ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
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ASSESSMENTS OF QUALITY MANAGEMENT PRACTICES IN READY MIX CONCRETE SUPPLIER:
The Case of Dugda Construction plc

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ASSESSMENTS OF QUALITY MANAGEMENT PRACTICES IN READY MIX CONCRETE SUPPLIER: The Case of Dugda Construction plc

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Advisor: Abebaw Kassie (PhD)

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By: Kalkidan Melesse

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DECLARATION

I, the undersigned, declare that this research paper entitled "Assessments of quality management practices in ready mix concrete supplier: The Case of Dugda Construction plc" is submitted to the Partial Fulfillment of Master of Art Degree in Project management (MA). And it is my original work, and this work has not been previously formed as the basis for the award of any academic Degree or Diploma Program in this or any other institution. Any materials borrowed from other sources, whether published or unpublished have been properly cited and acknowledged in accordance with appropriate academic conventions.

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This is to certify that this project work, "Assessments of quality management practices in ready mix concrete supplier: The Case of Dugda Construction plc" undertaken by Kalidan Melesse for the Partial fulfillment of the award of Master's degree in Project Management at St. Mary's university, is an original work and not submitted earlier for any degree either at this Company or any other Company.

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Abebaw Kassie (PhD)

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ABSTRACT

This study was mainly established with a general purpose to Assessments of quality management practices in ready-mix concrete supplier Dugda Construction plc. To achieve its objective, the study employed descriptive research and both primary and secondary data were used. Questionnaires, interview, and document review were, therefore, used as data collection tools. Furthermore, it employed purposive (judgmental) sampling techniques to draw its samples. The survey questionnaire was designed based on the literature and the information collected through the document review of the batching plant. The survey questionnaire was distributed to 57 employees related to quality who were selected purposively among them 48 respondents were responded, which represented a response rate of 84.21%. The generated data was presented using frequency, percentage, grand mean, correlation and multiple regression approaches. The result of the study indicated that Dugda construction plc does not employ all stages of quality management process, tools and techniques. Qualified and experiences personnel, poor communication with stakeholders, less quality of materials and equipment's used in the batching plant are identified as the top factors in the determinant of the quality management of ready mix concrete supplier. In the study it is examined that various quality assurance measures were taken starting from defining project objectives and to monitoring and the tasks that were carried out mostly in monthly and quarterly monitoring at specified level with management members involvement. It was also identified that some barriers of quality management; Ineffective communication, problem with raw materials shortage, Inadequate information and problem with more paper work were the major once. The study also recommended that Dugda construction plc have separate quality management policy in order to undertake complete quality management process, enhance management involvement, capacity building on quality management skills for successful quality management practices.

Key words: Quality, Quality management, Quality management process, top management commitment.

CHAPTER ONE

1 Introduction

1.1 Background of the Study

Quality is a universal phenomenon that has been a matter of great concern throughout recorded history. It was always the determination of builders and makers of products to ensure that their products meet the customer's desire. With the advent of globalization and the competitive market, the emphasis on quality management has increased. Quality has become the most important single factor for the survival and success of today's companies. Customer demands for better products and services at the lowest possible costs have put tremendous pressure on firms to improve the quality of products, services, and processes to compete in the market and improve business results. It became important that construction projects be more qualitative, competitive, and economical to meet owner's expectations (Rumane, 2011). In order to meet customer requirements, and do so on time and within budget, the project manager must incorporate sound quality management practices. He or she will be concerned with the quality of the following: The product/service/process that is the deliverable from the project, and the project management process itself (Wysocki, 2014).

The concept of quality management is to ensure efforts to achieve the required level of quality for the product/services which are well planned and organized. From the perspective of a construction company, quality management in construction projects should mean maintaining the quality of construction works at the required standard so as to obtain customers' satisfaction that would bring long term competitiveness and business survival for the companies (Abdul-Rahman, 2011). Quality management is critically required for a construction company to sustain in current construction market which is highly challenging and competitive. (Harris, 2001) Explained that quality management has to provide the environment within which related tools, techniques and procedures can be deployed effectively leading to operational success for a company. The role of quality management for a ready-mix concrete supplier is not an isolated activity, but intertwined with all the operational and managerial processes of the company. As for the implementation of quality management in project management, the concepts of quality planning (identification of quality standards), quality assurance (evaluation of overall project

performance) and quality control (monitoring of specific project results) in the quality management processes were defined by (PMI, 2008).

Concrete is a building material widely used in construction, while ready-mixed concrete (RMC) is the principal construction material for civil engineering infrastructure. Construction concrete produced under quality control guidelines constitutes about 70% of total concrete production. Since the properties of concrete are shaped from the moment of mixing in a process influenced by many factors, assessment of its quality (parameters) can be carried out at different times: during production, during delivery and before/after construction, and importantly, quality assessment can be performed by different participants of the investment process: the producer, the contractor, and the investor. Achieving the desired quality of concrete involves not only conformity assurance, but also appropriate design of concrete mix and selection of suitable ingredients, proper manufacturing, and development of innovative research methods that aid concrete design aimed at obtaining appropriate properties and durability and development of methods for analyzing obtained assessment results both during production and in existing constructions. (Chin-Keng, 2011)

Different researches show that, the construction industry in all developing countries should improve. Many writers state that governments are responsible for the construction industry development, however, (Anosike, 2011) argues that not only government but also construction enterprises and practitioners can contribute to efforts to improve the industry. He suggested two improvement areas; one is the need of continual reviewing of building regulations and standards drafted in the form of technical aids rather than restrictive rules and in a language appropriate to the educational background of the majority of the users. The other is the need of construction enterprises to improve their productivity, efficiency, quality of work and innovation as corporate objectives, and set up appropriate organizational structures to achieve them. Since Ethiopia is one of the developing countries in the world with the fastest growth rate, improvements in the quality of the construction industry is mandatory.

The construction industry in Ethiopia is boosting in high growth rate due to the need for infrastructures and other business sectors in the country. It contributes about 24.82% of the Country's GDP as reported on 2019. Though there is a high growth rate in the construction

industry of Ethiopia, most of mega projects are executed with foreign contractors due to lack of enough skilled professionals and inexperienced workmanship.

Concrete production in Ethiopia is not that much automated. Most of the building projects exist throughout the country uses cast in situ concrete for building structures but currently ready mixed concrete production and suppliers are emerging in urban areas of the country in significant amount. The production process of cast in situ concrete is accomplished on site manually. Every production processes are usually done through unqualified laborers. Even most constructors are not fully equipped and well organized. Therefore, with all those reasons the quality of concrete and overall buildings quality may greatly varies from project to project. Therefore, this paper tries to assess quality management practices in ready mix concrete supplier: the case of Dugda Construction.

1.2 Statement of the Problem

Project quality management involves both quality assurance (planning to meet quality requirements) and quality control (steps taken to control results to see if they conform to requirements). Quality can be defined as the level of conformance of the final deliverable to the customer's requirements. One cause of usual project failure is that quality is overlooked or scarified, so that a tight deadline can be met. It is very helpful to complete a project on time, only to discover that the thing delivered will not work properly (PMI, 2008).

From the perspective of a construction company, quality management in construction projects should mean maintaining the quality of construction works at the required standard so as to obtain customers' satisfaction that would bring long term competitiveness and business survival for the companies (Abdul-Rahman, 2011). Quality management is critically required for a construction company to sustain in current construction market which is highly challenging and competitive. It is accomplished through an integrated effort between all levels of a company to increase customers' satisfaction by continuously improving current performance (Biggar, 1990). In order to control quality management in construction projects several tools and techniques were identified as part of the implementation process, including, benefit/cost analysis, benchmarking, design of experiments, cost of quality, quality audits, inspection, control charts, praetor diagrams, statistical sampling, flow-charting and trend analysis (Abdul-Rahman, 2011).

There are studies made on project management in general and quality management in particular in the Ethiopian context. These studies also focused on general project management related, some of them are; Birhanu in his study identified that lack of effective supervision, communication, management of commitment, proper equipment's and materials available for use, quality assurance team lead the process, staff turnover, skilled turnover, Inefficient resource management and problems with contractors are some of the challenges he identified to the attainment of project quality (Birhanu, 2014). Furthermore, Temesgen on his study identified three major problems related to unsuccessful projects and that contribute to failures of projects in Ethiopia public sectors; the first is resource problem that includes shortage of adequately trained and skilled human, financial and material resources. Second involves, management problems such as weak sharing of responsibility during planning, weak follow-up, poor coordination and third, technical problems which include loose linkages with sectoral policy and strategy, weak technical skill and poor project design are some of the identified problems (Temesgen, 2007).

According to the researcher assessment and findings from different organizational project documents the main problems of quality management practice in Dugda construction plc are: there is no quality management guidelines, policy's, processes, tools and techniques and standards, there is a problem of experts about quality, lack of top management commitment, employee turnover, lack of expert laboratory technician, communication gap between top management and their subordinates', no one takes accountability and responsibility about individual duties, bureaucracy, and material shortage due to inflation etc. Therefore, based on what has been done in different contexts, Ethiopia and practical problems observed in the ready-mix concrete supplier Dugda construction plc which is that indicated above, this study aims to assess project quality management practices, top management commitment, and quality management implementation problems with special focus on ready mix concrete. In ready mix concrete suppliers, it is usual problem that the quality of concrete is less than the expected one. This problem needs proper quality assurance and quality control.

Only few researches were conducted that are relevant to project management in general specially to quality management but this research is conducted in detail and incorporating

various project based about ready mix concrete supplier there is no any study in Ethiopia so this makes it different.

1.3 Basic Research Question

The study tried to answer the following specific research questions:

1. How quality management is practiced in relation to quality management process in terms of quality planning, quality assurance and quality control in ready mix concrete supplier?
2. What is the quality management processes in terms of quality planning, quality assurance and quality control, tools and techniques commonly applied?
3. To what extent the management of Construction Company is perceived as committed towards quality management implementation?

1.4 Objective of the Study

The study has the following general and specific objectives.

1.4.1 General objective:

To study the current practice of successful quality management practices on selected ready-mix supplier and give recommendation with respect to quality management with the outcome of the paper.

1.4.2 Specific objectives:

1. Assess quality management practices in terms of Quality Planning, Quality Assurance, Quality Control, Top Management Commitment and Quality Management Tools and Technique to successful quality management practices in ready mix concrete supplier of Dugda Construction plc.
2. To determine the practical difficulties in adopting the quality system and to follow the best management practice.
3. To assess the level of commitment of top management towards the implementation of quality management in Dugda Construction plc.

1.5 Significance of the Study

Successfully managed and implemented qualified projects play a key role in the improvement human Safety, contribute to improved productivity, and increase sustainability. Project management in general and quality management in particular, is at its infant stage of development as a profession especially in Ethiopia. This research also aims to add to the existing literature and findings for other similar related projects to improve quality problems through successful implementation and management of projects. Therefore, this research work will contribute to the development of the disciple and adds to the project management body of knowledge by providing additional experiences of the organization.

The study findings also are relevant input to the management of the case company-Dugda construction plc in identifying the existing strength and weakness of quality management practices of Ready-mix concrete supplier in order to apply the existing projects and to similar suppliers in the future.

Likewise, other development projects can also use the result of the work to improve the quality related problems in Ready mix concrete supplier. Moreover, it is believed to provide insight to development policy makers, development program/project designers, donors and nongovernmental organizations. Furthermore, it may serve as a starting point towards further studies in the area at regional and national levels.

1.6 Scope of the Study

This study was limited to quality management practices in terms of quality planning, quality assurance, quality control, top management commitment and quality management tools and technique and problems of ready-mix concrete suppliers limited to Dugda construction plc. Generally, the study was limited to examining the nature of quality management in the Quality management process in terms of quality planning, quality assurance and quality control, tools and techniques, top management commitment, and challenges to implement quality management in Dugda construction plc. This study was also limited to batching plant managers, clients and testing agencies, only assessed due to limited personal and financial capacity, and shortage of time.

