Addis Ababa University

Addis Ababa Institute of Technology

School of Civil and Environmental Engineering

Total Quality Management Implementation in Selected Building Construction Firms in Addis Ababa

A thesis submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the degree of Master of Science in Construction Technology and Management

By: Ashenafi Birhanu

Advisor: Prof. Abebe Dinku (Dr. Ing)

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Addis Ababa Institute of Technology

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By Ashenafi Birhanu

Approved by Board of Examiners

Professor Abebe Dinku (Dr. -Ing.)	Abebe Dinku	24.07.2020
Advisor	Signature	Date
Ephraim Senbetta (PhD)	Ephraim Senbetta	16/07/2020
Internal Examiner	Signature	Date
Yibeltal Zewdu (Eng.)		15/07/2020
External Examiner	Signature	Date
	Mebruk Mohammed (Dr.Ing.) Dean,School of Civil & Environmental Engineering	
Chairman	Signature	Date

DECLARATION

I, the undersigned, declare that this thesis entitled **"Total Quality Management Implementation in Selected Building Construction Firms in Addis Ababa"** is my original work and has not been presented for a degree in any other university. All sources of materials used for the thesis have been properly acknowledged.

Name: Ashenafi Birhanu _____ _____

Signature Date

Place: Addis Ababa Institute of Technology (AAiT)

Department of Civil and Environmental Engineering

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ACRONYMS

BC …….Building Contractor

BCA …….. Building & Construction Authority (of Singapore)

BRE …….. Building Research Establishment

CMMI® …… Capability Maturity Model Integrated

CONQUAS ……Construction Quality System

COQ……Cost of Quality

EFQM ……European Foundation for Quality Management

EQAO…….Ethiopian Quality Award Organization

GC ……. General Contractor

ISO …….International Organization for Standardization

JUSE ……Union of Japanese Scientists and Engineers

MBNQA …….Malcolm Bardrige National Quality Award

MUDHo ……..…Ministry of Urban Development, Housing and Construction

OPM3® ……Organizational Project Management Maturity Model

PDCA ……plan, do, check, act

PDSA …….plan, do, study, and act

PMBOK® ……..Project Management Body of Knowledge

QA ……..Quality Assurance

QMS ……..Quality Management System

TQM ……Total Quality Management

TQC …….Total Quality Control

ABSTRACT

This research aims to assess whether the building construction firms under the study are practicing Total Quality Management or not, identify major difficulties encountered during TQM implementation for the firms who are implementing it, and identify the reasons or hindrances not to implement it for those which are not applying it.

The research consists of background of the study, statement of the problem which initiates the researcher to take this specific topic, and the objectives to be achieved at the end of the research. Previous researches and experiences on TQM around the world in general and in Ethiopia in particular are analyzed in the literature review. The research method uses questionnaire survey from primary data using both quantitative & qualitative approaches. The difficulties encountered in implementing the system, if any, and reasons behind resistance of the construction firms not to implement the system is also assessed in data analysis. And SPSS version 20.0 & MS Excel was used for the data analysis.

The practice of 60 randomly selected general and building contractors is investigated via questionnaires. After the data analysis the objectives has been accomplished & the findings are provided in the conclusion part. The result shows that firms in the survey are found to have implemented certain kinds of quality management programs but at the lowest level. This means they are generally conscious of the importance of TQM. However, the study shows that most of the firms were not practicing the complete components of TQM. The TQM factors applied in the building construction firms in the study are classified as a low level because the implementation of most of the critical success factors is weak.

The study also suggests some recommendations for building construction stakeholders i.e. the contractors, policy makers (public bodies), and public & private clients. Furthermore, limitations of the study and areas for future research are forwarded.

Key words: Building, Cost of Quality (COQ), ISO Standard, Quality Assurance, Total Quality Management (TQM), TQM practices.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

According to Low S. Pheng & Teo A. (2004) when building projects get larger and more complex, clients will demand good standards for their product or service delivery. Total quality management (TQM) has been perceived as one of the effective management philosophies in the manufacturing as well as service industries in many countries, especially in Europe, the USA & Japanese industries. TQM can also be included in the construction industry to help improve quality and productivity.

Schexnayder and Mayo (2004) put the definition of construction quality beyond just 'supplying the right materials' but construction quality is also about finishing the project safely, on time, within budget, and without claims and litigation.

As per PMBOK (2013), project Quality Management works to ensure that the project requirements, including product requirements, are met and validated. PMBOK also describes quality management in to three processes; planning quality management, performing quality assurance & controlling quality.

