate representation of the population of this study and therefore valid for consideration and use for the study based on the assertion of Kothari (2004) that the survey result possibly will be regarded as biased with little significance if the rate of response is lower than 15% of the circulated questionnaire.

4.3 Respondents' Profile

In this section, the surveyed respondents and the civil engineering department of councils are discussed. The major variables discussed in an attempt to explain the respondents' profile included their professional, experiences, maximum level of academic qualification and position in the civil engineering department. The results for the section are presented in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 as shown below.

4.3.1 Highest level of academic qualification

From Figure 4.1, the respondents' academic qualification is summarized as shown. It shows that 94.4% are Bachelor's Degree holders and 5.6% are Ordinary Diploma holders. Furthermore, it shows that none of the respondents possesses Advanced Diploma, Master's Degree and Doctorate Degree. The highest academic qualification

of the respondents is very significant to provide evidence that they are knowledgeable and capable of providing the much required professional judgment required for the credibility of the data collected for the research.

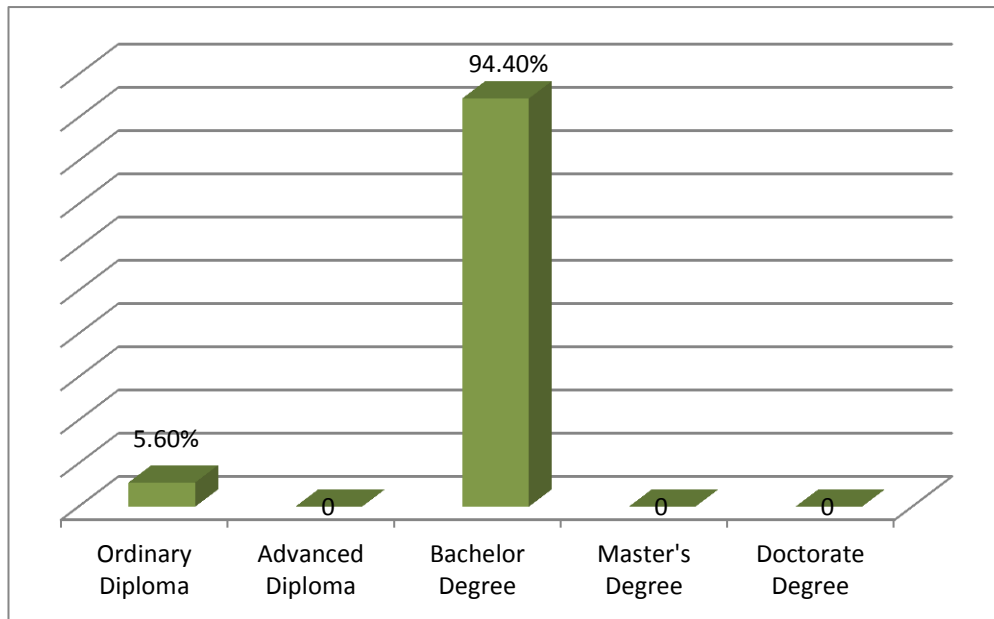


Figure 4.1: Academic qualification, (Source; Author, 2019)

4.3.2 Respondent's professional

From Figure 4.2, the results show that 83.3% of the respondents are engineers, 5.6% are Architects, 8.3% are Quantity Surveyors and 2.8% of respondents fall under other categories of profession

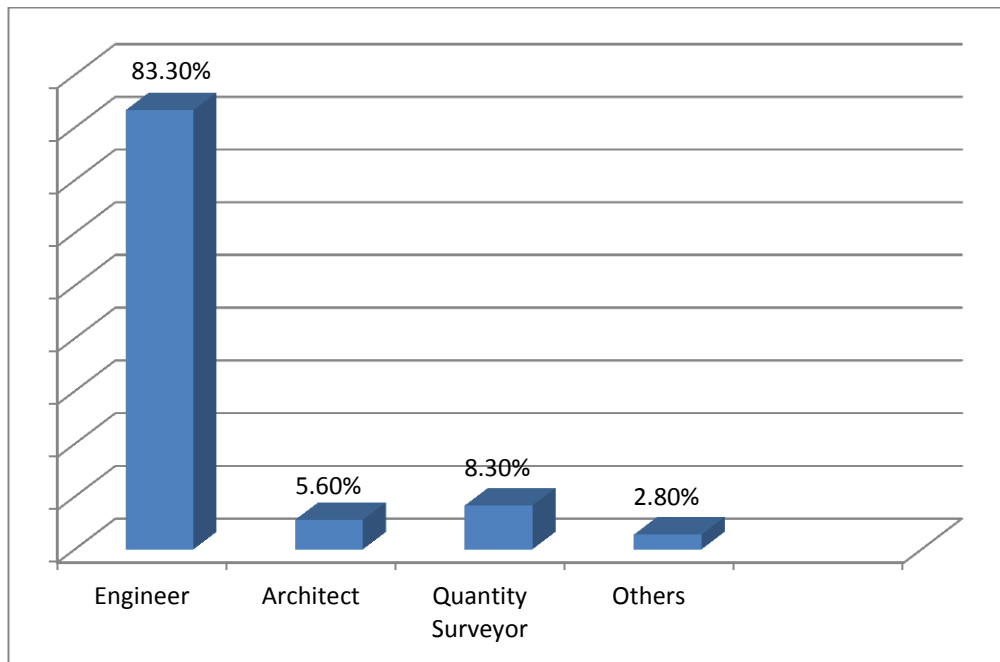


Figure 4.2: Respondent's profession, (Source; Author, 2019)

4.3.3 Respondent's position

In daily responsibilities, the findings shown that 83.3% of the respondents have the title of civil engineer, 8.3% have the title of quantity surveyor and 2.8% of respondents work as Architect where 5.6% have other responsibilities.

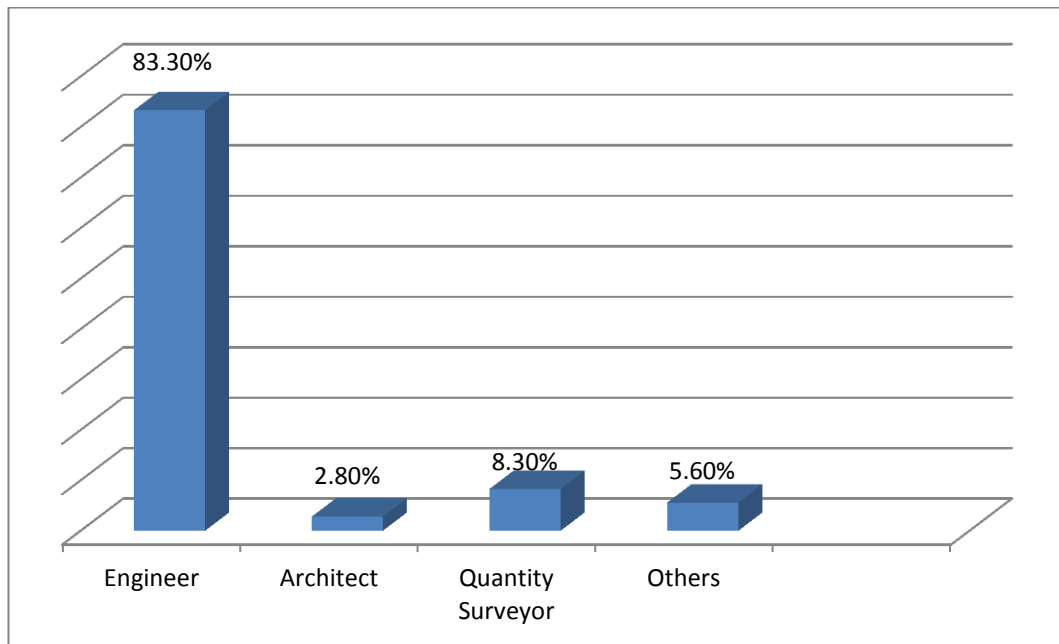


Figure 4.3: Respondent's position, (Source; Author, 2019)

4.3.4 Respondent's working experience

Figure 4.4 shows that 77.8% of respondents have 4-7 years working experience, 16.7% of the respondents have working experiences of more than 8 years and those with 0 - 3 years of working experience are 5.5% of total respondents. Therefore by considering academic qualification, profession, position and working years, the respondents have adequate knowledge and experience on quality issues.

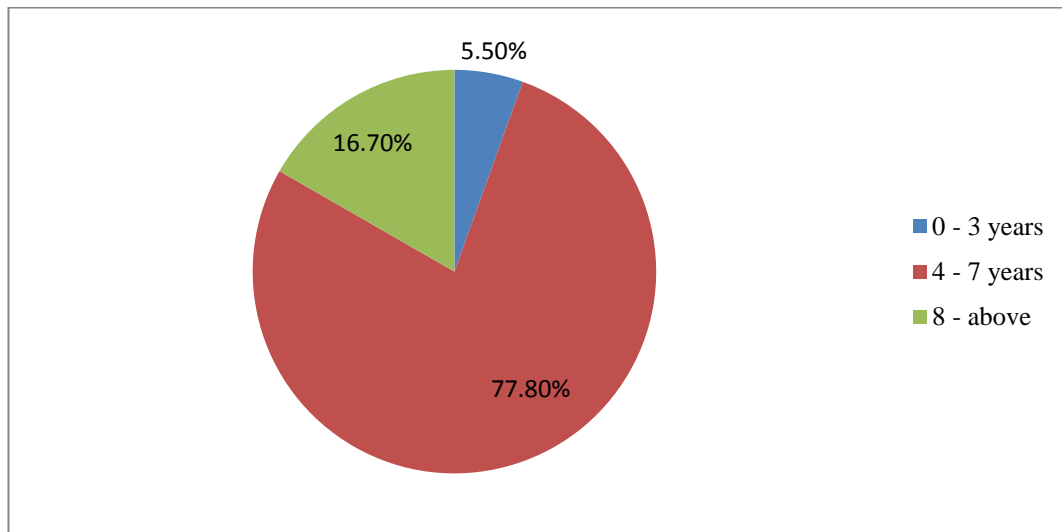


Figure 4.4: Respondent's working experience, (Source; Author, 2019)

4.4 Conformance to Quality Management Practices by civil engineering departments

This section of the study discusses the conformance of civil engineering departments to Quality management practices. The conformance to quality management practices is measured through quality control and quality assurance practices used in the respective civil engineering departments. The quality control practices investigated were: i) Department's material testing for construction, ii) way of managing workers on site during construction phase and iii) factors provides the need for conducting close site supervision While the quality assurance practices included: i) the carrying out of periodic reviews of work quality systems, ii) Information to be established and known to the procurement unit to ensure that materials purchased conforms to specification , iii) Actions taken to mitigate quality risks and cost involved in sourcing of materials, iv) Work method statements for construction project in department, v) management of Department's change order (variation order), vi)

Department's implementation of Quality appraisal for construction projects, vii) Department's top management commitment in the quality issues, viii) Department's management of corrective and preventive action for Quality, ix) Department's obedience to standards of pertinent agencies, x) Regularly provision of Staff training, xi) Internal and external Customer Satisfaction, xii) Proper project and work planning, xiii) Budgetary allocation, xiv) Involvement of Suppliers, xv) Continuous improvement (Learning and innovation) and xvi) Procedure for resources management at site during construction.

Furthermore the section inquired quality management professional units/divisions that exist in the construction department and some words that best summarize the meaning of quality. Lastly, respondents (civil engineering department) were asked if their department have a quality management plan in all projects and who developed it to be used. The discussions are elaborated more in relevant section in details.

4.4.1 Quality management professional units/divisions that exist in the department

In this question respondents required to indicate the quality management professional units/divisions which exists in their civil engineering departments and the results are presented in Figure 4.5.