1.7 Limitation of the Study

The lack of time is one of the biggest limitation and challenging of this study and the inability of the researcher to study the whole population or a majority of it. Due to the size of the study population, only a sample of the population was studied; and the findings there of was used to generalize the conclusions of the study to the whole population. The results were therefore be largely generalized. If the study was allocated more time and more resources, then it was prudent to carry out the research on both batching plant. Respondents to devote their time to provide the relevant information was seriously limited the outcome of the research. This limitation was mitigated against by ensuring that all sectors that the project deal in were well represented. The researcher also make certain that all the relevant data were collected within the available time.

1.8 Organization of the Study

The study was organized into five chapters. The first chapter presents introduction of the study. It includes background of the study and the organization, statement of the problem, objectives, significance, scope and limitation of the research. Chapter two covers the review of related literature. Research design and methodology was given in chapter three. Chapter four was about Data presentation, analysis and discussions. The last chapter deals with conclusion and recommendations.

CHAPTER TWO

2 Review of Related Literature

2.1 Introduction

This chapter will focus on different literature reviews available on quality management practices for ready mix concrete that will take from different journals, articles, thesis papers and books. Therefore, this chapter mainly focuses on the quality of those concrete in relation to physical and chemical as well as workmanship that intensively affect the quality of concrete.

2.2 Theoretical Literature Review

2.2.1 Quality and project quality management

2.2.1.1 Overview of Quality

Quality is defined as the totality of features and characteristics of a product for service that bears on its ability to satisfy the projects functional requirements. The quality of output is always agreed upon between the supplier and the client (in case of construction project works, usually the contractor and the employer, represent the supplier and client, respectively), and the quality objective is to achieve zero defects with best quality of the project works. This is possible only by ensuring quality control at every stage of the construction process. Quality is conformity to standards and requirements to achieve excellence (PMI .. , 2004).

According to Shen Quality as satisfying or exceeding customers' requirements and expectations, and consequently to some extent it is the customer who eventually judges the quality of a product (Shen, 2000). Moreover, Crosby who is one of the major contributors to quality improvements has four components of absolute quality these are; conformance to requirements, prevention, and performance standard is "zero defects" and measured by the cost of nonconformance. Furthermore, the Kodak definition of quality is those products and services that are perceived to meet or exceed the needs and expectations of the customer at a cost that represents outstanding value.

The scope triangle clearly illustrate variables of the project and there interdependence. Similarly PMI illustrates project quality through the concept of the triple constraint project scope, time

and cost. Project quality is affected by balancing these three interrelated factors. "The relationship among these factors is such that if any one of the three factors changes, at least one other factor is likely to be affected" (PMI, 2008). The following scope triangle clearly illustrate variables of the project and there interdependence.

Figure 1-1: Triple triangle or Iron triangle

Source: (Wysocki, 2014)

2.2.1.2 Project Quality Management

According to Crawford the overall aim of quality management is to satisfy the customer, conform to requirements, ensure fitness for purpose, and to ensure the product for use. Project model looks at quality management as set of activities or tasks that are required to ensure the project satisfies all the needs for which it was undertaken based on documented in the state of work and includes a focus on quality management from the perspective of product, processes, and the people needed to make quality an effective and efficient aspect of successful project completion (Crawford, 2002).

Moreover, Wysocki in his effective project management book states that: A sound quality management programs with processes in place that monitor the work in a project is a good investment. It is not only contributing to customer satisfaction but also it helps organizations use their resources more effectively and efficiently by reducing waste and rework. He further described "Quality management is one area that should not be compromised. The payoff is a higher probability of successfully completing the project and satisfying the customer" (Wysocki, 2014).

PMBOK Guide explains that “Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives and responsibilities so that the project will satisfy the needs for which it was undertaken. It implements the quality management system through policy and procedures with continuous process improvement activities conducted throughout, as appropriate” (PMI, 2008).

Furthermore, the PMI's PMBOK states that project quality management include:

- To identify all the quality standards relevant for the project and plan how to satisfy them,
- To evaluate the project to ensure that the relevant quality standards will be met, to monitor,
- To compare with the relevant quality standards, and to correct the product and the processes.

2.2.2 Types of Concrete

Concrete is a composite material composed of coarse granular material (the aggregate or filler) embedded in hard matrix of material (the cement of binder) that fills the space between the aggregate particles and glue them together (Sydney, 2013). The binder or matrix is a combination of cement and water; it is commonly called the "cement paste. Aggregates are essentially filler materials that can be separated into fine and coarse aggregates. In addition to aggregates and binders, there is another material called additive which may be used in concrete to improve certain of its properties (ABEBE, 2005). The production of concrete involves two distinct but equally important activities. One is related to material required for concrete production such as selection and proportioning of ingredients and the other is the process involved in its production such as batching, mixing, transporting, placement, compaction and curing (Sydney, 2013).To produce concrete as economically as possible with appropriate workability, strength and durability care has to be taken during concrete production because poor quality of concrete even from well-designed mix can be happen due to lack of attention in production (Sydney, 2013). A good and a bad concrete may be made from exactly the same ingredients if there is a difference on the quality control during production. The importance of

quality of concrete is being increasingly realized to derive the optimum benefit from the materials employed.

The construction industry uses two main types, which are called ready-mix concrete and site-mixed concrete. Selecting the right type for a project is very important: both types have their own specifications, advantages and disadvantages. While both types are viable in concrete construction, one may be more beneficial than the other depending on project conditions. (Flori, 2020).

Site-mixed concrete is volumetric concrete that is prepared at the construction site, as its name implies. Concrete components are mixed in specific ratios to obtain the desired strength. This method requires using formulas to determine the number of materials and steps to obtain the desired consistency. Workers must be careful and meticulous with the material's proportions to avoid any quality issues in the concrete. (Flori, 2020)

Ready-mix concrete is manufactured in a plant and delivered to the construction site in an unhardened and plastic state, ready for use. Ready-mix concrete is sold by volume, usually expressed in cubic meters.

Ready-mix concrete tends to be better for many projects, in spite of its higher cost. Ready-mix concrete offers a higher quality, and variation between batches is minimal when concrete is prepared in a plant environment. Another key factor is the project's location: transportation requirements partially determine which type of concrete is more suitable for a project. (Flori, 2020)

Ready Mixed Concrete (RMC) is delivered to the worksite, often in transit mixers capable of mixing the ingredients of the concrete just before the delivery of a batch. This results in a precise mixture, allowing specialty concrete mixtures to be developed and implemented on construction sites. The second option available is to mix the concrete at the batching plant and deliver the mixed concrete to the site in an agitator truck, which keeps the mixed concrete in correct form. In the case of the centrally mixed type, the drum carrying the concrete revolves slowly so as to prevent the mixed concrete from "segregation" and prevent its stiffening due to initial set. However, in the case of the truck-mixed concrete, the batched materials (sand, gravel

and cement) are carried and water was added just at the time of mixing. The use of the Ready Mixed Concrete (RMC) is facilitated through a truck-mounted 'boom placer' that can pump the product for ready use at multistoried construction sites. Ready Mixed Concrete (RMC) is preferred to onsite concrete mixing because of the precision of the mixture and reduced work site confusion. It facilitates speedy construction through programmed delivery at the site and mechanized operation with consequent economy. It also decreases labor, site supervising cost and project time, resulting in savings. It assures consistent quality through accurate computerized control of aggregates and water as per mix designs. It minimizes cement wastage due to bulk handling and there is no dust problem and therefore, pollution-free. (Ashish, 2013)

2.2.3 Need of Innovative Ready Mixed Concrete Selection Model

To understand current practice of Ready Mixed Concrete selection, a survey was carried out on selected Ready Mixed Concrete plants in Central Gujarat region of India. The purpose of the survey was to study the methodology and derive the relation between the various criteria for enhancing the utilization of Ready Mixed Concrete. Figure 2-1 given below shows the present approach used by construction companies in selection of best Ready Mixed Concrete. (International Journal of Engineering Trends and Technology (IJETT) , 2013).

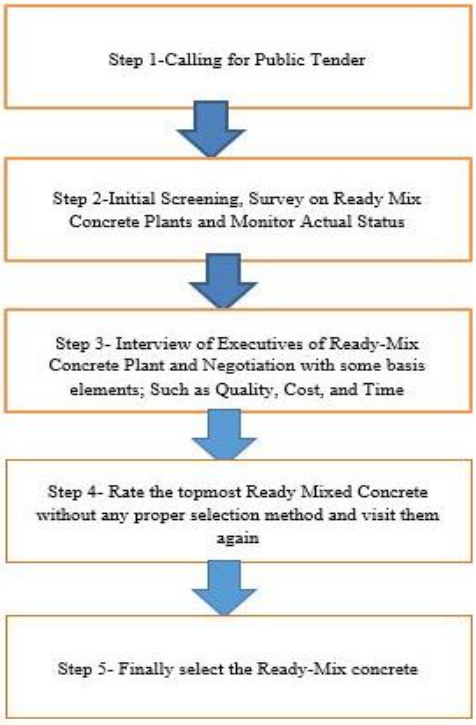

Figure 2-2: The present approach in selection of best Ready Mixed Concrete

Source: (International Journal of Engineering Trends and Technology (IJETT) , 2013)

From the study of current Ready Mixed Concrete selection approach, it is felt that stakeholders require support of scientific and mathematical technique. The present approach of Ready Mixed Concrete selection has following shortcomings:

- Need huge initial investment.
- Not affordable for small projects (small quantity of concrete).
- Needs effective transportation system from Ready Mixed Concrete plant to site.
- Traffic jam or failure of the vehicle creates a problem if the proper dose of retarder is not given.
- Labors should be ready on site to cast the concrete in position to vibrate it and compact it.
- Double handling, this results in additional cost and losses in weight, requirement of go downs for storage of cement and large area at site for storage of raw materials.
- Aggregates get mixed and impurities creep in because of wind, weather and mishandling at the site.
- Improper mixing at the site, as there is ineffective control and intangible cost associated with unorganized preparation at site are other drawbacks of RMC.
- There are always possibilities of manipulation; manual error and mischief as concreting are done at the mercy of gangs, who manipulate the concrete mixes and water cement ratio.

2.2.4 Total Quality management in construction project

The concept of Total quality management (TQM) movement started in Jan pan during the 1950s.In 1980's it became increasingly popular in the United States and Europe as a result of the success of Japanese firms in global market. Since the 1990's, quality management becoming one of the main and accepted issues in many organizations (Jackson, 2009).

Total quality management (TQM) is often defined as a complete management philosophy that permeates every aspect of a company and place quality as a strategic issue. It is accomplished through an integrated effort between all levels of a company to increase customers' satisfaction by continuously improving current performance (Biggar, 1990).

TQM is generally considered to be a higher-level concept of strategic achievement than that provided by quality management system.

ISO certification is nowadays a trend in most industries including construction industry. The five clauses for its implementation are quality management system, management responsibility, resource management, product realization, and measurement, analysis, and improvement. The application of ISO standards has received much attention from researchers. (Love, 2000) Commented that ISO 9000 certification is not an option but rather a reality for construction companies that wish to retain and sustain their competitiveness in today's highly competitive markets. (Liu, 2003) Stated that it is indicative that ISO 9000 has an impact on the contractors' attitude towards quality.

2.2.5 Quality of Concrete

Quality means excellence. It is thus a philosophy rather than a mere feature. The difference between two objects is judged by their qualities. We set some standards those can determine the level of acceptability. In most industries especially in manufacturing and processing, the concept of quality control is old and used extensively. Nowadays, application of quality control is not only becoming popular but also mandatory in construction industry. Just knowing some quality control methods or procedures will not do any good. We must have to adopt and implement the quality control methods and tools that are available to us. The concept and its practice must be tuned in harmoniously. Quality control in construction activities guides the implementation of correct structural design, specifications and proper materials ensuring that the quality of workmanship by the contractor /sub-contractor is achieved. (Chin-Keng, 2011)

Quality concrete is that which is capable of meeting the requirements of the job in terms of strength, durability and appearance. Strength is often the major feature in defining the quality because strength is both easy to define and to measure. Therefore, in many cases, strength is the unique measurement of concrete quality (Gupta, 2004). A quality concrete is that one who fits to its purpose. This means the product must meet or exceed the customer requirements and this needs improvement of concrete production. Quality improvement refers to product improvement, process improvement and people-based improvement. Process improvement relates to a series of action directed towards a specific aim of quality production of concrete.