In 1969, Feigenbaum used the term 'Total Quality' for the first time and it discussed to broader subjects such as planning, organization and management responsibility (Feigenbaum, 1991). During this period, Ishikawa explained 'total quality control' and interpreted it to be company-wide quality control. Thus, in the1960s and the early 1970s, the keywords in quality were 'zero defect' and 'total quality control', or TQC (Ishikawa, 1985). According to Deminig (2000), the PDCA (plan-do-check-act) cycle is the foundation for quality enhancement as defined by Shewhart and modified by Deming.

ISO 9000 became the internationally recognized standard for quality management systems in the 1990s. ISO standards specify the requirements for documentation, implementation and maintenance of quality system (ISO, 1994).

The essential role of top management for quality improvement programs is clarified in the definition of Whiteman (2002) which states, "TQM is a continuous process whereby the top management of construction firms take whatever steps are necessary to enable everyone in the organization, especially construction field supervisors and construction workers in the course of executing all their activities on construction sites to establish and achieve standards, which

include completion on time, within budget, to optimum quality standards, and without loss of life or limb, and exceed the needs and expectations of their clients, both internal and external".

Haile et al (2016) suggested that Ethiopian manufacturing firms in his study are found to have implemented certain kinds of quality management programs. This means they are generally aware of the importance of TQM. However, firms were not experienced the comprehensive components of TQM as their original advocates (American and Japanese TQM gurus) had conceived them.

According to research by Tekleberhan K. (2014), ISO certified companies attempt to measure the benefits of having QMS in terms of customer satisfaction and continual improvement, but their measurement lacks objectivity because they don't quantify in a figure. He also stipulates the top main challenges that certified companies faced during implementation of quality management system are: resistance to change, inconsistency in implementing QMS & turnover.

Previous studies in Ethiopia regarding TQM implementation were limited to the manufacturing industry and Tekleberhan's study is also limited to ISO certified construction firms only. Hence, the proposed research will fill this gap regarding TQM in building construction firms and will add to the existing knowledge.

1.2 Statement of the Problem

Poor construction quality management system sometimes causes failure to structures and these results in harm in health & safety to the workers & the population, damage to properties & large amount of cost for rework & scrap. This has been seen in many parts of the capital, Addis Ababa, and the rest of the country.

Poor construction quality also damages the reputation of construction companies and results in difficulty to get new projects. A number of construction companies start neglecting the quality aspects in their projects and this also started reflecting on the reputation of the industry in the country.

There are a few ISO 9001 certified Ethiopian construction companies and there might be some who implemented TQM system in their company. But little is known about how many of the construction companies have a clue about TQM and how many of them are implementing and benefited from it.

1.3 Objective of the Study

The objectives of this research are:

1. To assess to what extent are Ethiopian building construction companies implementing & committed to Total Quality Management system in the delivery of construction projects.
2. To determine the challenges encountered by the contractors while implementing or hindrances not to implement Total Quality Management system.
3. To identify critical success factors for Total Quality Management implementation.
4. To assess how the construction firms perceive the critical success factors and;
5. To propose Total Quality Management implementation framework system (roadmap) for the construction companies.

1.4 Scope and Limitation of the Research

The study is intended to assess and identify the level of total quality management level in selected construction firms in Addis Ababa.

As this study contributes in a way of implementing TQM in building construction firms, it is also subject to some limitations. However, care was taken so that these limitations would not significantly affect its contribution to this research. The major limitation that was faced during the research process was listed below;

1. The research is limited to the geographical boundaries of Addis Ababa city and data collection is limited to samples selected from grade 1 (GC/BC-1) construction companies.
2. The report only discusses TQM implementation on a corporate level, which means it does not cover TQM implementation in construction project execution. TQM implementation on corporate level will affect the behavior of project execution, though.
3. The inability to show the financial impact of TQM implementation also limited this study as organizations wanting to adopt the TQM ideology are mostly concerned about the financial gains from the implementation.
4. Limited access to organizational information of the construction firms is the other limitation of the study.

1.5 Outline of Methodology

The research embraced both quantitative & qualitative approaches spanning on four steps. In the initial step, a wide literature review on the subject matter was undertaken. The literature review covered the management structure of building construction firms in Addis Ababa, concepts of quality and Total quality management in the construction sector and ultimately establishing framework or roadmap for implementation of TQM in the building construction firms.