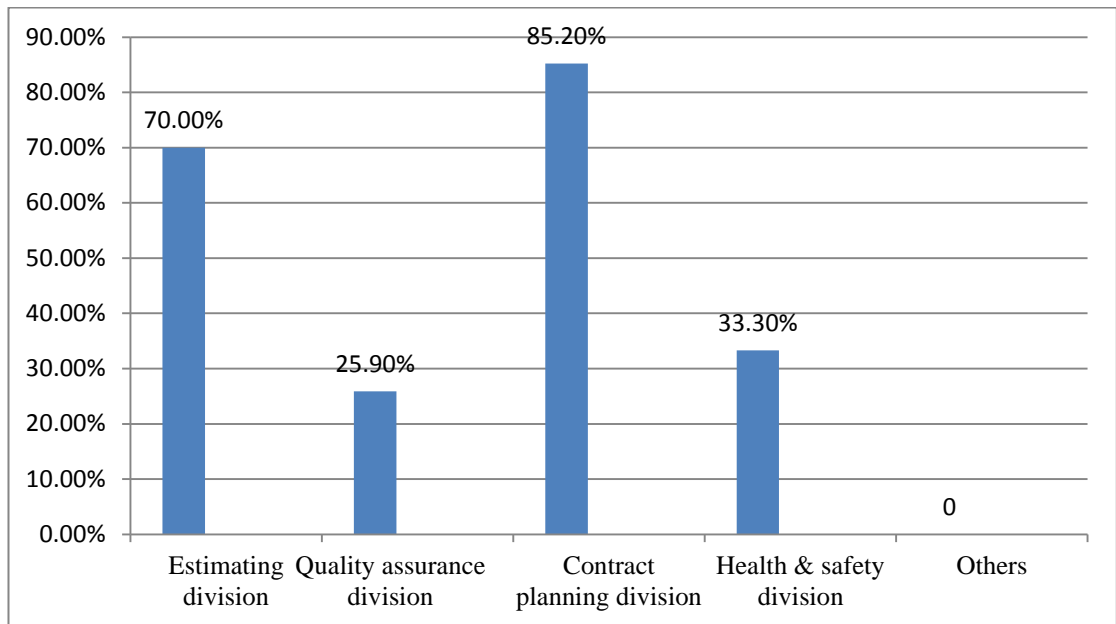


Figure 4.5: Quality management professional units/divisions that exist in the department

(Source; Author, 2019)

Figure 4.5 shows that 85.2% of the surveyed civil engineering department has the Contract planning unit/division. Other areas of specialization that departments put more effort according to majority of respondents (70%) were Estimating unit/division. However, a significant percentage (25.9%) of the civil engineering departments also had Quality assurance unit/division. Also, 33.3% of the surveyed construction department had Health & safety unit/division.

4.4.2 How department best summarize the definition of quality

In this part, respondents were required to indicate the words that best summarize the definition of quality in their departments and the results are shown in the Figure 4.6.

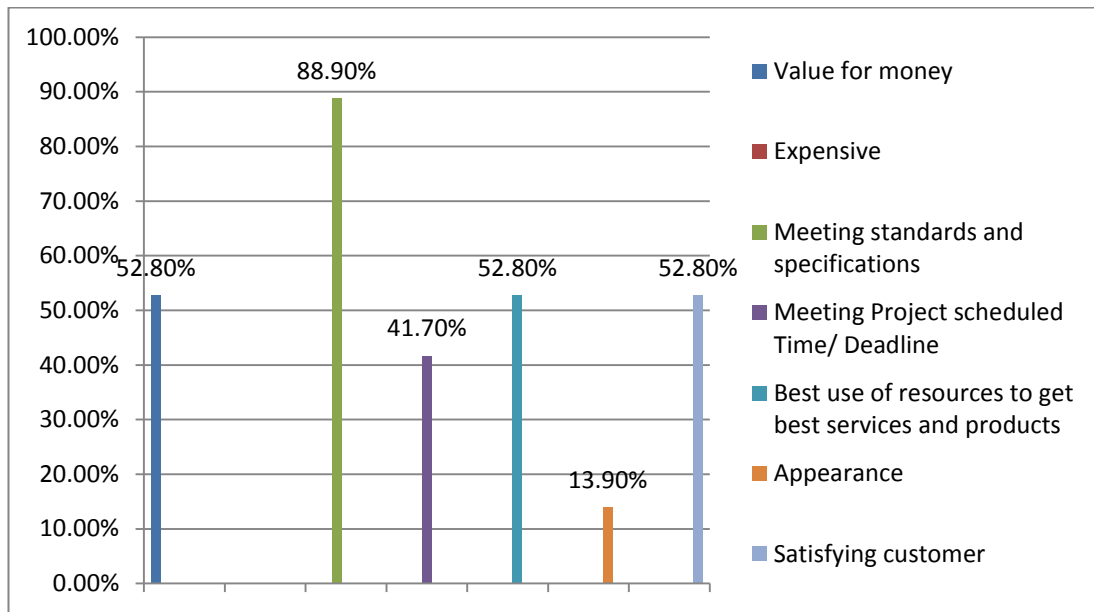


Figure 4.6: How department best summarize the definition of quality, (Source; Author, 2019)

From Figure 4.6, the most prioritized definition of the quality in the civil engineering department is meeting standards and specifications as indicated by 88.9% of respondents. This was subsequently followed by achieving Value for money, best use of resources to get best services and products and Satisfying customer needs which all of the three definitions scored 52.8% of the respondents. These three definitions were then followed by Meeting Project scheduled time or deadline and Appearance scored 41.7% and 13.9% respectively. Furthermore, this finding shows that none of the departments defines quality as project being expensive (high cost).

4.4.3 Way of managing workers on site during construction phase

In this sub-section, respondents were asked to select from a list given, how they manage workers on site during the construction phase in their areas. From Figure 4.7 the results are indicated

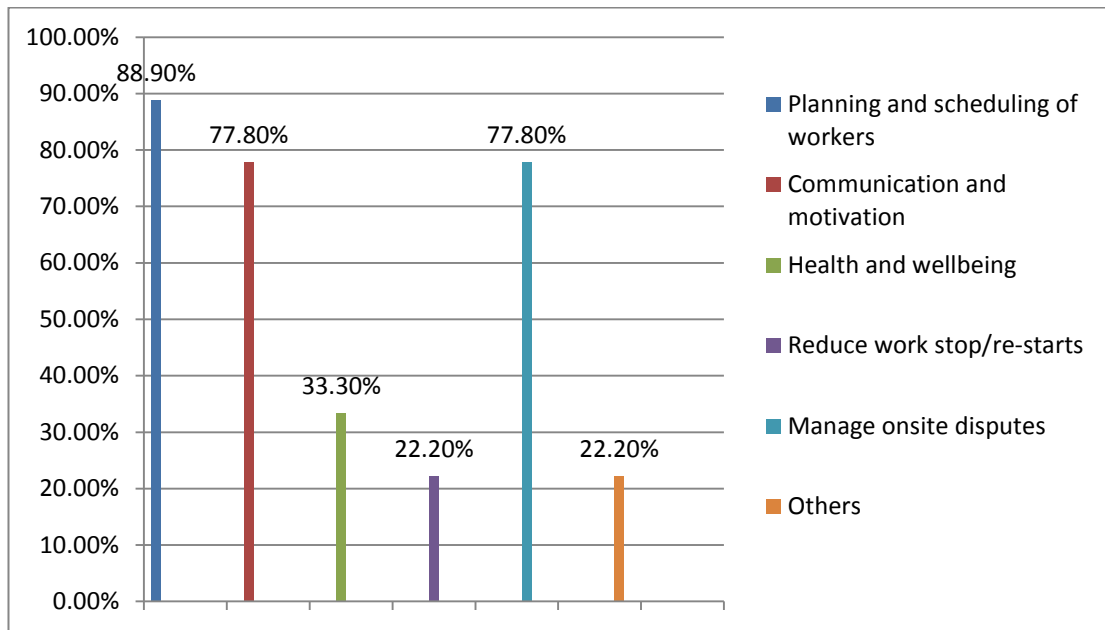


Figure 4.7: Way of managing workers on site during construction phase, (Source; Author, 2019)

Figure 4.7 presents the way of managing workers on site during construction which conforms to quality management practices. Findings show that 88.9% of respondents put more efforts on Planning and scheduling of workers as a way of managing workers during construction phase in their departments. Also 77.8% of respondents said that to manage the workers during construction phase in their departments; they concentrate more on Communication and motivation and manage onsite disputes. 33.3% of respondents claimed that their departments are very attention on health and wellbeing of their workers for producing quality works. Furthermore findings shows that 22.2% of respondents are concentrate on reduce work stop/re-starts and other ways to manage workers during construction phase. All of these ways were reported are very essential to enhance conformance to practices of quality management of

civil engineering department for all building projects carried under force account procuring method.

4.4.4 Department's material testing for construction

In this sub-section, respondents (civil engineering departments) were required to indicate if their departments conduct material testing construction or building projects. For those who their answers were yes, also were asked the following: i) to indicate if their departments have material testing laboratory and those who do not have material testing laboratory were also asked to indicate the place where their materials are tested, ii) to indicate factors provide the needs for material testing and Category of material testing conducted in their departments. The list of possible answers were given in which respondents were required to select and add more if any. The results are indicated in Figure 4.8, Figure 4.9, and Figure 4.10

4.4.5 Response for material testing

From Figure 4.8, 86.1% of respondents said that their departments are conducting material testing for construction projects and 13.9% of respondents said that their departments do not conducting material testing. This shows that most departments are conform to material testing of the construction projects that they undertake.

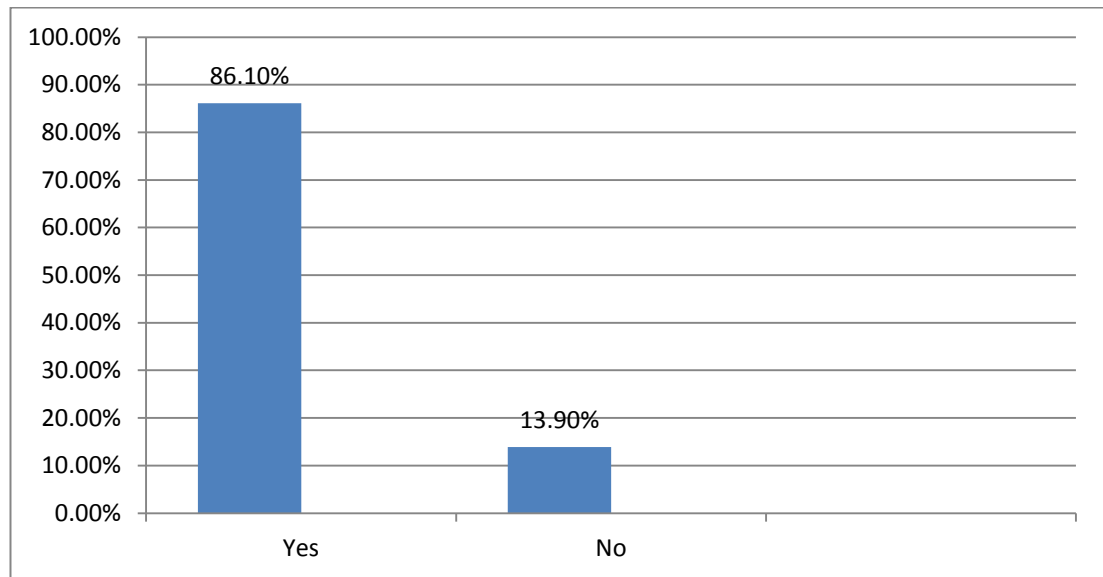


Figure 4.8: Response for material testing, (Source; Author, 2019)

4.4.6 Response for Department's own material testing laboratory

All respondents (100%) said that their departments do not have their own material testing laboratory and they carry the sample of materials to be tested to the nearest institute which have material testing laboratory. Most of departments are conducting material testing at their nearest regional TANROADS offices where the required tests are available. Some of respondents said that their material testing is conducted at University of Dar es salaam (UDSM), Mbeya University of science and technology (MUST), Dar es salaam institute of technology (DIT) and Arusha technical college (ATC)

4.4.7 Factors justifying the need for material testing

The following are factors reported by respondents to provide the need for material testing for construction projects as shown in Figure 4.9 below; Selecting appropriate materials and treatment for an application and Evaluating material design or

improvement of specifications are both scored (74.2%) of total respondents. Also 45.2% of respondents said that their departments conduct material testing in order to meet requirements of regulatory agencies. Moreover, 29% of respondents claimed that their departments conduct material testing with intention of verifying a design process.