People based improvement refers to the employment of personnel with adequate skill, knowledge and experience needed for accuracy and performance improvement of in-situ concrete (PMI .. , 2004) (Anosike, 2011). Concrete is a variable material, and to meet the requirements described or its intended quality, its production, handling, compaction, finishing, and curing procedures must be controlled, as well as its ingredients. Quality of concrete can only be obtained by skilled supervisors and well-trained workers who understand the science of concrete. Hence, the workmanship of concreting operations is therefore supreme in maintaining the required concrete quality. The specifications should also contain sufficient information on the workmanship requirements as well as on Proposed Quality Management plan for concreting works in materials to maintain satisfactory supervision. A good level of supervision helps to improve the standard of workmanship on the site (Turner, 1996).

2.2.6 Factors Affecting Quality

(Lepartobiko, 2012) Stated that quality can be assured by identifying and eliminating the factors that cause poor project performance. (Turner, 1996) On his part described good quality in the context of projects and programs as being to meet the customer requirement, meet the specifications, solve the problem, fit the purpose and satisfy the customer in this case the community who are served by the project. Most of the scholars agree that project quality in construction sector is affected by various internal and external factors.

2.2.7 Factors affecting quality of concrete

In view of the different processes involved in the manufacture of concrete, the problems of quality control are diversified and their solution elaborated. The factors involved are the personnel, the materials and equipment, the workmanship in all stages of concreting, i.e. batching of materials, mixing, transportation, placing, compaction, curing, and finally testing and inspection. It is therefore necessary to analyze the different factors causing variations in the quality and the manner in which they can be controlled. (Chin-Keng, 2011)

2.2.8 Project Quality Management Process Flow

The project quality management process includes three basic stages which help in improving quality production. The first is quality planning and refers to identifying which quality standards are relevant to the project and determining how to satisfy them. The second is performing

quality assurance; this stage helps in applying the planned, systematic quality activities to ensure that the project employs all processes needed to meet requirements. The third and final stage is performing quality control which greatly helps in monitoring specific project results to determine whether they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance. Hence, applying these three quality management processes in concrete production greatly helps to enhance the quality of concrete produced at site. (PMI .. , 2004).

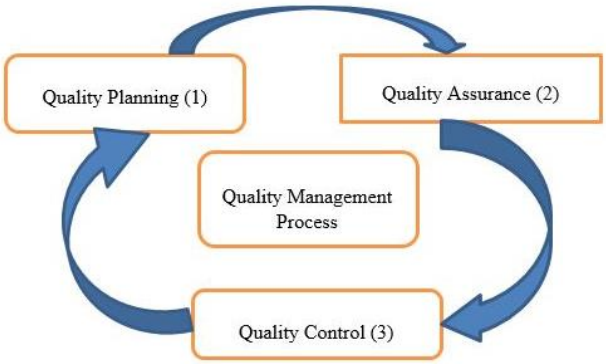

Figure 2-3 : Quality management process

Source: Quality management for delivering sustainable construction projects in South African rural areas: the construction project manager's perspective.

2.2.8.1 Quality Planning

The first step in quality management is to define quality which is under taken by the project manager and the team to identify what quality standards will be in the project from perspectives of key stakeholders of the project depending upon the area of specialization of the projects.

Identifying the quality standards that are relevant to the project and determining how to meet them. It is one of the Key facilitating processes during the project planning. Quality planning is usually involved during preparation phase, Design phase, and pre-construction phase. Quality planning should be performed regularly and parallel with the other project planning processes.

According to (Jackson, 2009), the guidelines to ensure the quality in planning are: (i) Ensure that all relevant parties involved including consultants, subcontractors and suppliers are included in the task of quality planning for the project; (ii) Establish and define the purpose of the quality system; (iii) minimize the effort required to amend copies of documents; (iv) Set up

a quality system development team so that the team can produce an effective plan; (v) Ensure that throughout the quality planning task constantly focused on the customer requirements. (Jackson, 2009). (Harris, 2001) Defined quality planning as a set of activities whose purpose is to define quality system policies, objectives, and requirements, and to explain how these policies will be applied, how these objectives will be achieved, and how these requirements will be met. Subsequent to this definition, (George, 2003) stressed that quality plan is different from a test plan. The study continued that quality plan defines the quality goals, is realistic about where defects come from, selects appropriate detection and prevention methods, and has means not to "go dark". The Project Management Book of Knowledge "PMBOK" also addressed quality planning from a different position to enhance the thoughts earlier expressed. It said that quality planning has a process input generated by predecessor processes referred to as the Project Scope Statement and Project Management Plan. These processes are introduced by external units like Enterprise Environmental Factors and Organizational Process Assets. PMBOK for further defined quality planning as the process for "identifying which quality standards are relevant to a project and determining how to satisfy them": In other words, it means planning how to fulfill process and product (deliverable) quality requirements: "Quality is the degree to which a set of inherent characteristics fulfill requirements". By planning the quality one has to respect some principles, and these are:

Customer satisfaction comes first: Quality is defined by the requirements of the customer.

Prevention over inspection: It's better to avoid mistakes than to inspect the result and repair the defects.

Management responsibility: Costs of quality must be approved by the management.

Continuous improvement: Becoming better is an iteratively structured process.

2.2.8.2 Quality Assurance

(Harris, 2001) Defined quality assurance as a set of activities whose purpose is to demonstrate that an entity meets all quality requirements. Quality assurance activities are carried out in order to inspire the confidence of both customers and managers, confidence that all quality requirements are being met. Moreover, the main objective of quality assurance measures in information processes is to fulfill a required quality level (Harris, 2001). In general quality

assurance is a process to provide confirmation based on evidence to ensure to the donor, beneficiaries, organization management and other stakeholders that product meet needs, expectations, and other requirements. It assures the existence and effectiveness of process and procedures tools, and safeguards are in place to make sure that the expected levels of quality will be reached to produce quality outputs. Therefore, quality assurance occurs during the implementation phase of the project and includes the evaluation of the overall performance of the project on a regular basis to provide confidence that the project will satisfy the quality standards defined by the project.

2.2.8.3 Quality Control

The PMBOK refers to quality control as the technical aspect of quality management. Project team members who have specific technical expertise on the various aspects of the project play an active role in quality control. They set up the technical processes and procedures that ensure that each step of the project provides a quality output from design and development through implementation and maintenance. Each step's output must conform to the overall quality standards and quality plans, thus ensuring that quality is achieved (PMI, 2008).

According to (Liu, 2003) a good quality control system will; "Select what to control, set standards that provide the basis for decisions regarding possible corrective action, establish the measurement methods used, compare the actual results to the quality standards, act to bring nonconforming processes and material back to the standard based on the information collected, monitor and calibrate measuring devices and include detailed documentation for all processes" (Liu, 2003). Quality control is the use of techniques and activities that compare actual quality performance with goals and define appropriate action in response to a shortfall. It is the process that monitors specific project results to determine if they comply with relevant standards and identifies different approaches to eliminate the causes for the unsatisfactory performance. The goal of quality control is to improve quality and involves monitoring the project outputs to determine if they meet the quality standards or definitions based on the project stakeholder's expectations. Quality control also includes how the project performs in its efforts to manage scope, budget and schedule (PMI, 2008).

2.2.8.4 Quality Improvements

Quality improvement refers to the application of methods and tools to close the gap between current and expected levels of quality by understanding and addressing system deficiencies and strengths to improve, or in some cases, re-design project processes. A variety of quality improvement approaches exists, ranging from individual performance improvement to redesign of entire project processes. These approaches differ in terms of time, resources, and complexity, but share the four steps in quality improvement: identify, analyze, develop and test. In general, quality improvement is the systematic approach to the processes of work that looks to remove waste, loss, rework, frustration, etc. in order to make the processes of work more effective, efficient, and appropriate.

According to (Huemann, 2004)who was the developer of control charts and the continuous cycle of process improvement which was popularized by Deming who was a disciple of huemann, popularized the Cycle as the Plan-Do-Check-Act (PDCA) cycle.

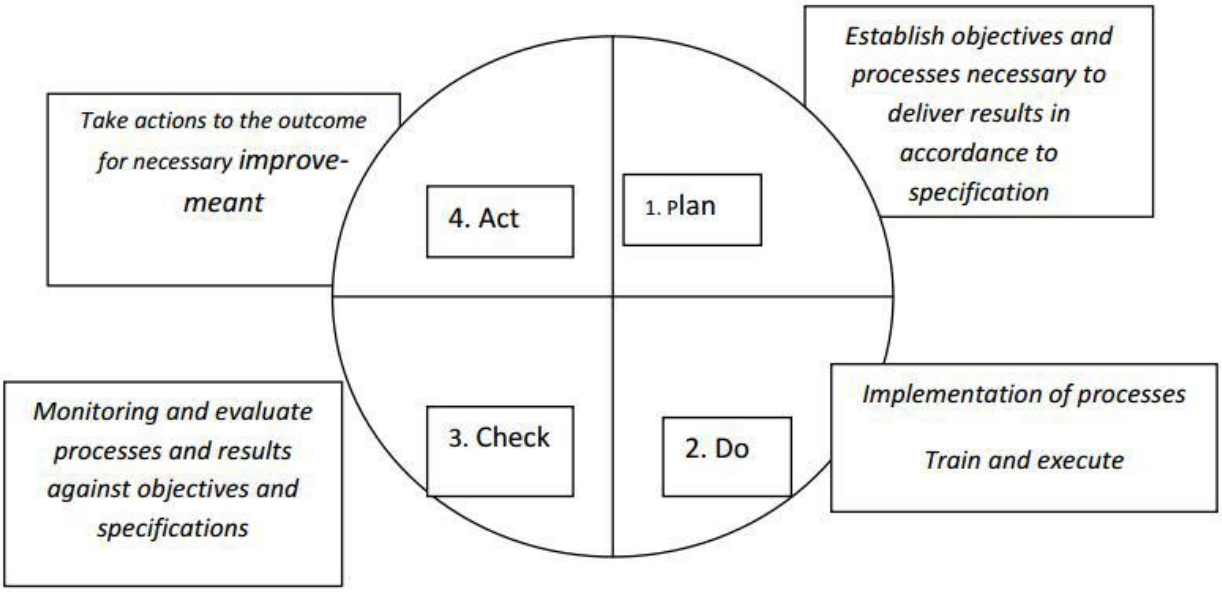

Figure 2-4 The Deming cycle for improvement

Source: (Huemann, 2004)

In general, different scholars put various approaches to Quality improvement. The most popular philosophers in quality management put different approach on quality improvements, among these the following are the steps by the famous quality scholars.

2.2.9 Quality Management Tools and Techniques

As for the implementation of quality management in project management, the concepts of quality planning (identification of quality standards), quality assurance (evaluation of overall project performance) and quality control (monitoring of specific project results) in the quality management processes were defined by (PMI .. , 2004). (Mathews, 2001) Divided quality tools and techniques that are in support of quality programs into three main types, i.e., hard quality tools, mixing methods and soft methods. Hard quality tools are formal quality systems, documented quality systems, quality costs, control charts, and statistical sampling standards. Mixing methods are strategy and action plans review, flexibility of organization structure, control charts, quality circles, and quality planning tools. Soft methods are training, customer satisfaction surveys, regular contact with vendors and external organizations, actions to optimize environment impact, empowerment, self-assessment, and benchmarking.

For the implementation of quality management in construction projects, where identification of quality standards, evaluation of overall project performance and quality control monitoring of specific project results in the quality management processes were defined by (PMI, 2008). Several tools and techniques were identified as part of the implementation process, like benefit-cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts, pareto diagrams, statistical sampling, flow-charting and trend analysis.

According to project management body of knowledge project quality management tools and techniques are: Check sheet, Histogram, flowcharting, Cause and Effect Diagrams, Run Chart, Pillar Diagram, Brainstorming, control charts, Pareto diagrams and Nominal Group Technique. Let me define each individual based on PMBOK.