Based on the literature review, a standardized questionnaire was developed to collect data from building construction firms about their quality management practices and their perception of factors contributing to the successful implementation of TQM. The targeted respondents were CEOs, General Managers, Project Managers, Project Engineers, and Quality Managers of construction firms. A total of 60 randomly selected (Section 3.3.3.1) construction firms in Addis Ababa were targeted to respond to a set of close-ended questionnaires.

The third step was data analysis. The data were analyzed using Statistical Package for Social Scientist (SPSS.20). The ranking analysis was done by Microsoft Excel using importance index.

Finally, the information which was obtained, regarding the quality management practices and critical success factors contributing to the successful implementation of TQM was used to develop a road map or framework for TQM implementation, which is one of the objectives of the research.

The methods employed as well as the questionnaire design and development processes are listed out in Chapter Three of the thesis.

1.6 Structure of the Research

The thesis comprises of six chapters and these have been organized as follows:

Chapter one deals with the introduction to the research including, background to the study, statement of the problem, objectives of study, scope of research, significance of study and organization of the research.

Chapter two addresses the Ethiopian construction industry which looks at its demography and economics. It also reviews the fundamentals of TQM necessary for a better understanding of the concepts and an in-depth review of the main quality factors for TQM implementation.

Chapter three addresses the adopted research methodology. The research concept is described including the design of the research instrument and method for collecting and analyzing the related data.

Chapter four presents data analysis & discussion of the results on quality management as currently practiced by the construction firms in Addis Ababa and critical factors for successful implementation of TQM. From these discussions a proposed road map or framework would be developed that can be used to implement TQM in the construction industry.

In chapter five, design of suitable quality management framework for implementation of TQM was considered. Finally, chapter six presents the conclusions & recommendations of the research and finally, recommendations for future research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

According to a report in 2006/07 by Ethiopian Economic Association (EEA), the Ethiopian economy recorded a healthy consecutive economic growth since 2003/04. Based on the recently revised national accounts data, the Ethiopian economy grew by 11.7%, 12.6% and 11.6% during 2003/04, 2004/05 and 2005/06, respectively. The economy has, therefore, been in a robust growth trajectory over the last four years. The important aspect of this growth is that, all the three sectors (agriculture, industry and services) grew by double digits during the year in review (2005/06) suggesting, more or less, a balanced growth in the economy, with only slight edge in the service sector. It is worth emphasizing that the economic growth recorded in the last three years is one of the highest consecutive performances of the economy compared to any averages over the last four decades (EEA, 2006/07).

In October 2017, ETB was devaluated almost 15% to boost exports. Merchandise exports increased by 1.4%, while imports decreased by 5.5%, reducing the current account deficit. Remittances remained stable at $4.4 billion (6% of GDP) in 2016/17.

According to World Bank (2017), Ethiopia was ranked as the 2nd largest FDI host economy among the least developed countries in 2016, supported by its large market and cheap labor force. The development of industrial parks and devaluation of ETB are expected to increase manufacturing exports, which is about 20% of total exports, thereby mitigating this risk.

The government is implementing the 2nd phase of its growth and transformation plan (GTP II). GTP II, which will come to 2019/20, targets to continue work on infrastructure through public investment projects, and to transform Ethiopia into a manufacturing hub. Growth targets are 11% yearly average GDP; in line with manufacturing plan, it also expected that the industrial sector will grow by an average of 20%. (Ethiopian Economic Association, 2006/07).

2.2 Ethiopian Construction Industry

As per the Ministry of Urban Development and Construction report (2012), the construction industry has significant contributions to the Ethiopian economy, as demonstrated by its share in the GDP. The sector has registered a remarkable growth, over the last 11 years there has been increased investment on the development and expansion of various infrastructure projects.

According to MUDHo (2012), “Since 2005 there have been a number of initiatives in nurturing the local construction industry. In spite of such interventions, the condition of the local

construction industry has remained poor. Constraints include insufficient capacity of local contractors and consultants, inadequate public sector delivery capacity, corruption, erratic work opportunities, use of outdated technologies and practices, lack of effective supporting policies and poor economy". The report added that, in order to attain significant results, there is a need for total commitment from all stakeholders and that a higher level of collaboration among stakeholders is a prerequisite for success (MUDHo, 2012).

"Over the last few years there has been a dramatic change in the way construction activity is being undertaken. This is not only in the form of new technology, but also in the way that construction projects are procured and managed. A substantial part of the construction work takes place in the informal sector of industry too. The buildings and other small infrastructure facilities for this major part of the population are constructed by the informal sector. The informal construction sector comprises of unregulated and unprotected individuals engaged in economic activities that include the supply of labor, materials and building components to the formal construction sector directly in response to needs of clients. It also includes works carried out by individuals and groups on a self-help basis without contracting" (MUDHo, 2012).