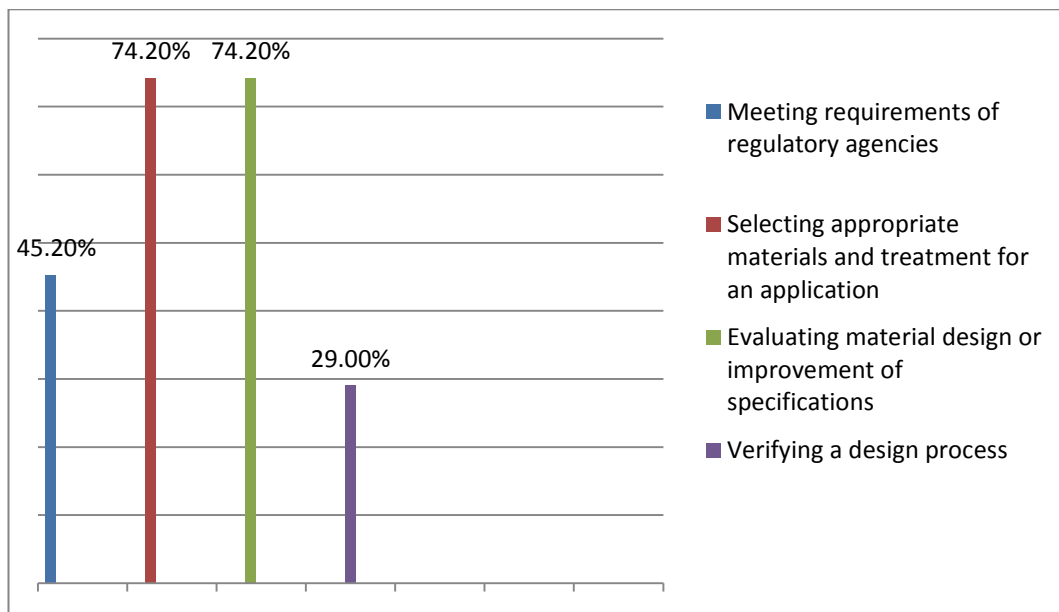


Figure 4.9: Factors provide the need for material testing, (Source; Author, 2019)

4.4.8 Category of material testing conducted by civil engineering department

Figure 5.0 shows the results regarding the category of material testing conducted in the construction departments. It is seen that 86.1% of civil engineering departments surveyed are conducting mechanical testing for material testing while Non-destructive test is conducted by only 16.1% of respondents. Therefore from the findings it is seen that mechanical testing is the key category of material testing in the departments.

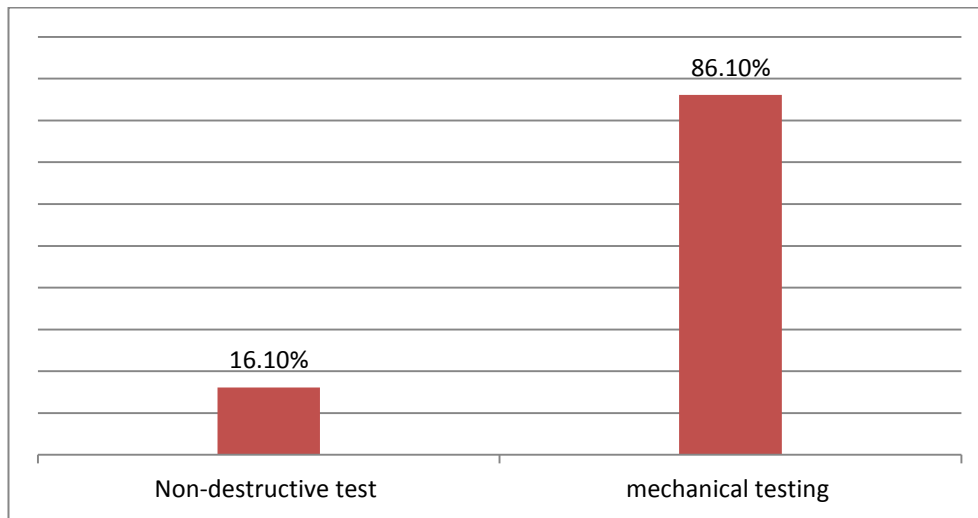


Figure 4.10: Category of material testing conducted, (Source; Author, 2019)

4.4.9 Reasons for close site supervision by the civil engineering departments (respondents).

In this sub-section, respondents (civil engineering departments) were required to show the factors provide the need for close site supervision in their departments. The list of possible reasons was given out in which respondents were asked to select. Figure 4.11 shows the result regarding factors provides the need for close site supervision. From the findings of department surveyed, it is seen that 86.1% of respondents need close site supervision for the purpose of controlling workmanship at the construction site. Also 75% of respondents said that they need site supervision for the purpose of “Regular inspections to ensure compliance with relevant legal requirements and procedures” and “Resolving problems and implementing improvements”. Furthermore, 63.9% of respondents said that they need close site supervision for the purpose of “Planning the work program” and “Helping coordinate deliveries of materials, plant and equipment”. Moreover, 38.9% of

respondents claimed that their departments need for close site supervision for the purpose of “Assess hazards and determine risks”, “Maintain a safety program” and “Completing records for site reports”. From the results it’s seen that control workmanship is the key factor for need of close site supervision followed nearly by “Regular inspections to ensure compliance with relevant legal requirements and procedures” and “Resolving problems and implementing improvements”

4.4.10 Application of quality management plan in construction project by the civil engineering departments

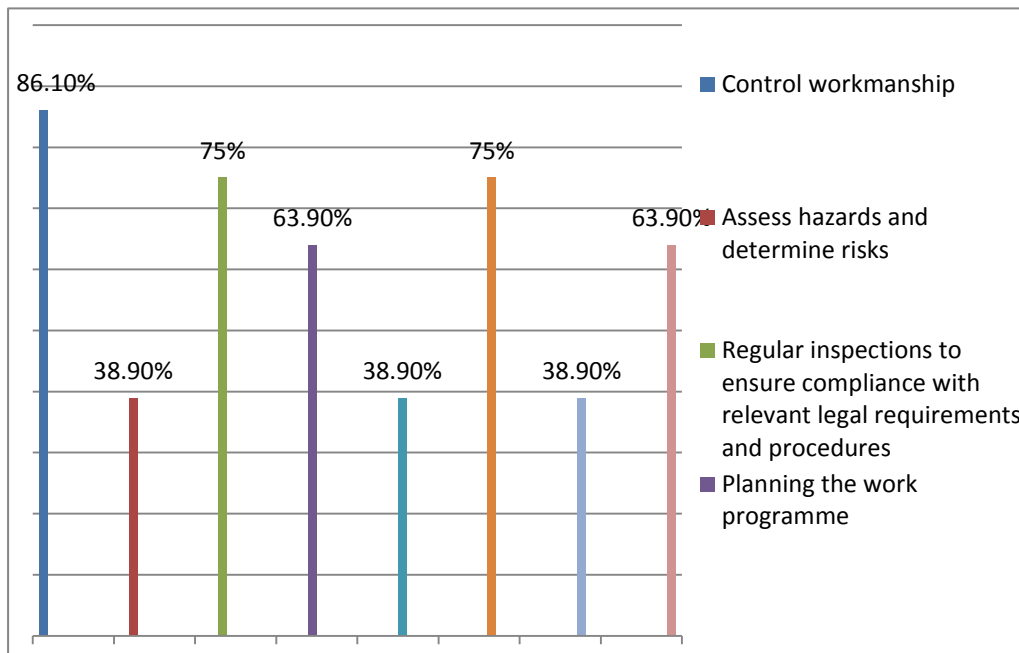


Figure 4.11: Reasons for close site supervision by construction department, (Source; Author, 2019)

in Figure 4.12.

In this part, respondents and engineers (civil

works in shown

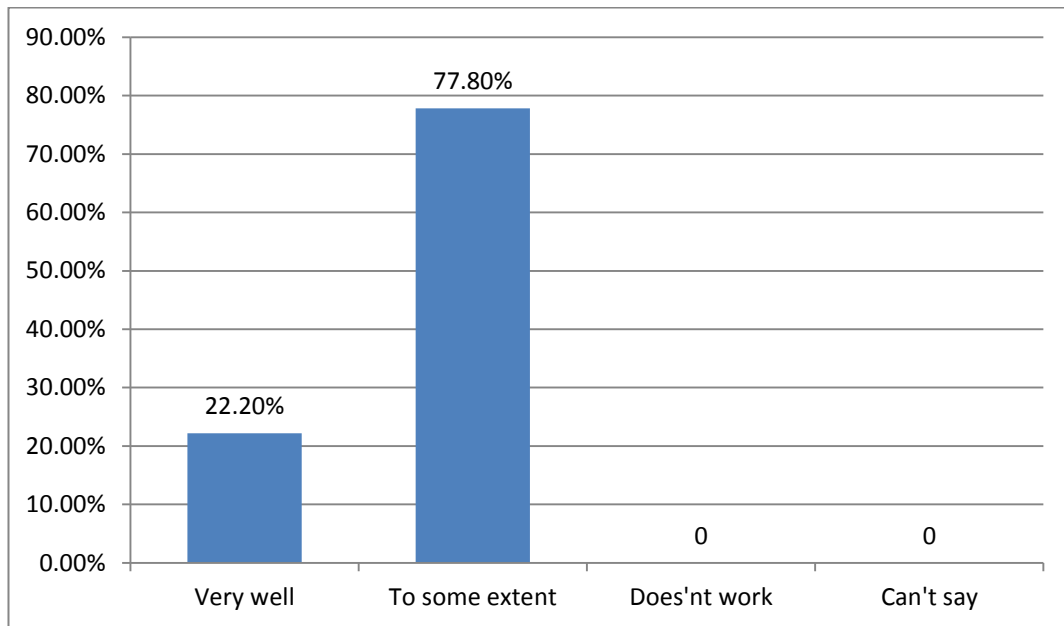


Figure 4.12: Application of quality management plan in construction project by the civil engineering departments, (Source; Author, 2019)

From the Figure 4.12, 8 out of 36 respondents(22.2%) said that their departments implement quality management plan and works very well and 28 out of 36 respondents(77.8%) said that in their departments, quality management plan works to some extent. This shows favorable use of quality management plan in all construction or building projects carried by departments.

4.4.11 The personnel responsible in preparation of quality management plans for construction projects in civil engineering departments

In this sub-section, respondents (civil engineering departments) were required to point out people who prepared quality management plans in their departments. The list of possible answers was given for them to select the appropriate one in their departments. The results are shown in Figure 4.13.