Check Sheet: is a simple yet powerful tool for collecting data.it is used to compile and record data from contemporaneous observations or historical data, noting more.

Histogram: is a type of bar graph that deals with data that exist in a continuous range from a low number to a high number. Histogram display frequency distribution, or how often

individual data points occur across the range of the data from low to high. Histograms summarize data in a form that is more easily understood than a table of collected numbers.

Flowcharting: which are also referred to as process maps because they display the sequence of steps and the branching possibilities that exist for a process that transforms one or more inputs into one or more outputs. Flowcharts show the activities, decision points, branching loops, parallel paths, and the overall order of processing by mapping the operational details of procedures.

Cause and Effect Diagrams: This diagram is sometimes called a "fishbone diagram" because of its shape and sometimes called an "Ishikawa diagram" in honor of its developer, Dr. Kaoru Ishikawa. It is used to identify, explore, and graphically display all possible causes related to a problem, including root causes.

Run chart: is used to observe process performance over time. It is a line graph with data that vary around a centerline, usually the mean. It is used for repeatable processes where performance is expected to be stable. A run chart will show defect trends, shifts, or cycles.

Pillar Diagrams: A pillar diagram is a combination of a cause-and-effect diagram and another quality tool, the interrelationship digraph. It addresses multiple problems and it shows relationships among a limited set of causes and results. An interrelationship digraph is used to determine relationships among all contributing elements of a system. The purpose of a pillar diagram is to identify root causes related to multiple results.

Brainstorming: is common quality tool that is much applied in the breach. That is, people think they are doing brainstorming, but they are really just having a discussion. True brainstorming is a formal process that may be applied in a structured or unstructured approach, as described below. The goal of either method is to generate a high volume of ideas creatively and efficiently, free of criticism and other chilling or disruptive influences.

Control charts: are used to determine whether or not a process is stable or has predictable performance. Upper and lower specification limits are based on requirements of the agreement. They reflect the maximum and minimum values allowed.

Pareto diagrams: a Pareto diagram is a histogram, ordered by frequency of occurrence that shows how many results were generated by type or category of identified cause. Rank ordering is used to guide corrective action the project team should take action to fix the problems that are causing the great number of defects first. Pareto diagrams are conceptually related to Pareto's law, which holds that a relatively small number of causes will typically produce large majority of the problems or defects. This is commonly referred to as the 80/20 principle, where 80% of the problems are due to 20% of the causes.

Nominal Group Technique: It is a disciplined process, not a haphazard approach, which allows the collection of input in a way that overcomes group bias or social influence by others. Nominal Group Technique works best when the number of ideas under consideration is about fifty or less. More than fifty ideas may be too many for team members to grasp at one time. Recall the corporate quality director who conducted the brainstorming session that generated seventeen ideas.

2.2.10 Management Commitment in Quality Management Implementation

From the literature of (Abdul-Rahman, 2011) concluded that senior managers' involvement, understanding and customer focus are essential antecedents of TQM success. (Samson, 1999) Described that leadership and human resources management are among strong predictors of performance TQM practices.

(Biggar, 1990) Recommended that management must fully understand and support the TQM process and actively participate in its implementation rather than delegate it. One of the issues arises in discussing the management commitment is the conceptualization of the term.

In addition to the above, ISO requires the following in relation to management commitment: Communicating about the importance of meeting customer as well as statutory and regulatory requirements; Establishing the quality policy; Ensuring that quality objectives are established; Conducting management reviews; Ensuring the availability of resources.

2.2.11 Problems in Quality Management Implementation

According to (Abdul-Rahman, 2011) literatures certain problems have been observed in relation to quality management implementation. (Huemann, 2004) noticed several hindrances for

implementing TQM on construction sites, i.e., too much paperwork, transient nature of workforce, field employees regard TQM as irrelevant, difficulty in measuring results, low bid subcontracting, and subcontractors and suppliers not interested in TQM. (Huemann, 2004) Found that the most difficult task in implementing ISO 9001 in engineering consultancies in Hong Kong is to make engineers understand and accept the system, followed by the lack of strong support from the management, and lack of effective communication. Based on interview conducted in Sweden, (Liu, 2003) argued that in construction process, many of the concepts in ISO 9001 are experienced as being too abstract and too difficult to comprehend. He also argued that it appears difficult for a company to improve its competitiveness and be more efficient by the use of ISO 9001 alone in view of the many stages of the construction process encompassed and the diverging interests represented.

(Chin-Keng, 2011) Noticed concerns in the areas of bureaucracy, cost, time consumption and interpretation in relation to the implementation of ISO 9000 standards in United Kingdom (UK) construction industry. (Crawford, 2002) stated that the three most significant negative outcomes encountered by contractors on ISO 9000 certification are, more paperwork, more time spent in management, and increase of bureaucracy. (Abdul-Rahman, 2011) Observed several shortcomings related to the quality management implementation in UK, i.e., QA and QM are not implemented on a full scale, the degree of commitment is different between top management and site employees, and quality management was limited to the construction stage only. (George, 2003) Found that most contractors in Singapore consider human-related problems are most critical in implementing quality assurance (QA).

2.3 Empirical Review of Literature

The empirical literature provides empirical evidences of quality management practices in ready mix concrete suppliers. Additionally, at the end of this section the conceptual framework of this study is presented.

Quality Management has increasingly been adopted by ready mix concrete supplier companies as an initiative to solve quality problems and to meet the needs of the final customer. Accordingly, this section is concerned with other studies conducted on other area in similar discipline. The first study selected for the empirical review is “Study of Quality Management to

continuous improvements in process of Ready-Mix Concrete production" in Poland. This research explores preliminarily the practices of quality management, management commitment in quality management, and quality management implementation problems in construction projects in the context of Poland construction industry. The other study conducted by (Karthik, 2018) in their study on factors involved in equipment quality and management in ready mix concrete in India, identified four major factors that most important determinants in general ready-mix concrete; Experience and qualification of personnel, quality of materials and equipment, conformance to specification and quality assurance training and meetings (Karthik, 2018). In addition, as Joy stated in his study on factors influencing quality of construction projects, the major factors that affect quality; material, labor, financial issues, conformance to codes and standards, top management support, management factors, selection of contractor, selection of designer design, co - operation of parties, contract documents and lack of communication (Joy, 2014).

Further as stated by (Agbenyega, 2014) in his study in quality management practices of construction firms in Ghana, in solving the potential barriers are the main measures to be taken, namely: management commitment, communication between managers and employees, employee involvement, detailed and logical work program, regular inspection, quality audit report, lack of training and education of team members and review and analysis (Agbenyega, 2014). Birhanu in his study identified that lack of effective supervision, communication, management of commitment, proper equipment and materials available for use, quality assurance team lead the process, staff turnover, skilled turnover, Inefficient resource management and problems with contractors are some of the challenges he identified to the attainment of project quality (Birhanu, 2014). Furthermore, Temesgen on his study identified three major problems related to unsuccessful projects and that contribute to failures of projects in Ethiopia public sectors; the first is resource problem that includes shortage of adequately trained and skilled human, financial and material resources. Second involves, management problems such as weak sharing of responsibility during planning, weak follow-up, poor coordination and third, technical problems which include loose linkages with sectoral policy and strategy, weak technical skill and poor project design are some of the identified problems (Temesgen, 2007). The problems identified by different researchers are almost similar even though there is variation due to their practical context of the projects. Accordingly, these

variables are also considered in the researcher study to consider in the context of the Ready-Mix Concrete Suppliers.

2.4 Conceptual Framework of the study

The conceptual framework of the study is first assessing the Parameters of Project quality management process tools and techniques, top management commitment from the perspective of Leadership and participation, Allocation of resources, and then followed by examination of major areas of project quality factors and management problems. The following figure shows the details of the conceptual framework:

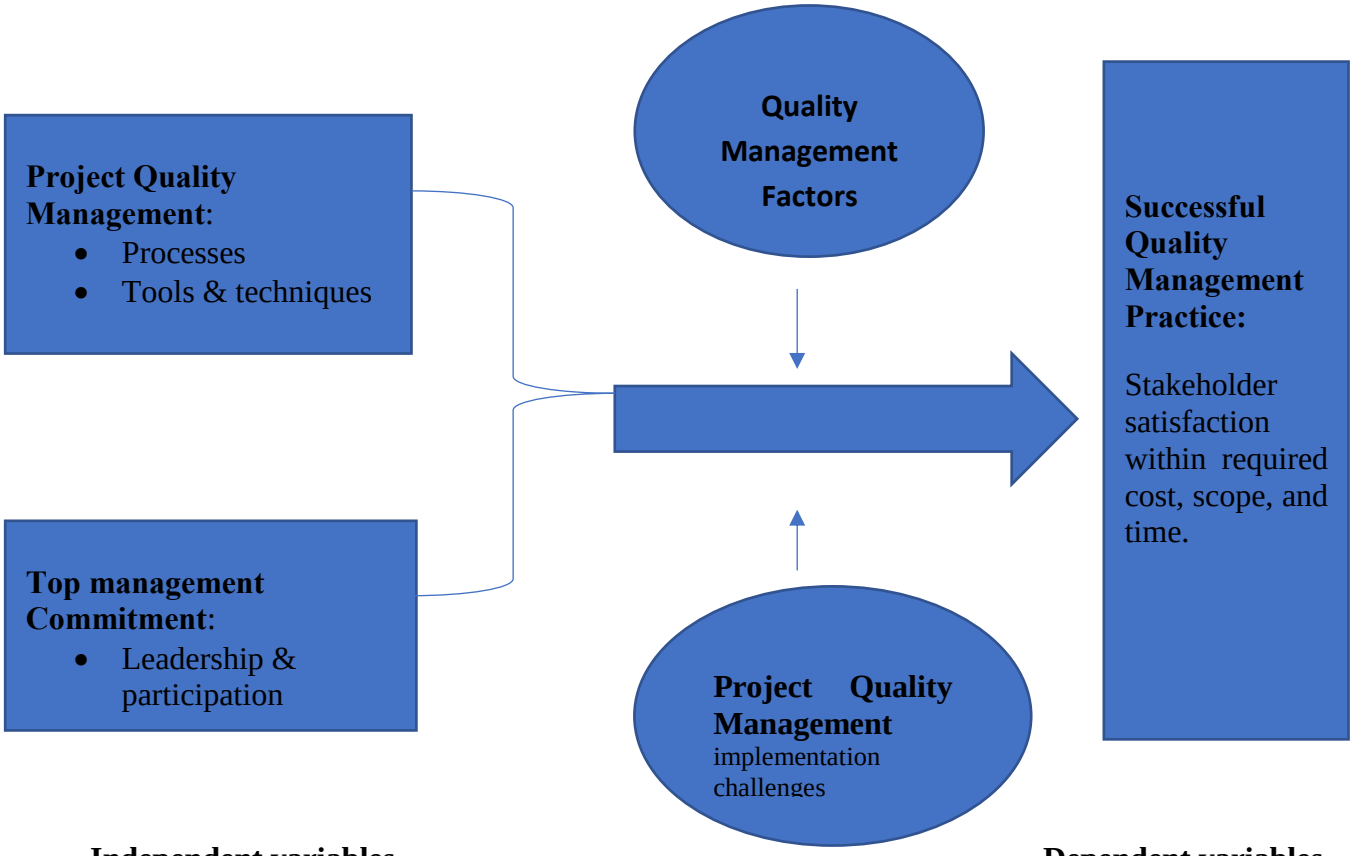

Figure 2-5: Conceptual framework

Source: own developed

CHAPTER THREE

3 Research Design and Methodology

3.1 Introduction

This part aims at elaborating the methodological process that was used, it outlines how the research was conduct based on the objective of the study. It explains the research design, sampling techniques and sample size determination, data sources, data collection tools used and validity and reliability test; describe how data collected from the research were analyzed.

3.2 Research Approach Design

In this study descriptive research method was used that makes use of quantitative data since the method enables to easily be an instrument to analyze, tabulate the frequency and percentage, correlation, and use multiple regressions. The study adopts mixed research approach both qualitative and quantitative. According to (Mark, 2009), mixing qualitative and quantitative approaches gives the potential to cover each method's weaknesses with strengthens from the other method. While explaining the collected data use the visual aids such as tables was used so as to make the reader understand the data.