In Ethiopia foreign contractors and consultants account for major proportions of the market share in road sector (about 58% in terms of value) but nearly 100% is executed by local contractors as far as building is concerned, as stated by the report.

According to the same report, the inefficient and deteriorated state of the construction industry with poor performance has detrimental effects to the development of the industry and the weaknesses, problems and constraints hampering the performance and development of the industry include:

- Low capacity and capability of the local contractors and consultants due to weak resource base and inadequate experience.
- Inadequate and erratic work opportunities, inappropriate contract packaging of works which favor foreign firms in donor funded projects, low public investment in infrastructure projects and over dependence on donor funding.
- Inefficient and non - transparent procurement systems, corruption and financial mismanagement in public/private sectors.
- Lack of supportive institutional mechanisms in terms of financial credit facilities, equipment for hire and professional development.

- Unfavorable donor conditionality which tend to marginalize local construction enterprises.
- Poor working environment, including low standards of safety and occupational hazards on construction sites
- Weak and non-facilitative policies and regulatory framework
- Low productivity and quality Low technological base (MUDHo, 2012).

Some of the issues which need to be pursued to curb some of the constraints above include:

- Improvement of capacity and performance of the local contractors and consultants
- Improvement of public sector delivery capacity
- Improvement of the performance of the informal construction sector
- Improvement of quality and productivity
- Application of appropriate building regulations and standards
- Promoting technological development
- Promoting sustainable construction practices
- Mobilization of adequate financial resources
- Human resources development
- Enhancing availability of construction equipment (MUDHo, 2012).

The construction industry and the nation in generally lag far behind the technological development of construction trend. However, the improvement of the capacity and performance of the industry to international competitiveness cannot be achieved through use of obsolete or inappropriate technologies and practices. Thus, to meaningfully improve the competitiveness of the industry, dynamic technological development is needed (MUDHo, 2012). However, deployment of technology only will not solve the current issue of the country's construction. There should be extra effort to radically improve people's attitude towards quality. It is a day to day experience that the peoples' attitude on the sector towards quality management is very poor especially on customer satisfaction.

Furthermore, there are world-wide renowned research and development institutions which act as mediums for exchange of knowledge. However, Ethiopia does not effectively participate in most of these forums. Thus it loses opportunities for capturing best practices much needed for technological & behavioral improvement. Over the years, there has also been an unfortunate disregard of good traditional materials and technologies (MUDHo, 2012).

2.3 Concept of Quality and Quality Management

Quality is an important issue in the modern competitive business world and it is acknowledged by most academia, researchers and practitioners, hence, defining it is very important for any organization embarking on quality improvement journey. Thus, it enables employees and management to channel their efforts in the vision of the company and their quality improvement goal.

There is no universally accepted definition for it (Dale et al., 2003). Most of the definitions give stress about meeting the customers' requirements, and this has been articulated in numerous ways by various authors:

- 'Fitness for purpose or use' – Juran, an early leader of quality management (Juran and Gryna, 1993).
- 'The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs' – BS 4778: 1987 (ISO 8402, 1986) Quality Vocabulary: Part 1
- 'Quality should be aimed at the needs of the consumer, present and future' – Deming, another early doyen of quality management (Deming, 2000).
- 'The total composite product and service characteristics of marketing, engineering, manufacture and maintenance through which the product and service in use will meet the expectation by the customer' – Feigenbaum, the first man to write a book with 'Total Quality' in the title (Feigenbaum, 1991).
- 'Conformance to requirements' – Crosby, an American consultant famous in the 1980s (Crosby, 1980).
- ISO defines it as "the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs" (ISO 8402, 1994).
- 'Degree to which a set of inherent characteristics fulfils requirements' – ISO (EN) 9000:2000 Quality Management Systems – fundamentals and vocabulary.
- Oakland (2003) also presents the following definition of quality "meeting the customer requirements. The requirements may embrace obtainability, delivery, reliability, maintainability, consistency and cost effectiveness amongst many other features".
- Garvin, who had studied many quality definitions, had suggested that it is possible to classify definitions of quality into five broad categories:

1. Transcendent (excellence);
2. Product-based (amount of desirable attribute);
3. User-based (fitness for use);
4. Manufacturing-based (conformance to specification);
5. Value-based (satisfaction relative to price), Garvin (1988).