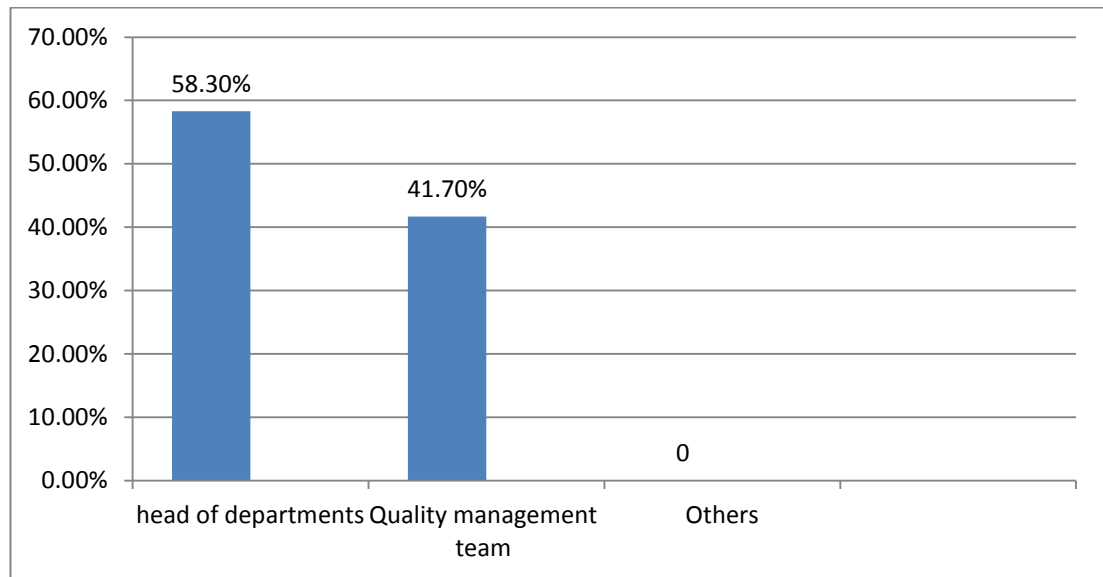


Figure 4.13: Who prepare quality management plan in civil engineering departments, (Source; Author, 2019)

From Figure 4.13, major (58.3%) of respondents said that the quality management plans are prepared by their head of departments while 41.7% of respondents said that the quality management plans in their department are prepared by Quality management team within the department. This shows favorable commitment to Quality Management plan in civil engineering departments.

4.4.12 Periodic reviews of work quality systems

In this sub-section, respondents were asked if their departments conduct the periodic reviews of quality systems in construction works. Most of them show that they carry out and few of them said otherwise. Those who reported to conduct the periodic reviews of quality systems in construction works, were asked to select from the list given, the people who conduct it in their departments. The findings are indicated in Figure 4.14 and Figure 4.15

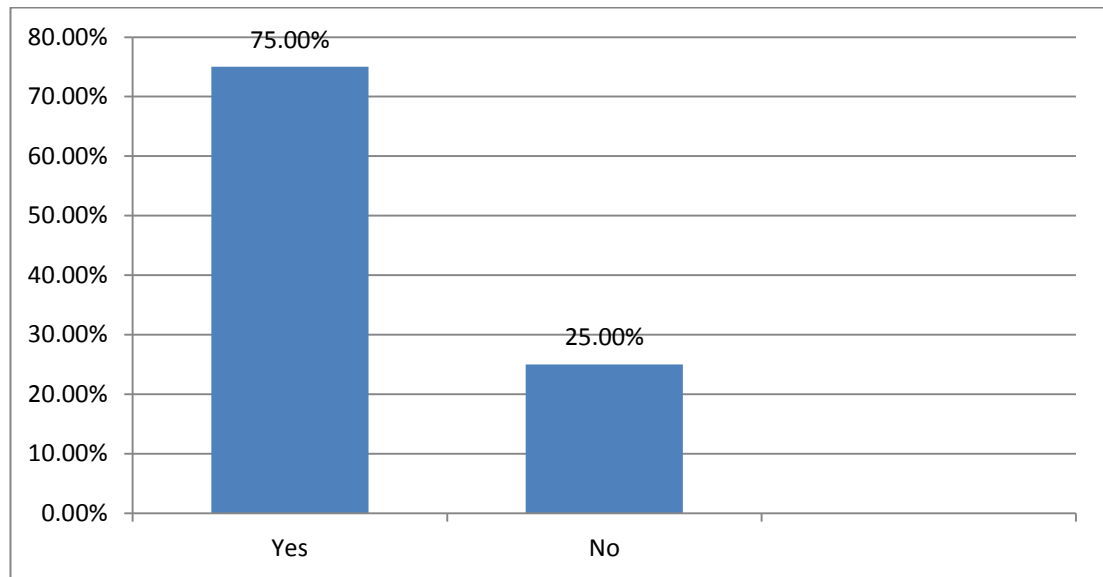


Figure 4.14: Response of conducting periodic reviews of quality systems of construction works by civil engineering departments, (Source; Author, 2019)

Figure 4.14 show the response of conducting periodic reviews of quality systems of construction works. Findings show that 75% of civil engineering departments are conducting periodic reviews of quality systems in construction projects while 25% of the civil engineering departments do not conduct periodic reviews of work quality systems.

Furthermore, Figure 4.15 shows people who are responsible for conducting Periodic reviews of quality systems of construction works in the department. Out of the total respondents surveyed, majority (77.8%) of the surveyed civil engineering departments said that Periodic reviews of quality systems of construction works are conducted by a quality management team from the civil engineering department while 22.2% of the respondents said that it's conducted by head of department.



Figure 4.15: Personnel that conduct Periodic review of work quality systems, (Source; Author, 2019)

4.4.13 Assessment of conformance to specification of the construction projects by civil engineering departments (respondents)

In this sub-section, respondents were asked on what information needs to be established and be known to the procurement unit to ensure that materials purchased conform to specification. The results are shown in Figure 4.16.

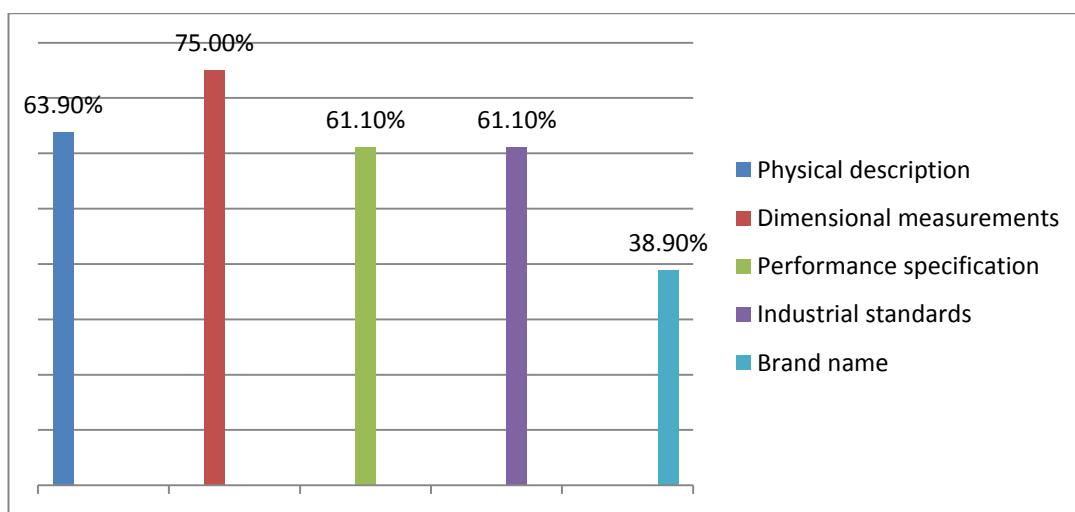


Figure 4.16: Information to be established and be known to the procurement unit to ensure that materials purchased conforms to specification, (Source; Author, 2019)

Figure 4.16 shows the Information to be established and be known to the procurement unit to ensure that materials purchased conform to specifications in the civil engineering departments. The highest number of respondents (75%) regarded Dimensional measurements as information with very high significance. The second information which marked by surveyed departments is Physical description which are 63.9% of total respondents while Performance specification and Industrial standards ranked third Information to be established and known to the procurement unit to ensure that materials purchased conforms to specifications in the civil engineering departments with 61.1% of total respondents in the surveyed departments. Furthermore, Brand name ranked fifth with 38.9% of total respondents.

Based on the above findings, it can be seen that Dimensional measurements are key Information to be established and be known to the procurement unit to ensure that materials purchased conforms to specifications in the civil engineering departments followed by Physical description of the required materials.

4.4.14 Actions taken to mitigate quality risks and cost involved in sourcing of materials

In this sub-section, respondents were asked the actions they take to mitigate risks of quality and associated cost in finding materials during the procuring process in their

departments. The list of possible actions was prepared from which respondents were asked to pick and add more if any. The results are shown in Figure 4.17.

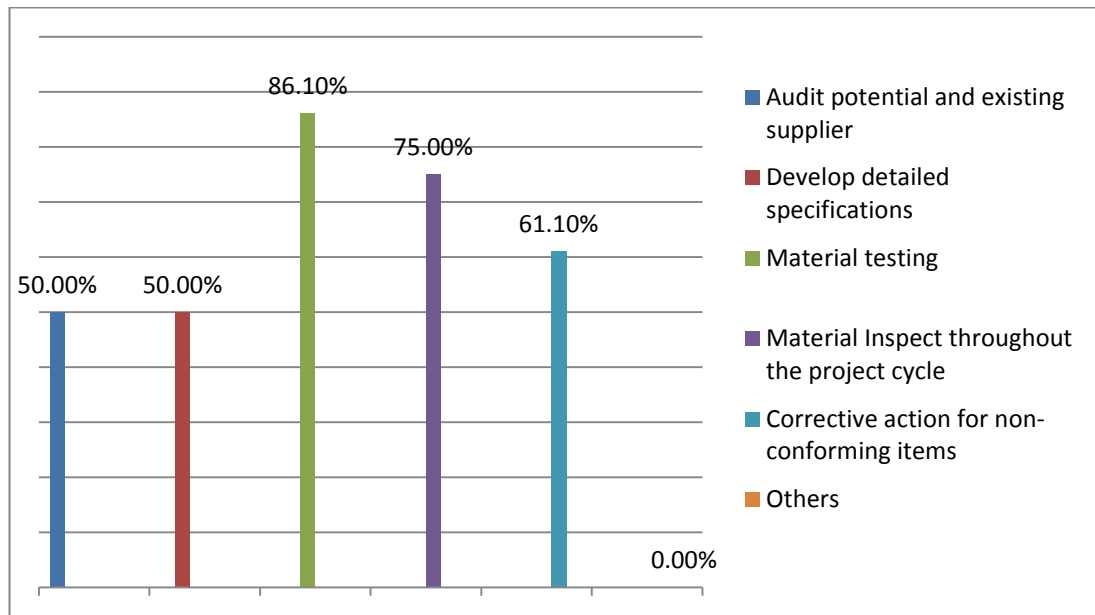


Figure 4.17: Actions taken to mitigate risks of quality and associated cost in finding materials, (Source; Author, 2019)

From Figure 4.17 we can see that over 86.1% of these respondents said that material testing is the most actions taken to mitigate quality risks and cost involved in sourcing of materials in their departments in construction projects, followed by Material Inspection throughout the project cycle which claimed by 75% of total respondents. 50% of respondents said that Audit potential and existing supplier and Develop detailed specifications are actions taken to mitigate risks of quality and associated cost in finding materials, while 25% of all respondents reveal that they put more effort on corrective action for non-conforming items. In other words, material

testing and Material Inspection throughout the project cycle should be given much attention.