3.3 Target Population and Sample Size

The term population refers to the aggregate or totally of all the objects, subjects or members that conform to a set of specifications. In quantitative studies, the researcher identifies the population to be studied during the planning phase. A smaller population can be studied more extensively at a fixed cost than a larger population, so it is important to decide what population is really of critical importance. For the successful quality management almost all member of the organization is Responsible since they are involved directly or indirectly in the process. But due to limited time the sample was limited to some of the employees, testing agencies and clients.

Sampling is the process of selecting representative units of construction parties for the research in research investigation. The advantage of using sample is that it is more practical and less costly than collecting data from the whole construction parties.

There are a lot of employees in Dugda construction plc but due to the above mentioned the optimum size of 57 samples of respondents was taken from large population in the organization in order to manage the study. The questioners were distributed, and interview was conducted with concerned participants of batching plant which was clients and testing agencies.

3.4 Sampling Techniques

To select the respondents for the questionnaire and interview, a purposive (judgmental) sampling technique was employed. This sampling method was chosen for it allows the researcher to focus on a limited number of informants that were selected from different department employees to get the required information to carry out the study in order to get optimal insight. In this study Batching plant was take as unit of analysis. The respondents were selected based on their experience, information and area of work they have about project quality management implementation and management challenges in Dugda construction plc.

3.5 Types and Sources of Data

The study used both primary and secondary data. To obtain sufficient and relevant data that helps to answer the research questions and achieve research objectives, both qualitative and quantitative data was collect from different primary and secondary sources. The primary sources of data were employees (professionals) on Dugda construction plc.

Apart from primary data, secondary data were also exploit to conduct the study. Documents review and analysis of secondary data from various sources were used as useful source of information for the study. Relevant books, text books, journals, organization past and current written documents on the relevant issues were used to get qualitative data for assessments of quality management practices in selected ready mix concrete supplier. Moreover, available organizational documents such as structure, company profile, plans and reports were also review.

3.6 Data Collection Tools/Instruments

The survey method was chosen by the researcher because of its popularity as a means of gathering much data in cost-effective way (Jackson, 2009). Therefore, semi-structured interview was administrated as survey instruments to some of the Client and Testing Agency to

get qualitative data and questionnaires were administrated as survey instruments to some of the Employee to get quantitative data. The main tools used to gather the primary data from the primary sources mainly include questionnaire and experiences of the researcher to get primary data for specific objectives and interview guides to get primary data for general objectives. Regarding the questionnaire; primary data was collect using self-administered semi-structure questionnaire composed of close ended and open-ended questions. Regarding the interview; primary data was collect using self-administered semi-structure question composed of open-ended questions. The source of questionnaire was the literature and other information collected through the document review of the company.

3.7 Procedures of Data Collection

In order to collect relevant data for the purpose of this study major instruments were applied. Accordingly, the researcher has chosen these methods assuming that this is cost and time effective, data were analyzed and reduces biases since similar questions will distribute to each respondent. Secondly, interviews are considered as chosen instrument. The methodology for the work consists of quality management process, tools and techniques, management commitment, and challenges to implement quality management. Questionnaires should be prepared considering quality aspects and problems of ready-mix concrete supplier and the interviews of client and testing agency was conduct since the responses contributes to the understanding of current quality management practices and problems of ready-mix concrete supplier encountered.

The first phase of data collection was the establishment of the study framework which includes the survey and secondary data. The survey framework includes the identification of all relevant documentation and formulation of questions for the interviews and questioners. The second phase introduces about the quality management practice in Ready mix concrete suppliers, and also introduces the steps that respondents want to fill before distributing to the total target. And the final version of questioner distributed to respondents and finally collected the data. Likewise, interview was used in gather more of in-depth qualitative data from the clients and testing agencies.

3.8 Methods of Data Analysis

After collecting all required data using the above-mentioned instruments from the identified sources, quantitative method of data analyses was applied. The data obtained from the questionnaire respondents used to assess the quality management practices and problems was analyzed using SPSS (Version 20).

3.9 Validity and Reliability of Instruments

3.9.1 Validity

The researcher checked the validity of questioners developed for this study. Before distributing the final questionnaires to the respondents, it was be checked and commented by friends and project personnel and the advisor of the researcher and pilots done to check the valid. The final version of the questioners was distributed after incorporating all the comments and feedbacks obtained from different professionals.

3.9.2 Reliability

Reliability analysis was carried out six parts for internal consistency with regard to respondent's data on project quality management rating using Cronbach's alpha and in principle Cronbach's alpha of 0.7 is acceptable for internal consistency of data obtained from respondents. Therefore, Cronbach's alpha for all variables is shown below.

Table 3-1: *Summary of Reliability Statistics*

No.	Dimension	Number of items	Cronbach's Alpah
1	Quality Planning	11	0.879
2	Quality Assurance	4	0.842
3	Quality Control	4	0.771
4	Quality Management Commitment	5	0.794
5	Quality Management Commitment Problems	16	0.735
6	Quality Management Commitment Tools	10	0.706

Source: Own Survey Result, 2021

(George, 2003) Provide the following rules of thumb for the Cronbach's alpha reliability coefficient: "_ >0.9 – Excellent, _ >0.8 – Good, _ >0.7 – Acceptable, _>0.6 – Questionable, _ >0.5 – Poor, and _ <0.5 – Unacceptable". Therefore, the reliability is checked based on the data process on SPSS.

3.10 Ethical Consideration

The researcher got an authorization from the target company (Dugda Construction PLC) and a supporting letter received from St. Mary's University. All information obtained in this research was strictly used for academic purposes and respondents was assured of the confidentially of information given were necessary.

CHAPTER FOUR

4 DATA PRESENTATION, ANALYSIS AND DISCUSION

4.1 Introduction

This chapter presents the result of the analysis and discusses that the data collected to answer the research questions and the derived objectives that the study was set to achieve. The result of the survey was discussed by triangulating the different source results: questionnaire results, interview and document review results.

4.2 Results

For the purpose of clarifying the methods that the researcher analysis and discussions: Quantitative data was analyzed by employing descriptive statistics using statistical package for social science (SPSS) version 20. The quantitative data was analyzed by the use of content analysis Descriptive statistics such as measures of central tendency and dispersion along with frequencies, and percentages were used to organize and summarize numerical data whose results will be presented in tables and charts for easy interpretation of the findings.

4.3 Response Rate

A total of 57 questionnaires were distributed to various respondents of interest for the study. Out of the covered population, 48 were responsive representing a response rate of 84.21%. The other 9 questionnaires as follows: 4(7.02%) are rejected due to illogical and incomplete answers, 5(8.77%) have not been received. Therefore, 48 questionnaires were used in the analysis.

This was in line with (Jackson, 2009) that a response rate above 50% contributes towards gathering of sufficient data that could be generalized to represent the opinions of respondents about the study problem in the target population**.**

4.4 ANALYSIS OF RESULTS AND DISCUSSION

4.4.1 General Information of Respondents

4.4.1.1 Gender Composition

The demographic statistics shown in the figure below show the distribution of respondents by gender. Participants were asked to indicate their gender by selecting the appropriate option provided (male or female).

The sex distribution of Questionnaires participants were identified in order to see who involved more in the Successful Quality Management works of the ready mix concrete supplier. The finding indicates that the majority of the respondents were male 36(75%) and female respondents were only 12(25%). This clearly implies that the sample population was more dominated by male respondents than female in the Successful Quality Management activities of the work in the batching plant.

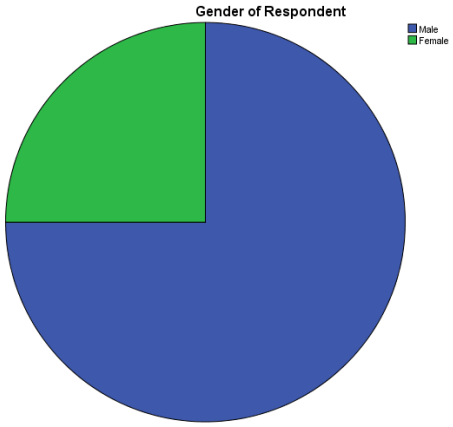

Chart 4-1: Gender Distribution of Respondents

Source: Own Survey Result, 2021

4.4.1.2 Educational Background

From the analysis on educational background of the respondents, it was found that only 2 respondents (4.2%) have graduate masters and above, 0 respondents (0%) have College Diploma, 16 respondents (33.3%) have TVET Certificate, the rest 30 respondents (62.5%) are undergraduate degree. This profile shows that majority of the respondents have undergraduate degree or first-degree level.

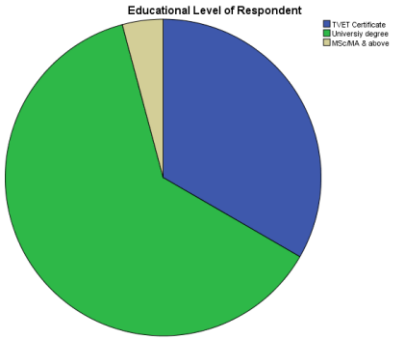

Chart 4-2: Educational Level of Respondents

Source: Own Survey Result, 2021

4.4.1.3 Work Division

Positions that respondents currently hold in the organizations are grouped into three major categories as manager, Laboratory technician, and Engineers. Accordingly, 2 (4.2%) hold manager position, 16 (33.3%) respondents hold position of Laboratory technician and 30 (62.5%) were engineers.

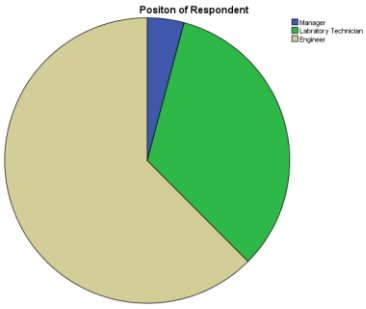

Chart 4-3: Position of Respondents

Source: Own Survey Result, 2021

4.4.1.4 Work Experience

The study chose to consider respondent's level of experience in the project area, which is vital towards knowledge of project management. 7 (14.6%) of them have 1year and less of experiences 11(22.9%) of the respondents have 1- 5 years' work experiences, 12(25.0%) have between 5-10 years, and only 18(37.5%) of them have 10years and above of experiences. This profile shows that more experienced employee does have in the organization.

This profile shows that more experienced employee does have in the organization.

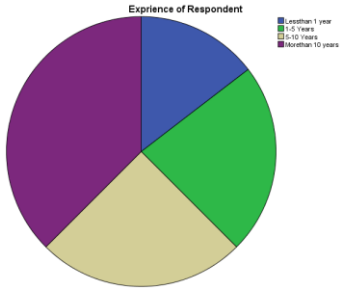

Chart 4-4: Experience of Respondents

4.4.1.5 Quality control training experience

The study chose to consider respondent's training experience in the project quality area.30 (62.5%) of them have taken quality control procedure training. 12(25%) of them have taken quality control procedure training to some extent.6 (12.5%) of them have not taken quality control procedure training at all.

As this indicates the majority of the respondents, are take quality control training.