- According to Mahisa G. (2014), "quality in construction can be defined as meeting the legal, aesthetics and functional requirements of a project. Requirements may be simple or complex, or they may be stated in terms of the end result required or as a detailed description of what is to be done. But, however expressed, quality is obtained if the stated requirements as adequate, and if the completed project conforms to the requirements".
- Citing from Arditi and Gunaydin (1997), in the construction industry quality can be defined as meeting the requirements of the designer, constructor and regulatory agencies as well as the owner. Quality can be characterized as follows:
    - Meeting the requirements of the owner as to functional adequacy; completion on time and within budget; life cycle costs; and operation and maintenance.
    - Meeting the requirements of the design professional as to provision of well-defined scope of work; budget to assemble and use a qualified, trained and experienced staff; budget to obtain adequate field information prior to design; provisions for timely decisions by owner and design professionals; and contract to perform necessary work at a fair fee with adequate time allowance.
    - Meeting the requirements of the constructor as to provision of contract plans, specifications, and other documents prepared in sufficient detail to permit the constructor to prepare priced proposal or competitive bid; timely decisions by the owner and design professional on authorization and processing of change orders; fair and timely interpretation of contract requirements from field design and inspection staff; and contract for performance of work on a reasonable schedule which permits a reasonable profit.
    - Meeting the requirements of regulatory agencies (the public) as to public safety and health; environmental considerations; protection of public property including utilities; and conformance with applicable laws, regulations, codes and policies.
- Dahlgaard et al., (2002) also suggested five discrete and interrelated definitions of quality. They are:

    - Exceptional

- Perfection
- Fitness for purpose
- Value for money
- Transformative.

According to McCaffer (2013), quality management generally refers to all activities of overall management functions, especially top management leadership, that determines quality policy objectives and responsibilities for all members of the organization. It includes all activities that managers perform in an effort to implement their quality policy. These activities include quality planning, quality control, quality assurance and quality improvement, (McCaffer and Harris, 2013). Quality management is also defined as "coordinated activities to direct and control an organization with regard to quality" (ISO 9000:2000). The activities are normally management driven and integrated into a system. This is known as the systems approach to managing quality and people are required to participate or are inspired to participate. The most common quality management implemented in recent history are ISO quality management system and Total Quality Management (TQM).

Oakland (2003) also differentiates QC & QA by defining as follows; "Quality control is essentially the activities and techniques employed to achieve and maintain the quality of a product, process, or service. It includes a monitoring activity, but is also concerned with finding and eliminating causes of quality problems so that the requirements of the customer are continually met".

According to Oakland (2003), quality assurance is broadly the prevention of quality problems through planned and systematic activities (including documentation). These will include the establishment of a good quality management system and the assessment of its adequacy, the audit of the operation of the system, and the review of the system itself.

According to "Quality in the Constructed Project", ASCE's guide for owners, designers and constructors, Quality Assurance (QA) is a program covering activities necessary to provide quality in the work to meet the project requirements. QA involves establishing project related policies, procedures, standards, training, guidelines, and system necessary to produce quality (ASCE guide, 2012).

The design consultant and contractor are responsible for developing a suitable program for each project. Quality Assurance (QA) provides protection against quality problems through early warnings of trouble ahead. Such early warnings play an important role in the prevention of both internal and external problems". On the other hand Quality Control (QC) is the specific

implementation of the QA program and related activities. Effective QC reduces the possibility of changes, mistakes and omissions, which in turn result in fewer conflicts and disputes (Arditi and Gunaydin, 1997).

According to Arditi and Gunaydin (1997), the terms quality assurance (QA) and quality control (QC) are regularly used interchangeably. Since quality control is a part of quality assurance, maintaining a clear distinction between them is difficult but important. Quality assurance is all of planned and methodical activities essential to deliver satisfactory sureness that a structure, system or component will accomplish adequately and conform to project requirements. On the contrary, quality control is a group of precise procedures involved in the quality assurance process. These procedures include planning, coordinating, developing, checking, reviewing, and scheduling the work. The quality control role is near to the produce in which different techniques and activities are used to monitor the process and to follow the removal of sources that lead to unacceptable quality performance. Most design-related quality assurance and quality control activities are covered by a design organization's standard office procedures. Improving and checking the actions in the quality assurance program during construction are the responsibility of both the designer and the contractor depending on the project delivery system in use (Arditi and Gunaydin, 1997).

According to PMBOK, quality management divided in to three processes; planning quality management, performing quality assurance & controlling quality. Hence, quality assurance is one of the components of quality management system (PMBOK, 2013).