4.4.15 Application of work method statements by the civil engineering department for projects

In this sub-section, respondents were asked if work method statements for construction projects are applicable in their departments and also were also asked to indicate who is responsible for preparing it for construction projects. The discussion of findings are indicated in Figure 4.18 and Figure 4.19

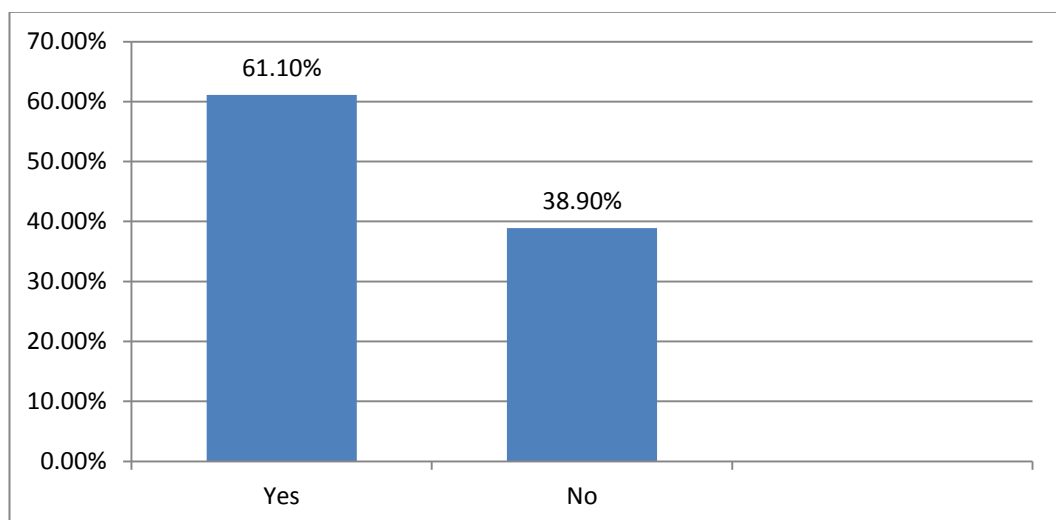


Figure 4.18: Application of work method statements by the construction department for projects, (Source; Author, 2019)

From Figure 4.18, 61.1% of respondents said that work method statements for construction project are applicable in their departments and 38.9% of respondents said that work method statements for construction project are not applicable in their departments. From the findings it is obvious that civil engineering departments are

conforms to work method statements for construction project as shown by results from the surveyed departments. Furthermore, Figure 4.19 shows people who are responsible for preparing work method statements for construction project. Out of the total respondents surveyed, majority (59.1%) of the surveyed construction departments who are using work method statements for construction project said that it is prepared by the head of department. While 40.9% of the respondents said that the work method statements for construction project in their departments are prepared by the quality management team.

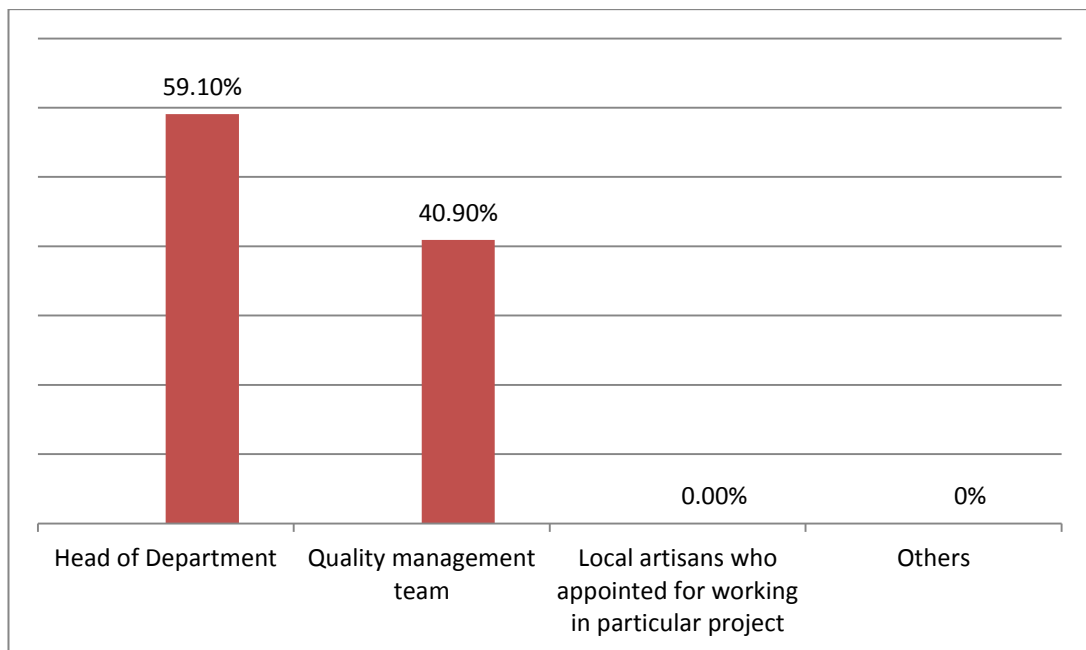


Figure 4.19: Who prepared method statements for construction project,
(Source; Author, 2019)

4.4.16 Department's implementation of quality appraisal in construction projects

In this sub-section, respondents were asked on their quality appraisal implementation in construction or building projects. For the respondents who their departments implement quality appraisal, were asked further questions on how they conducts quality appraisal and period of conducting it. The list of possible choices were given to them and also asked to add more as may be necessary. Figure 4.20, Figure 4.21 and Figure 4.22 are showing the results

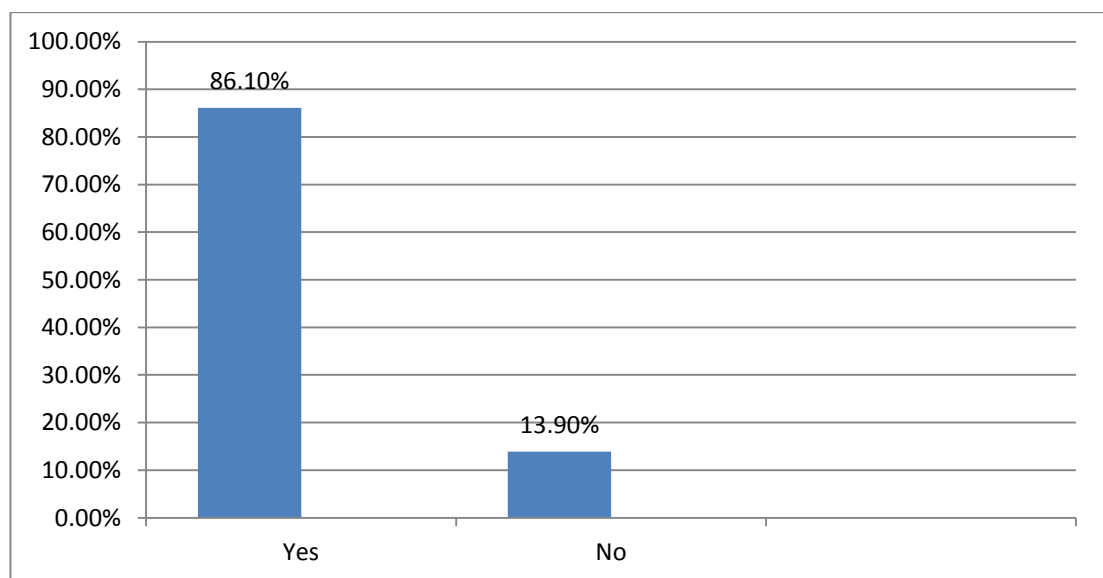


Figure 4.20: Response on department implementation of Quality appraisal in construction or building projects, (Source; Author, 2019)

Figure 4.20 show the category of response on departments quality appraisal implementation in construction or building projects. Major (86.1%) of respondents said that quality appraisal are conducted in their departments and minor (13.9%) of respondents said that quality appraisal do not employed in their departments.

Generally, from the findings it is obvious that construction departments are implementing quality appraisal in construction projects as shown by results from the major surveyed departments.

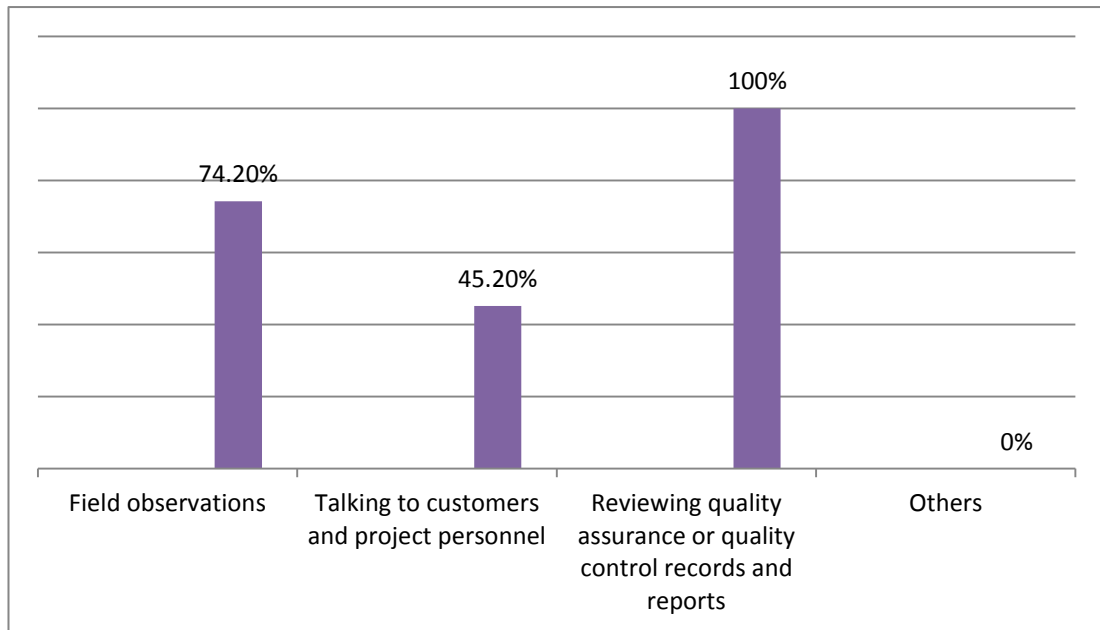


Figure 4.21: Departments method of conducting Quality appraisal, (Source; Author, 2019)

Figure 4.21 show the results concerning methods used in conducting quality appraisal in construction projects. The results show that all (100%) of respondents conduct quality appraisal in construction projects through “Reviewing quality assurance or quality control records and reports”. Also 74.2% of respondents (civil engineering departments) reported that they are conducting quality appraisal in building or construction projects through “Field observations” Furthermore, 45.2% of respondents reported to conduct quality appraisal in construction projects through “Talking to customers and project personnel”. From the findings it is seen that the

key method of conducting quality appraisal in construction projects is through “Reviewing quality assurance or quality control records and reports” followed nearly by “Field observations”

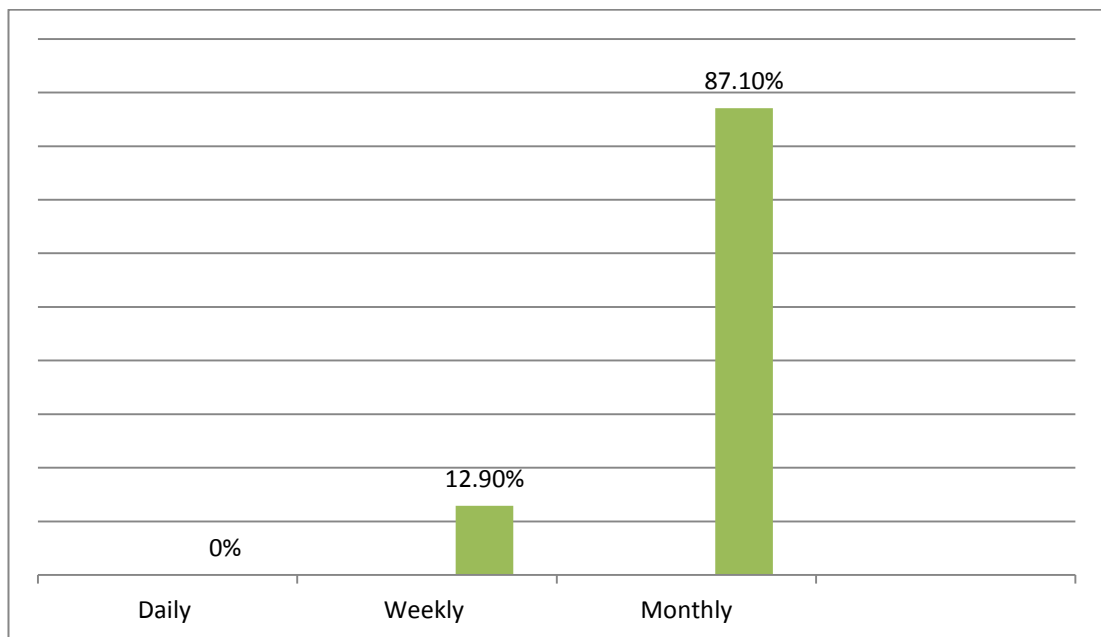


Figure 4.22: Departments period of conduct Quality appraisal in construction projects, (Source; Author, 2019)

Figure 4.22 shows that major (87.1%) of surveyed departments are conducting Quality appraisal in construction projects monthly while minor (12.9%) of departments are conducting Quality appraisal in construction projects weekly. Moreover, findings show that none of departments conducting Quality appraisal in construction projects daily.