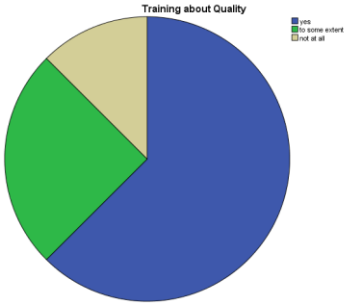

Chart 4-5: Quality control training experience of Respondents

Source: Own Survey Result, 2021

4.4.2 Quality Planning

Table 4-1: *Descriptive Statistics and Frequencies of quality planning*

	Strongly Dis-agree	**Dis-agree**	**Neutral**	**Agree**	**Strongly agree**	**Mean**
Brief description of Each project	2(4.2)	16(33.3)	13(27.1)	14(29.2)	3(6.3)	3.0000
Project quality objectives	1(2.1)	19(39.6)	14(29.2)	13(27.1)	1(2.1)	2.8750
Responsibilities and authorities of project staff	3(6.3)	19(39.6)	17(35.4)	9(18.8)	0(0)	2.6667
availability of testing laboratory	0(0)	19(39.6)	16(33.3)	13(27.1)	0(0)	2.8750
list(s) of materials and appliances used for the ready-mix concrete, showing the verification requirement of each	1(2.1)	13(27.1)	19(39.6)	13(27.1)	2(4.2)	3.0417
Inspection and test plans, or list thereof	1(2.1)	19(39.6)	18(37.5)	10(20.8)	0(0)	2.7708
list of quality procedures and work instructions applicable to project by making reference to the company's Quality Manual	2(4.2)	18(37.5)	14(29.2)	13(27.1)	1(2.1)	2.8542

and Procedures						
checklists, or target dates for their provision	2(4.2)	17(35.4)	17(35.4)	12(25)	0(0)	2.8125
list of quality records to be kept	3(6.3)	21(43.8)	14(29.2)	10(20.8)	0(0)	2.6458
frequency (or provisional dates if possible) of internal quality audits	1(2.1)	21(43.8)	17(35.4)	9(18.8)	0(0)	2.7083
Frequency of updating the quality plan	0(0)	21(43.8)	15(31.3)	12(25)	0(0)	2.8125
Grand Mean						2.8239

Source: Own Survey Result, 2021

The data in table 4-1 show the descriptive statistics of the questionnaire questions on quality planning. As the mean value indicates most participants have a neutral opinion about Quality Planning. It has a mean value of 3.0417, this indicates most employees are neutral in the list(s) of materials and appliances used for the ready-mix concrete, showing the verification requirement of each Inspection and test plans, or list thereof regularly. The second item with the highest mean value is regarding to Brief description of each project throughout the Dugda Construction plc. It has a mean score of 3.0000. This shows the majority of respondent's didn't believe that there is Brief description of each project. We can summarize from these two items that the employees feel there is no a quality plan. The item with the lowest mean score recorded is for the list of quality records to be kept frequency (or provisional dates if possible) of internal quality audits. With a mean score of 2.6458 it shows that employees little bit disagrees.

The overall mean indicates that the employees disagree with quality planning. It has mean score of 2.8239. It shows employees believe the available testing laboratory is not enough at the batching plant and also list of quality records aren't kept in the office.

Most of the result shows that the respondents had disagree with quality planning processes. According to (Harris, 2001) defined quality planning as a set of activities whose purpose is to define quality system policies, objectives, and requirements, and to explain how these policies will be applied, how these objectives will be achieved, and how these requirements will be met. And also, from project management body of knowledge quality planning means how to fulfill process and product (deliverable) quality requirements. Quality planning contains the standard variables for construction project as recommended by (George, 2003). So the result does not contain all planning process.

4.4.3 Quality Assurance

Table 4-2: *Descriptive Statistics and Frequencies of quality assurance*

	Strongly Dis-agree	**Dis-agree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**
Selects the appropriate quality management system requirements for each project.	2(4.2)	23(47.9)	15(31.3)	7(14.6)	1(2.1)	2.6250
Clearly specifies the quality management system requirements.	1(2.1)	19(39.6)	18(37.5)	8(16.7)	2(4.2)	2.8125
Evaluates and selects Laboratory technician on their ability to satisfy specified requirements.	1(2.1)	22(45.8)	16(33.3)	9(18.8)	0(0)	2.6875

Appropriate checking, measurement or testing of products and keeping proper records.	1(2.1)	20(41.7)	21(43.8)	6(12.5)	0(0)	2.6667
Grand Mean						2.6979

Source: Own Survey Result, 2021

The data in table 4-2 show the descriptive statistics of the survey questions on quality assurance. As the mean value indicates most participants have a negative opinion about clearly specifies the quality management system requirements in Quality Assurance. It has a mean value of 2.8125; this indicates most employees disagree on Quality assurance. The item with the lowest mean score recorded is for Selects the appropriate quality management system requirements for each project. With a mean score of 2.6250 it shows that employees disagree that they use quality assurance.

The overall mean indicates that the employees disagree with quality assurance. It has mean score of 2.6979. This shows appropriate checking, measurement or testing of products and keeping proper records hasn't been done in the batching plant and also employees believes there isn't quality assurance.

This result shows most of the respondents had disagree on quality assurance. According to (Harris, 2001) defined quality assurance occurs during the implementation phase of the project and includes the evaluation of the overall performance of the project on a regular basis to provide confidence that the project will satisfy the quality standards defined by the project.

In addition, the interview conducted shows that the Dugda assure quality of material by taking sample at Laboratory technical group of three persons from different professions directly related to construction work before approval of the supply of materials at batching and cross check on delivery of the material on the batching whether is based on the specification of quality requirements. Therefore, they accept or reject the materials before starting the Ready mix. Moreover, on the process assuring quality of ready-mix concrete, technical teams and quality

engineers follows on the regular supervision on quarterly, regular monitoring on monthly basis visit to batching and on daily basis respectively. Furthermore, Dugda construction plc has five groups in order to follow the status of the projects by giving special attention for quality of projects with reference to contract agreements and the cross checks the projects reports prepared and presented by the responsible department from laboratory technician and administration on the batching. Based on the reports there is also regular quarterly joint monitoring by organizing review meeting at head office with all project stakeholders; to discuss and ways forward to improve quality related problems. This may indicate that the project management system is participatory.

4.4.4 Quality control

Table 4-3: *Descriptive Statistics and Frequencies of quality control*

	Strongly Dis-agree	**Dis-agree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**
Select what to control and set standards that provide the basis for decisions regarding possible corrective action.	2(4.2)	22(45.8)	16(33.3)	8(16.7)	0(0)	2.6250
Establish the measurement methods used, compare the actual results to the quality standards.	0(0)	21(43.8)	20(41.7)	6(12.5)	1(2.1)	2.7292
Act to bring nonconforming processes and material back to the standard based on the information collected.	2(4.2)	19(39.6)	16(33.3)	9(18.8)	2(4.2)	2.7917

Monitor and standardize measuring devices, include detailed documentation for all processes.	0(0)	22(45.8)	19(39.6)	5(10.4)	2(4.2)	2.7292
Grand Mean						**2.7188**

Source: Own Survey Result, 2021

The data in table 4-3 show the descriptive statistics of the survey questions on quality control. As the mean value indicates most participants have a negative opinion about Act to bring nonconforming processes and material back to the standard based on the information collected in quality control. It has a mean value of 2.7917; this indicates most employees disagree on Quality assurance. The item with the lowest mean score recorded is for Select what to control and set standards that provide the basis for decisions regarding possible corrective action. With a mean score of 2.6250 it shows that employees disagree that they use quality control.

The overall mean indicates that the employees disagree with quality control. It has mean score of 2.7188. This shows employees believes for successful quality management quality control is important but they disagree there is quality control in the batching plant.

This result shows most of the respondents had disagree on quality control processes. According to Chang, 1999 defined, a good quality control system should have to consider Quality control processes. Since, the organization does not consider project quality control processes.

4.4.5 Top management commitment

Table 4-4: *Descriptive Statistics and Frequencies of Top management commitment*

	Strongly Dis-agree	**Dis-agree**	**Neutral**	**Agree**	**Strongly agree**	**Mean**

Communicate the importance of meeting customer requirements	9(18.75)	17(35.42)	6(12.5)	7(14.58)	9(18.75)	2.6875
Setting quality policies.	8(16.67)	12(25)	9(18.75)	9(18.75)	10(20.83)	2.4583
Conduct management reviews on project quality.	16(33.33)	11(22.92)	8(16.67)	9(18.75)	4(8.33)	2.4375
Seek to have more financial resources.	2(4.17)	0(0)	7(14.58)	18(37.5)	21(43.75)	2.5833
Seek to have more human resources.	5(10.42)	12(25)	10(20.83)	9(18.75)	12(25)	2.5208
Grand Mean						2.5429

Source: Own Survey Result, 2021

The data in table 4-4 show the descriptive statistics of the survey questions on top management commitment. As the mean value indicates most participants have a negative opinion about communicate the importance of meeting customer requirements in quality control. It has a mean value of 2.6875; this indicates most employees disagree on top management commitment. The item with the lowest mean score recorded is for Conduct management reviews on project quality with a mean score of 2.4375 it shows that employees disagree on top management commitment.

The overall mean indicates that the employees disagree with top management commitment. It has mean score of 2.5429. This shows the top management doesn't seek more financial and human resources for the batching plant for successful quality management.

This result shows most of the respondents had disagree on top management commitment. From the result of interview questions the top management had not regularly communicate with project concerned stakeholders and also top management had not conduct quality management reviews

4.4.6 Quality management implementation challenges

Table 4-5: *Descriptive Statistics and Frequencies of quality management implementation challenges*

	Strongly Dis-agree	**Dis-agree**	**Neutral**	**Agree**	**Strongly agree**	**Mean**
Inadequate management support	1(2.1)	2(4.2)	13(27.1)	18(37.5)	14(29.2)	3.8750
Unwillingness of project staff to accept the quality system	0(0)	6(12.5)	10(20.8)	25(52.1)	7(14.6)	3.6875
Difficulties in understanding the quality system	4(8.3)	2(4.2)	7(14.6)	24(50)	11(22.9)	3.7500
Problem with more paper works	0(0)	3(6.3)	10(20.8)	22(45.8)	13(27.1)	3.9375
Problem with documentation	2(4.2)	2(4.2)	7(14.6)	25(52.1)	12(25)	3.8125
Difficulties in measuring results	1(2.1)	5(10.4)	12(25)	19(39.6)	11(22.9)	3.7083
Problems with employee performance	2(4.2)	2(4.2)	5(10.4)	23(47.9)	16(33.3)	4.0208
Ineffective communication	0(0)	1(2.1)	10(20.8)	26(54.2)	11(22.9)	3.9792

Increase of cost	0(0)	0(0)	10(20.8)	25(52.1)	13(27.1)	4.0625
Increase of time	1(2.1)	2(4.2)	10(20.8)	25(52.1)	10(20.8)	3.8542
Inadequate information	0(0)	1(2.1)	11(22.9)	25(52.1)	11(22.9)	3.9583
Inadequate technical expertise/skills	0(0)	1(2.1)	16(33.3)	25(52.1)	6(12.5)	3.7500
Problem with Government bureaucracy	1(2.1)	3(6.3)	17(35.4)	20(41.7)	7(14.6)	3.6042
Problem with raw materials shortage due to inflation	0(0)	0(0)	14(29.2)	22(45.8)	12(25)	3.9583
Lack of standardized quality management guidelines	0(0)	4(8.3)	10(20.8)	20(41.7)	14(29.2)	3.9167
Employee turnover	0(0)	7(14.6)	13(27.1)	21(43.8)	7(14.6)	3.5833
Grand Mean						3.8411

Source: Own Survey Result, 2021

The data in table 4-5 show the descriptive statistics of the survey questions on management implementation challenges. As the mean value indicates most participants have a positive opinion about management implementation challenges. It has a mean value of 4.0625, this indicates most employees agree in the increase of cost. The second item with the highest mean value is regarding to problem with employee performance throughout the Dugda Construction plc. It has a mean score of 4.0208. This shows the majority of respondent's didn't believe that there is a good performance of the employees. We can summarize from these two items that the employees feel there is a problem in quality implementation. The item with the lowest mean score recorded is for the Employee turnover. With a mean score of 3.5833 it shows that employees agree.

The overall mean indicates that the employees agree with quality management implementation challenge. It has mean score of 3.8411. It shows there are problems in employee performance, ineffective communication and problems with government. So this means the respondents agree there are challenges that will affect the success of quality management.

This result shows most of the respondents had agree on quality management implementation challenges.

From the result of interview questions some of the respondent's responded as the main problem in the organization was a right of way. For this problem the main solution was integrated work with quality management consulting company. Most of the Authors from the literature were similar with those implementation challenges. According to (Flori, 2020) on his part described good quality in the context of projects and programs as being to meet the customer requirement, meet the specifications, solve the problem, fit the purpose and satisfy the customer in this case the community who are served by the project. For successful project quality implementation and management institutional as well as national quality management system guidelines should be needed, and accountability and responsibility of each individual for project and other related works should also be developed.