Quality management system (QMS) is defined as "all activities of the overall management function that determine the quality policy, objectives and responsibilities, and implementing them by means of quality planning, quality control, quality assurance, and quality improvement within the quality system" (MS ISO 8402, 1994). Quality Management System (QMS) certification has become a must in today's highly competitive construction market (Ilias Said & Nuruddeen, 2013).

According to Juran (1993), quality management system is the term coming into increasing use for discussing an organization's management system when the focus is upon the overall performance of the organization and its results in relation to the organization's objectives for quality. A benefit of the term "quality management system" is its effectiveness in emphasizing both:

- The commonalities in management system features

- The differences in the objectives for the results of an organization's management system, for various areas of application (e.g., quality management systems and environmental management systems) (Juran M., 1993).

2.4 Total Quality Management

According to Oakland (2003), Total Quality Management (TQM) is method of planning, organizing and understanding each activity that depends on each individual at each level. Ideas of continuous learning allied to concepts such as empowerment and partnership, which are facets of TQM, also imply that a change in behavior and culture is required if construction firms are to become learning organizations (Love et al. 2000). According to Low et al (2004), TQM is way of thinking about goals, organizations, processes and people to ensure that the right things are done right the first time. It is an approach to improving the competitiveness and effectiveness, and flexibility of the whole organization.

TQM is usually perceived to de-emphasize status distinctions while emphasizing employee empowerment (Plutat 1994). TQM experts discourse horizontal coordination based on the flow of work processes and linkages with suppliers and customers. Deming, Juran and Crosby are some of the world famous quality gurus. They have come out with their own ideas and concepts on quality. Deming modified the 'plan, do, check, act' (PDCA) cycle originated by Shewart. He named this as PDSA (plan, do, study, and act) cycle. Conceptually, PDSA cycle, now also called Deming cycle, is one of the problem solving methods. Juran developed the idea of quality trilogy – quality planning, quality control and quality improvement. And Crosby is known for his concepts of 'do it right first time' and 'zero defects'. He believed that doing it right the first time is less expensive than the cost of detecting and correcting the non-conformities (Kumar N. 2014). Hunt and Daniel (1993) predicted a TQM-oriented organization to have process rather than function as the basic fundamental unit of analysis.

Since a TQM implementing organization is basically a customer-oriented organization, Brown et al. (1994), suggested organizing to maximize customer satisfaction rather than internal efficiency. Each person within the organization must consider the needs of the next person in line who uses his output. Measurements must be made to find out how well the organization is meeting its customer needs and expectations.

Without upper-management involvement, commitment, and leadership, a TQM program cannot succeed. Chase et al (2001) suggested that teams should consist of employees from various parts of the company to work together to improve processes. The organization should always look

toward 100% customer satisfaction and error-free performance. The focus should not be on the 80% that is doing well, but rather on the 20% that is not. Strange and Vaughan (1993) further stressed that constantly measuring and analyzing factors that truly impact performance and then creating channels to communicate the lessons learned will result in performance improvement.

According to (Baden-Hallard 1993; Costin 1994; Dale et al. 2003; Oakland 2003), employees need to be trained and shown how to reallocate their time and energy to studying their processes in teams, searching for causes of problems, and correcting the causes, not the symptoms, once and for all. Quality improvement teams should be set up to ensure that the quality mentality is instilled in everyone within the organization and that there is continuous improvement in the quality systems.

The organization should also assimilate vendors into its TQM process. Williams (1997) stated that supplier relations should progress in the direction of supplier partnerships with both parties benefiting from the relationship. Both parties should seek to improve quality and work toward the intention of forming long-term relationships.

The requirements for restructuring for an organization wanting to implement TQM would include consideration to be given to the following (Chase et al 1993; Dale et al. 1994): customer focus, continuous improvement, leadership, employee involvement, teamwork, customer–supplier relationship, and process improvement.

TQM is both an operational philosophy and a methodology in which there is a strong commitment to customers, employees, and improvement. It goes well beyond the traditional limits of quality assurance and quality control (Chase et al., 1993).

On the report, Mahisa G. (2014) concludes that TQM implementation will differ from one company to another. The company should perform a cultural assessment before implementing TQM so that corporate objectives and behaviors can be aligned to the goal of the TQM program and establish proper TQM implementation methodology for the company.

According to Quazi et al., 1997, it is believed that adoption of TQM by construction companies will result in higher consumer satisfaction, better quality products and higher market share. However, adoption of TQM requires a complete turnaround in the corporate culture and management approach, as compared to traditional way of top management giving orders and employees merely obeying them (Quazi and Padibjo 1997).