4.4.17 Department's top management commitment in the quality issues

In this sub-section, respondents (civil engineering departments) were asked about the commitment of top management in the quality issues in which specifically they were asked to indicate the area of responsibility of top managements towards quality issues and ways in which top managements involved in quality issues. The list of possible choices were given to them and also asked to add more as may be necessary regarding the top management commitment to quality. Figure 4.23 and Figure 4.24 show the findings

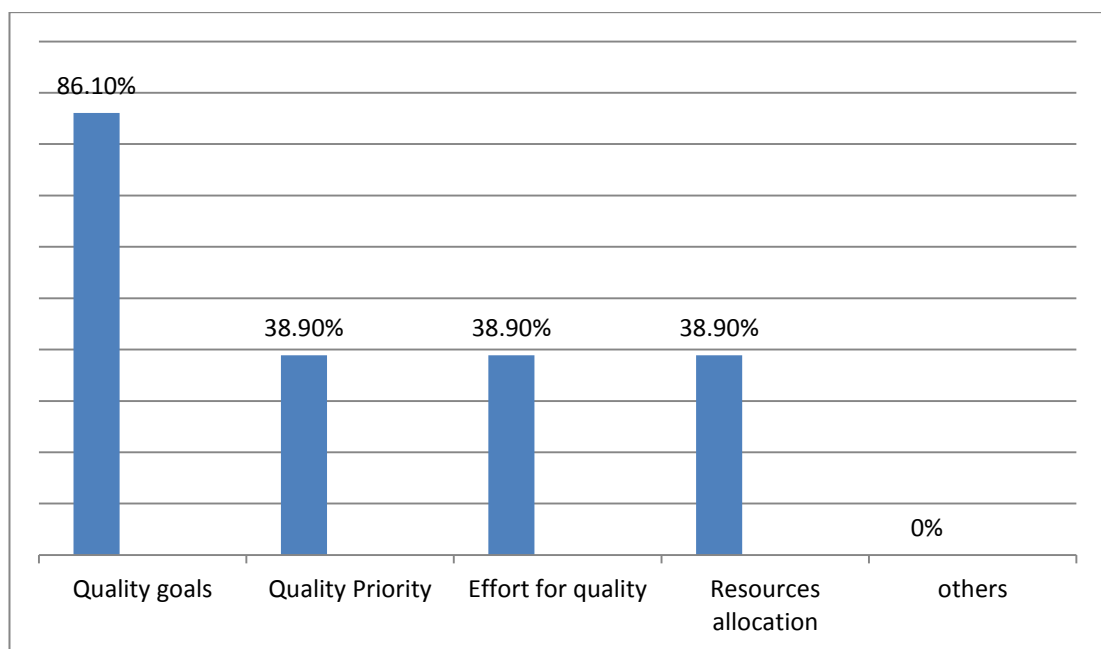


Figure 4.23: Departments top management commitment in the quality issues, (Source; Author, 2019)

Figure 4.23 show findings on Departments top management commitment in the quality issues where Top managements area of responsibility towards quality is shown. Major (86.1%) of respondents said that in their departments, top

managements are more involved in the “quality goals” for the construction projects. Also 38.9% of respondents said that the top managements are more responsible in three areas of responsibility that are “Quality priority”, “Effort for Quality” and “Resources allocation”. The results shows that the key area of responsibility of top management commitment to quality issues in the departments is “quality goals”.

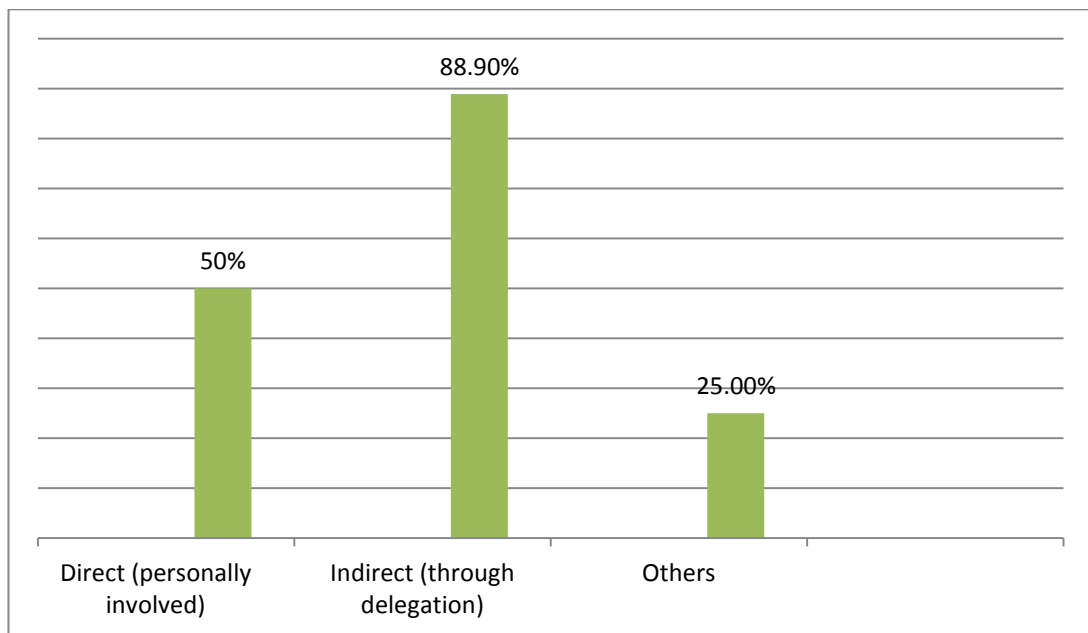


Figure 4.24: Department’s top management ways of involvement in the quality issues, (Source; Author, 2019)

Figure 4.24 indicates the findings concerning the ways of involvement of top management in the quality issues. From the findings, it is seen that major (88.9%) of respondents reported the involvement of the top managements in the quality issues to be indirectly (through delegation of power) in their departments while 50% of respondents reported the participation of the top managements in the quality issues to be directly (personally involved). Furthermore, 25% of respondents reported the participation of the top managements in the quality issues to be through other ways.

4.4.18 Department's implementation of corrective and preventive action for Quality

In this part, respondents were required to rate how their departments implement corrective and preventive action for Quality issues. The findings are shown in Figure 6.5.

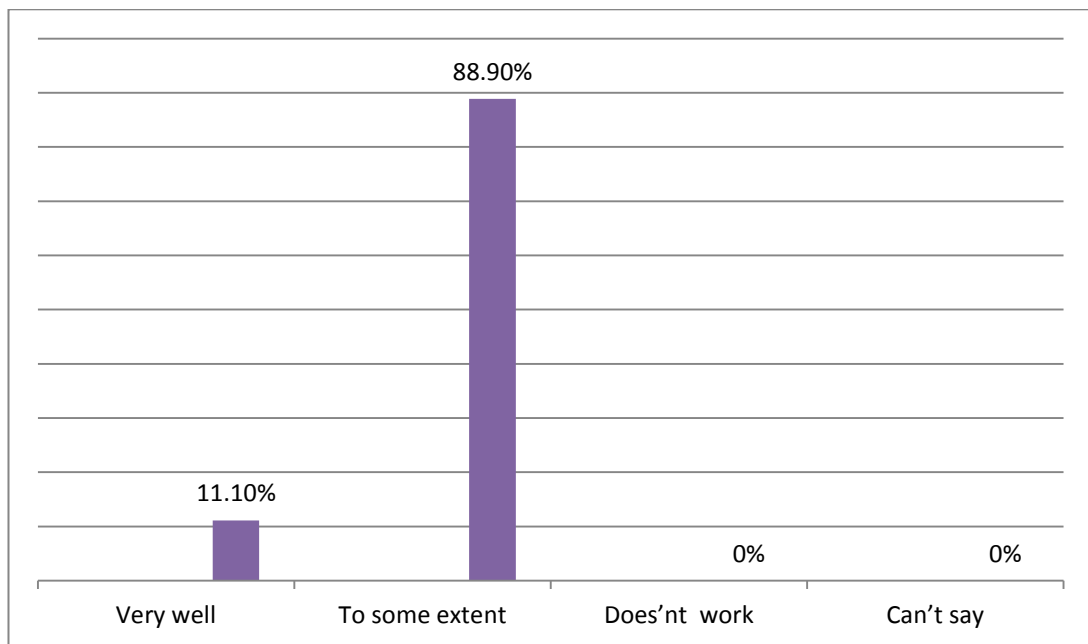


Figure 4.25: Departments preventive and corrective action implementation for Quality, (Source; Author, 2019)

From Figure 4.25 shows department preventive and corrective action implementation for issues. Major (88.9%) of respondents said that in their departments, corrective and preventive action for Quality are implemented “to some extent” while minor (11.1%) of respondents said that in their departments, corrective and preventive action for Quality issues are implemented very well.

4.4.19 Other quality management practices applied by civil engineering departments in implementation of construction projects

In this part, respondents (civil engineering departments) were required to indicate other quality management practices applied by the departments. The list of possible choices were given to them and also asked to add more as may be necessary regarding the practices of quality management. The findings are shown in the Figure 4.26.