4.4.7 Quality management tools and techniques

Table 4-6: *Descriptive Statistics and Frequencies of quality management tools and techniques*

	Strongly Dis-agree	**Dis-agree**	**Neutral**	**Agree**	**Strongly agree**	**Mean**
Check Sheet	3(6.3)	20(41.7)	19(39.6)	6(12.5)	0(0)	2.5833
Histograms	2(4.2)	22(45.8)	20(41.7)	4(8.3)	0(0)	2.5417
Flowcharting	1(2.1)	24(50)	17(35.4)	5(10.4)	1(2.1)	2.6042
Cause and Effect Diagram	1(2.1)	23(47.9)	21(43.8)	3(6.3)	0(0)	2.5417
Run Chart	6(12.5)	19(39.6)	16(33.3)	7(14.6)	0(0)	2.5000
Pillar Diagram	1(2.1)	21(43.8)	19(39.6)	7(14.6)	0(0)	2.6667
Brainstorming	4(8.3)	23(47.9)	15(31.3)	6(12.5)	0(0)	2.4792
Control charts	1(2.1)	20(41.7)	24(50)	3(6.3)	0(0)	2.6042
Pareto diagrams	2(4.2)	24(50)	20(41.7)	2(4.2)	0(0)	2.4583
Nominal Group Technique	2(4.2)	25(52.1)	17(35.4)	2(4.2)	2(4.2)	2.5208
Grand Mean						2.5500

Source: Own Survey Result, 2021

The data in table 4-6 show the descriptive statistics of the survey questions on management tools and techniques. As the mean value indicates most participants have a negative opinion about management tools and techniques. It has a mean value of 2.667; this indicates most employees disagree in the Pillar Diagram. The second item with the highest mean value is regarding to flowcharting and control charts throughout the Dugda Construction plc. It has a mean score of 2.6042. This shows the majority of respondent's didn't believe that there is a worthy tools and technique of the employees. We can summarize from these three items that the employees feel there is no management tools and techniques. The item with the lowest mean score recorded is for the Pareto diagrams. With a mean score of 2.4583 it shows that employees agree.

The overall mean indicates that the employee's disagree with quality management tools and technique. It has mean score of 2.5500. It shows the respondents believe there aren't tools for quality management like check sheet, flow charting, pillar diagrams and control chats. So this will affect the success of quality management.

This result shows most of the respondents had disagree on quality management tools and techniques.

From the result of interview questions respondents had the tools and techniques used weekly and monthly reporting system by quality engineers as well as laboratory technician, and sometimes the organization had used inspection by the response of quality assurance department. According to PMBOK defined, project quality management tools and techniques was the very critical one for successful project implementation. Since, Dugda construction plc does not used proper tools and techniques.

4.5 Summary of Descriptive Statistics

Table 4-7: *Summary of Descriptive Statistics*

	N	Mean
Quality Planning	48	2.8239
Quality Assurance	48	2.6979
Quality Control	48	2.7188
Top management commitment	48	2.5375
Quality management technique	48	2.5500

Source: Own Survey Result, 2021

The data in table 4-7 show there was 48 respondents used in the study. The mean for the independent variable Quality Planning was 2.8239. The mean score for Quality Assurance was 2.6979, Quality Control had a mean score of 2.7188, Top Management Commitment had a mean score of 2.5375 and the last independent variable Tools and Technique had a mean score of 2.5550. This show among the five independent variables, Quality Planning and Quality Control are the strongest factors determining Successful Quality Management at Dugda Construction plc.

4.6 Correlation Analysis

Pearson correlation was used in the study to scrutinize the factors determining Successful Quality Management at Dugda Construction plc. Table 4-8 indicates the findings.

Table 4-8: Correlation Analysis

		Successful Quality Management	Quality Planning	Quality Assurance	Quality Control	Top Management Commitment	Quality Management Tools and Technique
Successful Quality Management	Pearson Correlation	1	.432**	.545**	.643**	.575**	.494**
	Sig. (2-tailed)		.002	.000	.000	.000	.000
	N	48	48	48	48	48	48
Quality Planning	Pearson Correlation	.432**	1	.245	.130	.160	.291*
	Sig. (2-tailed)	.002		.093	.380	.276	.044
	N	48	48	48	48	48	48
Quality Assurance	Pearson Correlation	.545**	.245	1	.292*	.182	.283
	Sig. (2-tailed)	.000	.093		.044	.216	.051
	N	48	48	48	48	48	48
Quality Control	Pearson Correlation	.643**	.130	.292*	1	.186	.112

	Sig. (2-tailed)	.000	.380	.044		.206	.448
	N	48	48	48	48	48	48
Top Management Commitment	Pearson Correlation	.575**	.160	.182	.186	1	.237
	Sig. (2-tailed)	.000	.276	.216	.206		.105
	N	48	48	48	48	48	48
Quality Management Tools and Technique	Pearson Correlation	.494**	.291*	.283	.112	.237	1
	Sig. (2-tailed)	.000	.044	.051	.448	.105	
	N	48	48	48	48	48	48

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

*. Correlation is significant at the 0.05 level (2-tailed).

As indicated in Table 4-8, a positive correlation was found between Quality Assurance and Quality Control as indicated by a correlation of 0.292. This implies that proper designing of Quality Assurance process significantly results to better Quality Control thus Successful Quality Management.

The findings show a positive significant correlation between Quality Planning and Quality Management Commitment tools and techniques with a correlation of 0.291. This infers that appropriate Quality Planning by taking into attention Quality Planning aspects.

The findings also show positive correlation of 0.283 between Quality Assurance and Quality Management Commitment tools and techniques. This implies that the more effective Quality Assurance is, the better the chances of Quality Management Commitment tools and techniques. Furthermore, the findings reveal a positive correlation between Quality Planning and Quality Assurance with a correlation of 0.245. This reveal indicates that comprehensive and relevant Quality Planning process can significantly influence the effectiveness of Quality Assurance. The findings show a positive significant correlation between Quality Management Commitment and Quality Management Commitment tools and techniques with a correlation of 0.237. This suggests that better Quality Management Commitment in accordance with the goal and objectives of the organization results to Successful Quality Management.

4.7 Regression Analysis

The study used regression analysis to measure the strength of association between Quality Management Tools and Technique, Quality Control, Top Management Commitment, Quality Planning, Quality Assurance. The Table below shows the findings.

Table 4-9: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.909[a]	.827	.806	.21452

a. Predictors: (Constant), Quality Management Tools and Technique, Quality Control, Top Management Commitment, Quality Planning, Quality Assurance

From the Table given above, the R square is given as 0. 806 which is an indication that predictor

variables (Quality Management Tools and Technique, Quality Control, Top Management Commitment, Quality Planning, Quality Assurance) explicate 82.7% of Successful Quality Management leaving 17.3 percent unexplained.

Table 4-10: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.231	5	1.846	40.118	.000[b]
	Residual	1.933	42	.046		
	Total	11.164	47			

a. Dependent Variable: Successful Quality Management

b. Predictors: (Constant), Quality Management Tools and Technique, Quality Control, Top Management Commitment, Quality Planning, Quality Assurance

From Table 4-10 above, the significant value (P=0.000) show that there was a strong significant relationship between the independent variables (Quality Management Tools and Technique, Quality Control, Top Management Commitment, Quality Planning, Quality Assurance) and dependent variable (Successful Quality Management). The P- value of 0.000 which is less than 0.05 denotes that the model of Project Implementation is significant at the 5 percent significance level.

Table 4-11: Coefficients Distribution

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.267	.322		-.828	.413
	Quality Planning	.203	.074	.189	2.753	.009
	Quality Assurance	.188	.057	.233	3.301	.002
	Quality Control	.368	.055	.457	6.729	.000
	Top Management Commitment	.249	.046	.362	5.368	.000
	Quality Management Tools and Technique	.296	.088	.236	3.369	.002

a. Dependent Variable: Successful Quality Management

From the regression model:

$Y = \alpha 0 + \alpha 1X1 + \alpha 2X2 + \alpha 3X3 + \alpha 4\ X4 + \varepsilon$

Where: Y= Successful Project Quality Management Practices

X1 = Quality Planning

X2 = Quality Assurance

X3 = Quality Control

X4= Top Management Commitment

X5 = Quality Management Tools and Techniques

ε = error term

The regression equation is presented below.

$$Y = -0.267 + 0.203\ X1 + 0.188\ X2 + 0.368\ X3 + 0.249\ X4 + 0.296\ X5$$

The equation above concluded that Successful Project Quality Management Practices was extremely swayed by Quality Management Tools and Technique, Quality Control, Top Management Commitment, Quality Planning and Quality Assurance. Given all the predictor variables constant at zero (0), Successful Project Quality Management Practices will be -0.267.

The regression coefficient for Quality Planning is 0.203. This shows that the relationship between Quality Planning and Successful Project Quality Management is positive. This suggests that better and efficient Quality Planning enhances Successful Project Quality Management practices positively and vice versa.

The regression coefficient for Quality Assurance is 0.188. This means that the relationship between Quality Assurance and Successful Project Quality Management is positive. This indicates comprehensive Quality Assurance led to improvement in the Successful Project Quality Management practices and vice versa.

The regression coefficient for Quality Control is 0.368. This means that the relationship between Quality Control and Successful Project Quality Management is positive. This indicates comprehensive Quality Control led to improvement in the Successful Project Quality Management practices and vice versa.

The study found a positive relationship between Top Management Commitment and Successful Project Quality Management having a regression coefficient of 0.249. This shows that having Top Management Commitment influences the Successful Project Quality Management positively and vice versa.

The study found a positive relationship between Quality Management Tools and Technique and Successful Project Quality Management having a regression coefficient of 0.296. This shows that having Quality Management Tools and Technique influences the Successful Project Quality Management positively and vice versa.

CHAPTER 5

5 CONCLUSION & RECOMMENDATION

5.1 Introduction

This chapter has three sections. The first section presents summary of major findings, the second section presents conclusion of the study derived from findings and the last section deals with recommendation that were made on basis of the findings.

5.2 Summary of the Finding

Based on the results of the study carried out the major summary of finding of the study shows that:

✓ Dugda Construction plc has no written quality policy but they use the project agreement as standards and guidelines in addition to other government checklist for follow up project. Most of the activities identified as quality plan content on the guiding of other literature project quality document are in one way or another included in their project work and contract documents but there is no separate quality planning for construction projects.

✓ The overall quality planning process lacks preparing with direct participation of the implementers starting from planning phases their involvement is mostly at implementation, follow up and the controlling.

✓ Respondents were confirmed that Check sheet, Pillar diagram, Flowcharting and Control chart is the major quality management tools and technique respectively.

✓ Increase of cost, employee performance and inadequate information ranked 1st, 2nd, and 3rd respectively are estimated the three most challenges examined in the determinant of the quality of batching plant works.

✓ Clearly specifies the quality management system requirements and Evaluates and selects Laboratory technician on their ability to satisfy specified requirements are the major variables affect quality assurance of the project.

✓ As most of the respondents argue that quality of the projects at organizational level seems not improved therefore it is one of the areas of improvement for the organization.

In general there is no separate quality management policy in the organization unlike in the literature most studies recommend that to have separate quality policy in the organization which

help as guiding to undertake the whole process of quality management. But the organization put it as part of the project contract agreement document by specifying the required quality requirements every project.

5.3 Conclusion

The study assessed the quality management practices of ready-mix concrete supplier Dugda construction plc at ready mix concrete plant with the general objective of the research is to study the current practice of quality management practices. On the basis of the major findings of the study and as discussed in detail in the literature review part of this study, Successful Quality management enhances the chance of successfully completing works within time, cost and quality constraints. Quality management also helps to achieve project constraints such as within customer satisfaction, and meeting the organizational goal of the project.

Quality management is one of the nine core knowledge areas that quality managers should be familiar and for the successful management of projects the organization has to undergo the quality management process. It involves estimating the planning process, quality assurance process, quality controlling process based on the organizational quality procedure.