It is also suggested that TQM increases innovation. The research by Dong-Young et al (2012) shows that quality management practices are associated with innovation directly or indirectly and that the importance of individual quality management practices is tied to other practices. In

particular, the results indicate that process management directly and positively relates to all types of innovation.

TQM, like quality, has many theoretical and functioning definitions; it does not have a worldwide definition between its users (Zhang, 2000) for example, ISO defined it as the management approach of an organization, which concentrates on quality, based on the participation of its members which aims at long-term success through satisfaction and benefits to all members of the organization and society (ISO 8402, 1994). Zhang et al., (2000) defined TQM as a management philosophy for continuously improving overall business performance based on leadership, supplier quality management, vision and plan statement, evaluation, process control and improvement, product design, quality system improvement, employee participation, recognition and reward, education and training, and customer focus. Dahlgaard et al., (2002) saw TQM as: "a corporate culture characterized by increased customer satisfaction through continuous improvement, in which all employees in the firm actively participate".

TQM is different from traditional management as its philosophy seeks to integrate all organizational functions including marketing, finance, design, engineering and production, customer service whilst focusing on meeting customer (internal and external) needs, employees satisfaction and organizational objectives by ensuring that the processes being carried out is right, first time and every time. It embraces principles, processes, practices and procedures necessary for providing customer satisfaction and achieving improvement in productivity and business performance (Love et al., 2000).

In certainty, no firm can fully implement TQM; it is a continuous improvement process and as such never ending. Its culture and philosophy must infiltrate an organization, and can thrive only under senior management when it establishes it as a top management priority and commit itself to its success (Kobina A. 2012).

Teixeira (1999) concluded his paper by stating: The fact that TQM does not have a universal definition leaves a great amount of freedom to those developing solutions under its main guidelines. As solutions are not directly transferable, each organization must develop its own framework and each manager his mindset of Quality Management (QM) and any tentative desire to theorize QM must take this into account.

The Teixeira's statement above indicates that although there are some methods using a step-by-step approach in TQM implementation, including the one proposed by Burati and Oswald (1993), these models were only guidelines for TQM implementations. Considering the TQM implementation will be differ for every company. Therefore researches conducted by Arditi and

Gunaydin (1997) and Harrington and Voehl (2012) explain that TQM implementation for construction firm is started with the basic concept of TQM itself. However, research conducted by Burati and Oswald (1993) presents an account of successful practices to date in the interviewed companies, and that the implementation road map has no end point. It is likely that improvements are continuously being made in the process of TQM implementation in a construction firm.

Considering TQM implementation will cause cultural changing and each company has its own culture, methodology of TQM implementation will differ from one company to another. As suggested by Love et al (2004), the company should perform a cultural audit before implementing TQM so that corporate objectives and behaviors can be aligned to the goal of the TQM program and establish proper TQM implementation methodology for the company.

A quality management system is one of the key building-blocks for an organization's TQM activities. ISO9001 and ISO9004 define and set out a definitive list of features and characteristics which should be present in an organization's quality management system through documented policies, manual and procedures, whatever the product manufactured or offered, or the service provided, or the technology used. In this way sound advice is provided on how an organization may develop a quality system (Dale et al., 2003).

Total Quality Management is a quality management system which pursues excellence in customer satisfaction through continuous improvements of products and process by the total involvement and dedication of everyone involved in the process or the products (Chase et al., 2001). When applied effectively, TQM enables a company to improve long-term relationships, create a harmonious team spirit, enhance professionalism and skills in all spheres of the business sector, encourage open addressing of problems and help to achieve the intended project objectives and benefits (Low and Teo, 2004).

2.4.1 Historical Evolution of Total Quality Management

According to Dahlgaard, it is widely thought that total quality management evolved gradually and took place in four stages namely; Quality Inspection, Quality Control, Quality Assurance and Total Quality Management (Dahlgaard et al, 2002).

The 1st stage of this growth started in the 1910s and began with craftsmen quality control (inspection). During that period craftsmen were responsible for manufacturing and exclusively controlling the quality of their products. Quality was in the hands of the craftsmen, and building quality into a product was the aim of craftsmen (Dahlgaard et al., 2002). However, the industrial

revolution created a factory system when large scale productions of goods and services in factories developed. Craftsmen were grouped together and supervised by supervisors (foremen) for their quality work. Thus, the master foremen maintained a form of quality control by inspecting the finished products before selling them (Juran, 1991).The quality of the product depended largely on the skills of the craftsmen and the effectiveness of the master foremen.