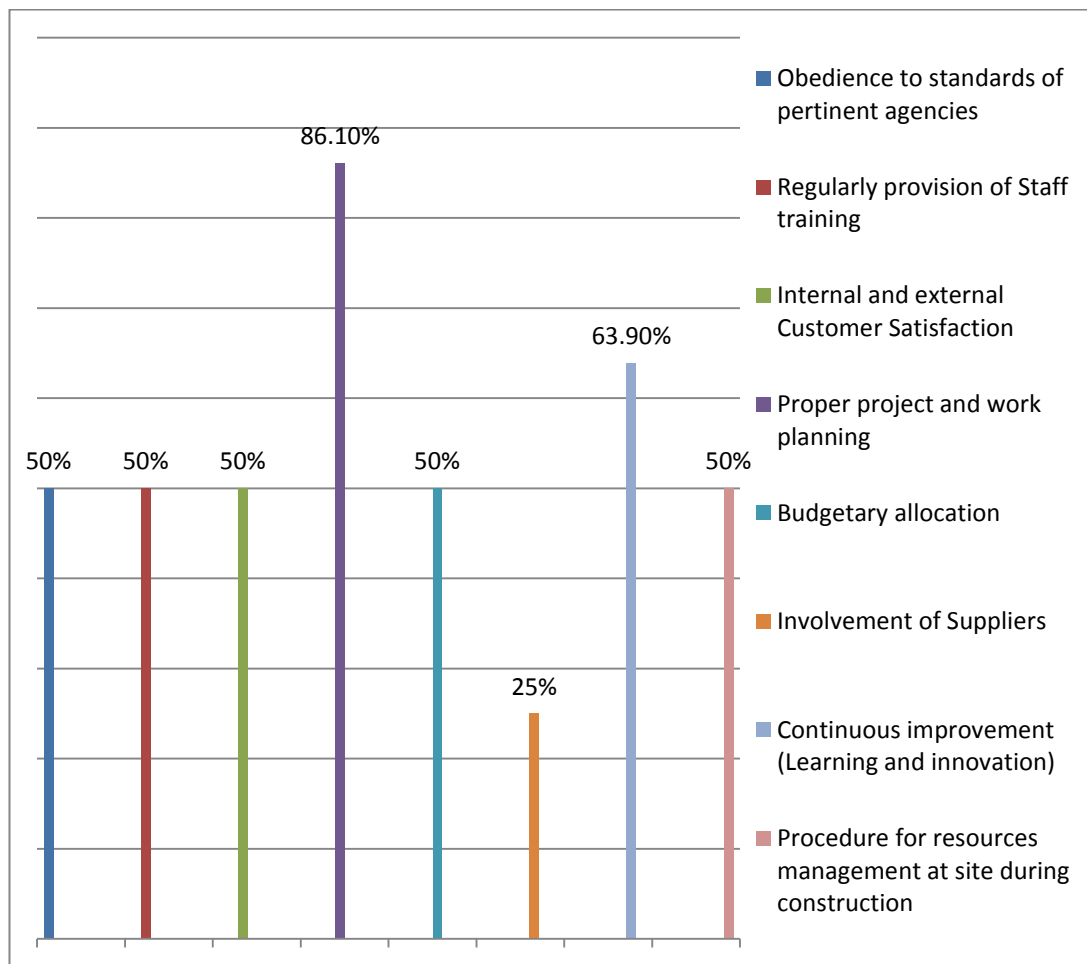


Figure 4.26: Other quality management practices applied by civil engineering departments in implementation of construction projects, (Source; Author, 2019)

Figure 4.26 present others quality management practices that civil engineering departments conform with. Proper project and work planning scored 86.1% of the total respondents while Continuous improvement (Learning and innovation) scored 63.9% of the total respondents. Furthermore, 50% of the respondents conform to “Obedience to standards of pertinent agencies”, “Regularly provision of Staff training”, “Internal and external Customer Satisfaction”, “Budgetary allocation” and “Procedure for resources management at site during construction”. Also 25% of the total respondents said that they conform to “Involvement of Suppliers” in their construction departments.

4.5 Challenges and measures for implementing effective quality management practices in local government civil engineering departments for construction projects

4.5.1 Challenges in implementation of quality management practices by civil engineering department for projects

In determining the challenges hindering the quality management practices implementation during execution construction projects, some of the challenges or difficulties drawn from literature were listed for respondents to select the one significant to their departments. From the table 4.2 the feedback from respondents, a higher percentage rated procedure implies more significant challenge to quality management implementation.

Table 4.2 Challenges in quality management practices implementation by civil engineering departments for projects

Challenges in quality management practices implementation	Response	Frequency	Percent (%)	Rank
Lack of proper site supervision	YES	32	88.9	1
	NO	4	11.1	
Lack or shortage of qualified professionals in the department	YES	32	88.9	1
	NO	4	11.1	
Lack or inadequate training programs	YES	32	88.9	1
	NO	4	11.1	
Lack of proper understanding of contract documents (Especially specification for works)	YES	28	77.8	2
	NO	8	22.2	
Lack of effective communication	YES	28	77.8	2
	NO	8	22.2	
Lack of quality materials	YE	28	77.8	2
	NO	8	22.2	
Lack of proper equipment available for use	YES	28	77.8	2
	NO	8	22.2	
Working with new people/employees most often	YES	21	58.3	3
	NO	15	41.7	
Lack of top-management commitment/understanding	YES	21	58.3	3
	NO	15	41.7	
Lack of employees commitment/understanding	YES	21	58.3	3
	NO	15	41.7	
High cost to implement quality management practices	YES	19	52.8	4
	NO	17	47.2	
The transient nature of construction works	YES	19	52.8	4
	NO	17	47.2	
Difficult to apply to the department	YES	14	38.9	5
	NO	22	61.1	
Lack of progress review meetings	YES	9	25	6
	NO	27	75	
Lack of proper scheduling	YES	7	19.4	7
	NO	29	80.6	
Lack of proper Risk assessment	YES	4	11.1	8
	NO	32	88.9	
Lack of adequacy of design	YES	3	8.3	9
	NO	33	91.7	

(Source; Author, 2019)

These are some of the challenges hindering quality management in civil engineering departments during implementation of construction projects as ranked from the highest(1) to lowest(9) from the Table 4.2 above: Lack of proper site supervision, Lack or shortage of qualified professionals in the department and Lack or insufficient training programs (88.9%) ranked first, Lack of proper equipment available for use, Lack of proper understanding of contract documents (works specification), Lack of quality materials and Lack of successful communication (77.8%) ranked second, Lack of top-management commitment/understanding, Lack of employees commitment/understanding and Working with new people/employees most often (58.3%) ranked third, The transient nature of construction works and High cost to implement quality management practices (52.8%) ranked fourth, Difficult to apply in the department (38.9%) ranked fifth, Lack of progress review meetings (25%) ranked sixth, Lack of proper scheduling (19.4%) ranked seventh, Lack of proper Risk assessment (11.1%) eighth and Lack of adequacy of design (8.3%) ranked ninth.

4.5.2 Measures for successful Quality management by civil engineering departments for projects

In this section, proposals based on the research findings and literature review are listed, and the respondents were required to tick their best choice indicating the measure for effective quality management during execution of construction projects. Table 4.3 shows the feedback from the respondents, a higher percentage rated measure implies more significant measure to implementation of effective quality management.

Table 4.3 Measures for effective Quality management practices by civil engineering departments for projects

Measures for successful quality management practices	Response	Frequency	Percent (%)	Rank
Emphasis on adequate employment of qualified professionals in the department	YES	35	97.2	1
	NO	1	2.8	
Emphasis on adequate provision of training programs to the employees /workers	YES	35	97.2	1
	NO	1	2.8	
Emphasis on proper site supervision	YES	30	83.3	2
	NO	6	16.7	
Emphasis on regular inspection and quality auditing of the project works	YES	30	83.3	2
	NO	6	16.7	
Emphasis on mobilization of equipments on site	YES	30	83.3	2
	NO	6	16.7	
Emphasis on proper sourcing and procedures for purchasing of materials	YES	27	75	3
	NO	9	25	
Emphasis on Effective communication between managements and employees /workers	YES	27	75	3
	NO	9	25	
Emphasis on Effective involvement of employees /workers in quality issues	YES	27	75	3
	NO	9	25	
Emphasis on Management commitment to quality issues and policies	YES	20	55.6	4
	NO	16	44.4	
Emphasis on regular site meetings of project participants	YES	20	55.6	4
	NO	16	44.4	
Emphasis on Proper detailed working schedule	YES	17	47.2	5
	NO	19	52.7	
Emphasis on site safety	YES	11	30.6	6
	NO	25	69.4	
Emphasis on proper Risk assessment	YES	5	13.9	7
	NO	31	86.1	
Emphasis on incentives for good performance	YES	2	5.6	8
	NO	34	94.4	

(Source; Author, 2019)

These are some of the measures for effective quality management practices of local government civil engineering departments during implementation of construction projects in Tanzania as ranked from the highest(1) to lowest (8) from the Table 4.3 above: Emphasis on adequate employment of qualified professionals in the department and Emphasis on adequate provision of training programs to the

employees /workers (97.2%) ranked first, Emphasis on proper site supervision, Emphasis on regular inspection and quality auditing of the project works Emphasis on mobilization of equipments on site (83.3%) ranked second, Emphasis on proper sourcing and procedures for purchasing of materials, Emphasis on Effective communication between managements and employees /workers and Emphasis on Effective involvement of employees /workers in quality issues (75%) ranked third, Emphasis on Management commitment to quality issues and policies and Emphasis on regular site meetings of project participants (55.6%) ranked fourth, Emphasis on Proper detailed working schedule (47.2%) ranked fifth, Emphasis on site safety (30.6%) ranked sixth, Emphasis on proper Risk assessment (13.9%) ranked seventh and Emphasis on incentives for good performance (5.6%) ranked eighth.

4.6 Summary

The chapter discussed findings of data collected and analyzed into useful information. In addressing the assessment of quality management practices of local government civil engineering departments during implementation of construction projects in Tanzania questionnaires were used to collect the opinions of civil engineering departments in which 72% responded. Different quality management practices are implemented at different levels. Some of the top most challenges of practices of quality management found are: Lack of proper site supervision, Shortage or lack of qualified professionals in the department, Working with new employees most frequently, Lack of successful communication, Inadequate or lack training programs, Lack of appropriate equipment available for use, Lack of proper

understanding of contract documents, Lack of quality materials, Lack of commitment to top-management and employees.

Strategies of Emphasis on adequate employment of qualified professionals in the department and Emphasis on adequate provision of training programs to the employees /workers, Emphasis on proper site supervision, Emphasis on regular inspection and quality auditing of the project works, Emphasis on mobilization of equipments on site, Emphasis on proper sourcing and procedures for purchasing of materials, Emphasis on Effective communication between managements and employees /workers and Emphasis on Effective involvement of employees /workers in quality issues as the key measures for enhancing the quality management in construction departments. The study was limited to the projects executed under force account as a method of procuring public projects and supervised by local government construction departments.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The previous Chapter has presented the results and discussion on findings and interpretation of results in response along the specific objectives. This Chapter presents conclusion guided by specific objectives and also provides recommendation for further enhancement of the practices of quality management by the civil engineering departments. Also gives recommendation on further researches along with limitation of findings.

5.2 Conclusions

This research aimed to assess the quality management practices for projects in local government civil engineering departments in Tanzania. The specific objectives prepared for this purpose were: i) to assess the conformance of local Government civil engineering departments to quality management practices in Tanzania, ii) to determine the challenges encountered by local government civil engineering departments in implementation of quality management practices during carrying out of projects in Tanzania, and iii) to suggest possible measures towards enhancement of quality management practices during carrying out of projects by local government civil engineering departments in Tanzania.

The questionnaires targeting local government civil engineering departments such as district, township and municipal construction departments were used to collect data for this study.

The main findings of the research discovered that Contract planning and Estimating unit/division were found to be key unit/division in the departments however for effective quality management practices Quality assurance unit/division and Health & safety unit/division are highly recommended to be in place in the construction department. Furthermore departments defines quality as “ability of meeting standards and specifications” followed by a project “achieving Value for money”, “Best use of resources to get best services and products” and “Satisfying customer needs”. In addition, finding shows that departments have a quality management plan in each project which are prepared by head of department in most departments and Quality management team in some departments. This is a good practice but preparation of quality management plan should be the responsibility of quality management team who is directly responsible for quality issues in each project because head of department sometimes have a lot of managerial responsibilities.

The major quality management practices that departments conform with to enhance quality management are;

- Managing workers on site. The top most three ways through which departments managing workers are through Planning and scheduling of workers, Communication and motivation and manage of onsite disputes. These are very important practices for quality achievement.
- Periodic reviews of quality systems of construction works. The results shows that in most departments, periodic review of quality systems of construction works are conducted by quality management team from construction

department while in few departments are conducted by head of department. Quality management team should be responsible for this practice because sometimes head of department has a lot of managerial responsibilities in the office.

- Assessment of conformance to specification by civil engineering department. From the findings it shows that departments are establishing important information which help procurement unit to ensure that materials purchased conforms to specifications. Most departments show that the key information is “Dimensional measurements of material component” followed by “Physical description of the material”. Also “Performance specification” and “Industrial standards” shown to be important information while a few departments considered “Brand name” to be important information to be established and known to the procurement unit.