Quality Management practices remain important for achieving effective quality performance in ready mix concrete plant to achieve social and economic developments. The quality management process is partially undergoing with limitations of considering all the steps and parameters fully under consideration since Dugda Construction PLC has no the guiding for designing quality management at organizational level. Therefore, the quality management process lacks standardization as per the literature on the process quality management.

Moreover, the Successful quality management is challenged by various factors mainly; increase of cost, problem with employee performance, inadequate information, Problem with raw materials shortage due to inflation in dugda construction plc.

Additionally, regular and periodic ready mix concrete plant supervision and inspection were the most important measure to improve quality management of ready-mix suppliers. The next important measure is implementing a comprehensive quality control mechanism starting from the planning phase and continuing into the end of implementation phases.

Therefore, it may be concluded that, undertaking complete quality management process by developing quality management policy at organizational level helps to improve the quality management related problems listed and working on the factors that affect quality management of ready-mix suppliers.

5.4 Recommendations

Based on the findings of study it is recommended that Dugda Construction Plc considers the following areas of improvement in management of its work in ready mix concrete plants in general and quality management in particular.

- Dugda Construction Plc should build capacity of ready-mix concrete plant staff on quality management to use qualified and experienced staffs to follow up the use of good quality of materials and equipment to ensure the work conformances to specification and standard requirements.

- According to different scholars, planning is the first stage of any activity. Since, as observed in the result most of the planning process do not apply in the organization. This indicated that the system does not organize with quality management. So, the organization should follow quality planning process in order to prevent any defect.

- The planning process needs improvements to make it participatory since the knowledge of the quality team varies on the quality tools and techniques used in quality management to properly follow the works, they undertake in Dugda Construction Plc.

- Quality Assurance authority should give attention to appropriate quality management system requirements and the authority should appropriate checking, measurement or testing of products and keeping proper records.

- The organization should also focus on management body of knowledge areas in order to minimize the ready-mix concrete supply challenges, and should assign at least two quality manager professionals at the organizational level.

- Top management should work on identifying the gaps which require their strong support and strengthen the quality focused activities since their guidance is decisive for the success of the quality in ready mix concrete supplier plant.

- Quality management of ready-mix concrete supplier plant requires stakeholder's collaboration from laboratory technicians, engineers and managers sides on the basis on their respective roles and responsibilities defined. Therefore, the organization should strongly work on to build partnership/collaboration with its stakeholders.

- Currently, there is no quality management policy document in the organization, the organization is considering project agreement document as reference/basis for quality management, but there should be defined quality policy since there are many projects undertaken by the sector to improve the customer satisfaction.

Therefore, the organization can make use of the results of this study to identify areas of improvements in order to manage its ready-mix concrete plant quality as per the standards of other literature which helps to manage the ready-mix concrete plant in a more effective and efficient manner.

5.5 Future Studies

The practice of quality project management based on the quality management skills and knowledge is in its early ages in Ethiopia and only few researches were conducted that are relevant to project management in general specially to quality management. Thus, future researches can be conducted in detail and incorporating various project based organizations to compare their project quality management practice and contribute to growth of the disciple.

Moreover, this study focused on the employee, client and testing agencies side of the dugda construction plc batching plant to assess the quality management practices related.

Other study can be done incorporating quality management challenges including contractors and beneficiaries.

6 References

Abdul-Rahman, T. C.-K. (2011). *Study of Quality Management in Construction Projects.*

ABEBE, E. (2005). *Concrete production and quality control in building construction industry of Ethiopia.*

Agbenyega. (2014). *quality management practices of construction firms in Ghana.*

Anosike, N. M. (2011). *Parameters for good site concrete production management practice In Nigeria* .

Ashish, P. j. (2013). An Approach for Ready Mixed Concrete Selection for Construction Companies through Analytic Hierarchy Process. *International Journal of Engineering Trends and Technology*.

Biggar, J. L. (1990). *Total quality management in construction.*

Birhanu, D. K. (2014). Quality management practice in Ethiopia. *Journal of Business management*.

Chin-Keng, T. (2011). *Study of quality management in construction projects.*

Crawford, J. K. (2002). *Project management maturity model: Providing a proven path to project management excellence.*

Flori, M. (2020). *Comparing ready mix concrete and site mixed concrete.*

George, D. &. (2003). *SPSS for Windows step by step: answers to selected exercises.*

Gupta, B. a. (2004). *Concrete Technology.*

Harris, F. M. (2001). *Modern Construction Management,.*

Huemann, M. (2004). *Improving Quality in Projects and Programs.*

International Journal of Engineering Trends and Technology (IJETT) . (2013).

Jackson, B. (2009). *Construction Management.*

Joy. (2014). *factors influencing quality of construction projects.*

Karthik, S. K. (2018). *factors involved in equipment quality and management in ready mix concrete.*

Lepartobiko, W. (2012). *Factors that influence success in large construction projects.*

Liu, A. M. (2003). *The quest for quality in public housing projects: a behaviour-to-outcome paradigm.*

Love, P. E. (2000). *Total quality management and the learning organization: a dialogue for change in construction.*

Mark, S. P. (2009). *Research methods for business students.*

Mathews, B. P. (2001). European quality management practices: The impact of national culture. . *International Journal of Quality & Reliability Management.*

PMI. (2008). *A Guide to the Project Management Body of Knowledge* .

PMI, .. (2004). *A Guide to the Project Management Body of Knowledge.*

Rumane, A. R. (2011). *Quality Management in Construction Projects.*

Samson, D. &. (1999). The relationship between total quality management practices and operational performance. *Journal of operations management*.

Shen, X. X. (2000). An integrated approach to innovative product development using Kano's model and QFD. *European journal of innovation management*.

Sydney, F. a. (2013). *Concrete,Pearson Education.*

Temesgen, W. (2007). *Managing the Project Cycle: A Challenge for the Ethiopian Public.*

Turner, J. R. (1996). International Project Management Association global qualification, certification and accreditation. *International Journal of Project Management*.

Wysocki, R. (2014). *Effective complex project management: An adaptive agile framework for delivering business value.*

APPENDICES

Appendix I: Questionnaire

Questionnaires for Employee

Dear respondent,

Thank you for taking your precious time to respond for this questionnaire.

The questionnaires are a research instrument for fulfillment of my MSc thesis.

My research topic title is “Assessments of quality management practices in selected ready mix concrete supplier: A case of Dugda Construction plc.”

The questionnaires listed below are attempted to respond the quality control for concrete materials in selected ready mix concrete supplier. Hence, your responses are highly valuable to finalize my thesis.

Therefore, the information that you provide will be used purely for academic purposes and will be kept strictly confidential. You do not need to write your name or personal related issues. Finally, I would like to thank you very much for your cooperation and sparing your valuable time for my request. Please tick one box below to show how much you agree or disagree with the given questions.

With regards,

Kalkidan Melesse

Part One: General Information of the respondents

1.1 Gender

A) Male B) Female

1.2 What is the highest level of education you have completed?

A) TVET Certificate B) College Diploma

C) University Degree D) MSC/MA & Above

1.3 You are currently working as employee of

A) Manager B) Laboratory technician C) Engineer

1.4 How long have you been working in construction project?

A) Less than 1 year B) 1 -5 years

C) 5- 10 years D) More than 10 years

1.5 Did you have taken concrete quality control procedure training in your organization?

A) Yes B) to some extent C) Not at all

Part II. This sub-section covers questions related to quality management process, tools and techniques, top management commitment, and problems encountered in Dugda construction plc.

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

Quality planning

1. Does your quality plan contain the following?

I. No.	Description	1	2	3	4	5
1	Brief description of Each project					
2	Project quality objectives					
3	Responsibilities and authorities of project staff					

4	availability of testing laboratory					
5	list(s) of materials and appliances used for the ready-mix concrete, showing the verification requirement of each					
6	Inspection and test plans, or list thereof					
7	list of quality procedures and work instructions applicable to project by making reference to the company's Quality Manual and Procedures					
8	checklists, or target dates for their provision					
9	list of quality records to be kept					
10	frequency (or provisional dates if possible) of internal quality audits					
11	Frequency of updating the quality plan					

Quality Assurance

1. Do you consider the following factors in your quality assurance mechanism?

I. No.	Description	1	2	3	4	5
1	Selects the appropriate quality management system requirements for each project.					
2	Clearly specifies the quality management system requirements.					
3	Evaluates and selects Laboratory technician on their ability to satisfy specified requirements.					
4	Appropriate checking, measurement or testing of products and keeping proper records.					

Quality control

1. Do you consider the following factors in your quality control mechanism?

I. No.	Description	1	2	3	4	5
1	Select what to control and set standards that provide the basis for decisions regarding possible corrective action.					
2	Establish the measurement methods used, compare the actual results to the quality standards.					
3	Act to bring nonconforming processes and material back to the standard based on the information collected.					
4	Monitor and standardize measuring devices, include detailed documentation for all processes.					

Top Management Commitment to Quality Management

I. No.	Description	1	2	3	4	5
1	Communicate the importance of meeting customer requirements					
2	Setting quality policies.					
3	Conduct management reviews on project quality.					
4	Seek to have more financial resources.					
5	Seek to have more human resources.					

Quality Management Implementation Problems /challenges

I. No.	List of Quality Management Implementation Problems	1	2	3	4	5
1	Inadequate management support					
2	Unwillingness of project staff to accept the quality system					
3	Difficulties in understanding the quality system					
4	Problem with more paper works					

5	Problem with documentation					
6	Difficulties in measuring results					
7	Problems with employee performance					
8	Ineffective communication					
9	Increase of cost					
10	Increase of time					
11	Inadequate information					
12	Inadequate technical expertise/skills					
13	Problem with Government bureaucracy					
14	Problem with raw materials shortage due to inflation					
15	Lack of standardized quality management guidelines					
16	Employee turnover					

Quality Management Tools and Techniques Applied

I. No.	**The organization applied**: -	1	2	3	4	5
1	Check Sheet					
2	Histograms					
3	Flowcharting					
4	Cause and Effect Diagram					
5	Run Chart					
6	Pillar Diagram					
7	Brainstorming					
8	control charts					
9	Pareto diagrams					
10	Nominal Group Technique					
11	Any other Quality tools and techniques? Please mention: _____ _____ _____ _____ _____ _____					

Appendix II: Interview Questions

Interview Questionnaire for Client

Thank you for your cooperation and sparing your valuable time for this interview. The interview questions are a research instrument for the fulfillment of MSC program and study. Your responses will be completely anonymous and confidential and will not be identified by individual.

1. How project quality management is been practiced? Based on:

    a. Has formal quality management system (e.g., ISO 9000) been widely practiced?

    b. What are the quality management tools and techniques commonly applied?

2. Does the top management ever communicate to the subordinate of the importance of meeting customer requirements?
3. Is there quality management standardized guidelines?
4. Does the top management conduct management reviews on project quality?
5. What are the problems to implement project quality management in Dugda construction plc?
6. What do you think must be fulfilled for successful project quality implementation and management in general?
7. Do they have a quality manager separately? What are the major responsibilities? Or Do other departments participate on the preparation of the quality plan?
8. How and in what ways are project quality related issues communicated?
9. What precaution measures they take in batching concrete?
10. What precaution measures they take in concrete mixing?
11. What precaution and corrective measures they take in concrete transporting and placing?

Interview Questionnaire for Testing Agency

Thank you for your cooperation and sparing your valuable time for this interview. The interview questions are a research instrument for the fulfillment of MSC program and study. Your responses will be completely anonymous and confidential and will not be identified by individual.

1. How does Dugda Construction plc control the quality of material?
2. How do you see management commitment and priority for project Quality implementation and management?
3. What do you think must be fulfilled for successful project quality implementation and management in general?
4. In your opinion, do you think the efforts and commitments of direct stakeholders on those projects to improve quality of concrete are satisfactory? Please specify your reasons.
5. What preventive and control methods you advice in order to enhance the current concrete production practices on that sector?
6. In your opinion, do you think the quality of concrete used in dugda construction is better quality? Please specify your reasons.
7. Please list any comment and suggestion you have.