Furthermore results shows that to mitigate the risks of quality and associated cost in finding materials, the following actions are taken: “material testing”, “material inspection throughout the project cycle”, “Auditing potential and existing supplier” and “Develop detailed specifications” are also done. Other actions revealed are corrective action for non-conforming items.

- Material testing for construction. Findings shows that the key factors provide the need for material testing for construction projects are “Selecting appropriate materials and treatment for an application” and “Evaluating material design or improvement of specifications”. Other factors are “meeting requirements of regulatory agencies” and “Verifying a design

process”. Moreover, results shows that mechanical testing is a key category of material testing in the departments while a few department are conducting Non-destructive testing in constructed structures.

- Close site supervision. Finding shows that the key factors provide the need for close site supervision is “control of workmanship”, “Regular inspections to ensure compliance with relevant legal requirements and procedures” and “Resolving problems and implementing improvements”. Other factors are “Planning the work program”, “Helping co-ordinate deliveries of materials, plant and equipment”, “Assess hazards and determine risks”, “Maintain a safety program” and “Completing records for site reports”.
- Uses of work method statements for construction project. According to results, it shows that in major departments work method statements are prepared by the head of department while in a few departments it is prepared by the quality management team. For effective work method statements preparation it should be the responsibility of the quality management team because head of department sometimes have a lot of managerial responsibilities and she/he should work as approver in this practice.
- Implementation of Quality appraisal in construction projects. In this practice the key methods of conducting Quality appraisal are “Reviewing quality assurance or quality control records and reports” and “Field observations”. Other method is “Talking to customers and project personnel”. Furthermore it shows that most of departments are conducting Quality appraisal monthly

while a few departments are conducting Quality appraisal weekly which are a good practices of ensuring quality of work.

- Involvement of top management to quality issues. The key area where the top management involved is in “quality goals”. Other areas of responsibility are in “Quality priority”, “Effort for Quality” and “Resources allocation”. Furthermore it shows most of top managements are involved in quality issues indirectly (through delegation of power) while some of them are involved directly (personally involved).
- Implementation of corrective and preventive action for Quality. Findings shows that in most of departments this practice is implemented “to some extent” while in some departments it is implemented very well.
- Other major practices that departments conform with to enhance quality management are; “Proper project and work planning”, “Continuous improvement (Learning and innovation)”, “Obedience to standards of pertinent agencies”, “Regularly provision of Staff training”, “Internal and external Customer Satisfaction”, “Budgetary allocation”, “Procedure for resources management at site during construction” and “Involvement of Suppliers” in their construction departments.
- The findings revealed the following as the fourth top ranked challenges hindering practices of quality management in the civil engineering departments during implementation of projects: “Lack of proper site supervision”, “Lack or shortage of qualified professionals in the department” and “Lack or inadequate training programs” all these ranked first; “Lack of

proper understanding of contract documents (Especially specification for works)”, “Lack of effective communication”, “Lack of quality materials and Lack of proper equipment available for use” all these ranked second;, “Working with new people/employees most often”, “Lack of top-management commitment/understanding” and “Lack of employees commitment/understanding” all these ranked third;, “The transient nature of construction works” and “High cost to implement quality management practices” both ranked fourth.

- Furthermore, findings revealed the following as the top most four measures for effective quality management in construction departments during implementation of projects: “Emphasis on adequate employment of qualified professionals in the department” and “Emphasis on adequate provision of training programs to the employees /workers” both ranked first;, “Emphasis on proper site supervision”, “Emphasis on regular inspection and quality auditing of the project works,” “Emphasis on mobilization of equipments on site” all these ranked second;, “Emphasis on proper sourcing and procedures for purchasing of materials”, “Emphasis on Effective communication between managements and employees /workers” and “Emphasis on Effective involvement of employees /workers in quality issues” all these ranked third;, “Emphasis on Management commitment to quality issues and policies” and “Emphasis on regular site meetings of project participants” both ranked fourth.

5.3 Recommendations

In line with the results of the research based on literature review, data analysis and interpretations including the conclusion, the following recommendations were made based on the key challenges found:

- Government should make sure that it has enough professional workers in the civil engineering departments in the Local Government Authorities through employment or any other means.
- Government should provide more grants for civil engineering departments in LGAs to undergo training in areas of quality management. Knowledge in quality management practices should be given through formal and informal training programs.
- Civil engineering departments in LGAs should establish quality manual for construction workers in which proper supervision practice shall be described.
- Civil engineering departments should establish pre qualification system for suppliers of materials.
- Civil engineering departments in LGAs should make the flexible and conducive environment which supports the growth of quality management practices in all aspect of the construction sector.
- Civil engineering departments s in LGAs hould make improvement on their information and communication management approaches.
- It is highly recommended for the civil engineering departments to build up its own overall management system that includes materials management system,

labors management system and equipment management system. These systems will make sure that most quality elements are achieved.

5.4 Area of further studies

- i. Future study into the framework for quality management practices of local government civil engineering departments for projects in Tanzania.
- ii. Future study into the impact of quality management practices for projects by local government construction departments in Tanzania.

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APPENDICES

APPENDIX I - QUESTIONNAIRE

ASSESSMENT OF QUALITY MANAGEMENT PRACTICES OF LOCAL GOVERNMENT CIVIL ENGINEERING DEPARTMENTS DURING EXECUTION OF CONSTRUCTION PROJECTS IN TANZANIA

SECTION A

General Information of Respondents

1. Region name
2. District name
3. Profession (Please tick your choice)
 - Engineer Architect Quantity Surveyor
 - Others (Specify)
4. Maximum level of academic qualification attained (Please tick your choice)
 - Ordinary Diploma Advanced Diploma Bachelor's Degree
 - Master's Degree Doctorate Degree
 - Others (Specify)
5. What is your current position in the department? (Please specify)
6. How long you have been in this position?

7. Please would you like to be contacted again whenever necessary for more clarification concerning this questionnaire? If you would like, Please write down your name and contact details:
8. For more references would you like your department to be quoted in the research?
- Yes No

SECTION B

Conformance to Quality Management Practices

9. What are quality management professional units/divisions do exist in your Department? (Please indicate all units/divisions do exist)
- Contract planning unit/division Estimating unit/division
- Quality assurance unit/division Health & safety unit/division
- Others (please specify).....
10. In your view, which of these words best summarize the definition of quality? (Tick all that correspond to your opinion, not limited to one answer)
- Value for money Expensive (High cost)
- Meeting standards and specifications
- Meeting Project scheduled Time/ Deadline
- Best use of resources to get best services and products
- Appearance Satisfying customer

11. (a) Does the Department have a quality management plan in all projects?

Yes No can't say

(b) In the question 11(a) above, if yes, who develops the quality management plan?

Head of Department

Quality management team

Others (please specify).....

12. How do you manage workers on site during construction phase? (Please tick your choice, not limited to one answer)

Planning and scheduling of workers

Communication and motivation

Health and wellbeing

Reduce work stop/re-starts

Manage onsite disputes

Others (please specify).....

13. Does your department conduct Periodic reviews of quality systems for construction works? (Tick your choice)

Yes No (if No, don't answer question 14)

14. Who conduct Periodic review of works quality systems in your department?

(Tick your choice)

Head of Department

Quality management team

Others (please specify).....

15. To ensure that materials purchased conforms to specification, the following are items information to be established and known to the procurement unit

(Please tick your choice, not limited to one answer)

Physical description

Dimensional measurements

Performance specification

Industrial standards

Brand name

16. To mitigate the quality risks and cost involved in sourcing of materials, which actions do you take? (Please tick your choice, not limited to one answer)

Audit potential and existing supplier

Develop detailed specifications

Material testing

Material Inspect throughout the project cycle

Corrective action for non-conforming items

Others (please specify).....

17. Does your Department carries out material testing for construction? (Tick your choice)

Yes No (if No, don't answer question 18 and 19)

18. Which of the following factors provides the need for material testing before project commencement? (Please tick your choice, not limited to one answer)

Meeting requirements of regulatory agencies

Selecting appropriate materials and treatment for an application

Evaluating material design or improvement of specifications

Verifying a design process

19. Which category of material testing is conducted at your department? (Please tick your choice, not limited to one answer)

Mechanical testing

Non-destructive testing

Others (please specify).....

20. Which of the following factors provides the need for close site supervision?
(Please tick your choice, not limited to one answer)

- Control workmanship
- assess hazards and determine risks
- Regular inspections to ensure compliance with relevant legal requirements and procedures
- Planning the work program
- maintain a safety program
- Resolving problems and implementing improvements
- Completing records for site reports
- Helping co-ordinate deliveries of materials, plant and equipment

21. Does work method statements for construction project works in your department?

- Yes No (if No, don't answer question 22)

22. Who prepared work method statements for construction project?

- Head of Department Quality management team
- local artisans who appointed for working in particular project
- Others (please specify).....

23. Do your Department implement Quality appraisal in construction projects?

- Yes No (if No, don't answer question 24 and 25)

24. How do you conducting Quality appraisal? (Please tick your choice, not limited to one answer)

- Field observations
- Talking to customers and project personnel
- Reviewing quality assurance or quality control records and reports
- Others (please specify).....

25. When do you conduct Quality appraisal in your project? (Please tick your choice)

- Daily
- Weekly
- Monthly

26. What are the top management commitments in the quality issues? (Please tick your choice, not limited to one answer)

- Quality goals
- Quality Priority
- Effort for quality
- Resources allocation
- Others (please specify).....

27. How the Top management is involved in the quality issues?

- direct (personally involved)
- indirect (through delegation)
- Others (please specify).....

28. Rate the statement, Your Department is implementing corrective and preventive action for Quality issues

Very well to some extent doesn't work can't say

29. Please indicate the other quality management practices you conform to in your department (You are not limited to one answer).

Obedience to standards of pertinent agencies

Regularly provision of Staff training

Internal and external Customer Satisfaction

Proper project and work planning

Budgetary allocation

Involvement of Suppliers

Continuous improvement (Learning and innovation)

Procedure for resources management at site during construction

Others (please specify).....

SECTION C**Challenges and measures for implementing successful quality management practices in local government civil engineering departments for the projects**

30. These are some of the challenges encountered by local government construction departments in implementation of quality management practices for projects in Tanzania. (not limited to one answer), (Tick your choice)

- Lack of progress review meetings
- Lack of proper Risk assessment
- Lack of proper understanding of contract documents (works specification)
- Lack of top-management commitment/understanding
- Lack of effective communication
- The transient nature of construction works
- High cost to implement quality management practices
- Lack or shortage of qualified professionals in the department
- Lack of adequacy of design
- Working with new employees most frequently
- Lack of proper site supervision

- Lack of appropriate equipment available for use
- Lack of employees commitment/understanding
- Lack or inadequate training programs
- Lack of proper scheduling
- Lack of quality materials

31. These are some measures for successful Quality management practices for the projects in local government construction departments. (not limited to one answer, tick your choice)

- Emphasis on proper Risk assessment
- Emphasis on mobilization of equipment's on site
- Emphasis on adequate employment of qualified professionals in the
department
- Proper detailed working schedule
- Emphasis on effective involvement of employees /workers in quality
issues
- Emphasis on adequate provision of training programs to the employees
/workers
- Emphasis on proper site supervision

- () Emphasis on incentives for good performance
- () Emphasis on effective communication between managements and employees /workers
- () Emphasis on regular site meetings of project participants
- () Emphasis on management commitment to quality issues and policies
- () Emphasis on proper sourcing and procedures for purchasing of materials
- () Emphasis on regular inspection and quality auditing of the project works
- () Emphasis on site safety

THANK YOU FOR SPENDING YOUR VALUABLE TIME TO COMPLETE THIS QUESTIONNAIRE

Note: All information provided in a questionnaire will be confidentially treated and will be used for academic purposes only.