According to Feigenbaum (1991), the emphasis at this stage was on product' uniformity, and inspection was thought to be the only way to ensure quality. Under a simple inspection- based system, one or more characteristics of a product were examined, measured, tested or assessed, and compared with specified requirements to assess conformity. The role of the quality professionals was mainly inspection, sorting, counting and grading of products. The approach here was to inspecting quality (Garvin, 1988). In general, simple inspection-based systems were usually wholly found in-house and did not involve customers (Dale et al., 2003).

With more manufacturing development and the Second World War came the second stage of TQM development when manufacturing system was complex and quality thinking is very essential due to mass production and high military standards for product and services. During that era, quality was controlled through supervised skills, written specification, measurement and standardization. Thus, sophisticated methods and system were required in controlling and maintaining quality. Statistical quality control i.e. control charts and sampling methods was then developed to inspect the post-production effort by separating the good product from the bad product. Shewhart, Dodge and Roming are credited for the advancement of quality improvement by developing this new method of inspection to improve and maintain quality- the quality control charts (Rahman, 2004).

Shewhart promoted that the process variations in product, that is variation resulting from random causes, and variation resulting from assignable causes or special causes can be distinguished by using control charts, sampling techniques, and economic analysis techniques for maintaining quality. These philosophical foundations of Shewhart's continuous improvement process were captured in a diagram later to be known as the Shewhart/Deming/ PDCA cycle (Rahman, 2004). Shewhart's cycle stage led to greater process control and fewer incidences of non-conformance contributing significantly to quality management and formed the foundation for modem quality assurance, the next stage in the evolution of TQM.

The third stage of this development is the quality assurance. This contains all the previous stages in order to provide sufficient confidence that a product or service will satisfy customers' needs (Dahlgaard et al., 2002). During this stage, more emphasis was put on problem prevention rather

than detection. Thus, there was paradigm shift from detection to prevention through the use of tools and methods such as quality manuals, use of cost of quality, development of process control and auditing of quality systems to progress from quality control to the quality assurance era of Total Quality Management. Quality assurance is widely known as a prevention-based system which improves product quality by placing emphasis on product and process design. This approach stressed detection of error at source. Emphasis was on the entire production chain from design to market, and the contribution of all functional departments. Quality planning and improvement certainly begin when top management include prevention as opposed to detection in organizational policy and objectives, and start to integrate the improvement efforts of various departments (Garvin, 1988).

In the 1990s, the ISO 9000 standards emerged and embodied these concepts of quality (Dahlgaard et al., 2002). This stage took on board the first two initial stages to the evolution of TQM in its endeavor to produce products or services that meet customer needs.

Finally, the fourth stage, which is Total quality control/management evolved in the early 1980s through a dramatic increase in user quality requirements and quality as a competitive weapon for organizations. This shift to the view of quality as an aggressive competitive weapon in the West arose from competition from Japanese manufacturers, an increase in customer demand for higher-quality products, a loss in profit and market due to poor quality (Garvin 1988; Dahlgaard et al., 2002).

TQM is a company-wide approach focusing on managing quality through collective effort, commitment of every member of the organization and even goes beyond the organization by recognizing the contributions made by suppliers and customers, and establishing formal and close working links and relations with them (Zhang, 2000; Dahlgaard et al., 2002). According to Oakland (2003), TQM is accompanied by the use of sophisticated quality management tools and techniques (the hard aspects of quality control) and increased emphasis on people and personal values (the soft aspects of TQM).

According to Whiteman (2002), TQM is a continuous where by the top management of construction firms take whatever steps that are necessary to enable everyone in the organization, especially construction field supervisors and construction workers in the course of executing all their activities on construction sites to establish and achieve standards, which include completion on time, within budget, to optimum quality standards, and without loss of life or limb, and exceed the needs and expectations of their clients, both internal and external.

According to Arditi et al (1997), a look at history gives some insight into the problem. Through the first half of this century, engineers and architects were in total control during the design phase. During the construction phase they carried out a role described as 'supervision', insuring that the owner received his money's worth in terms of quality. In the 1950s and 1960s, owners became increasingly concerned with cost and schedule, areas where design professionals were not providing good control. The emphasis continued to be on quality and control of exposure to liability. At about the same time, the widespread use in the public sector and, to a large degree, in the private sector, of the sealed competitive bid gave the owner the advantage of competitive pricing, but also forced the general contractor to look for every advantage during construction to control cost and maintain a profitable stance.

In the 1980s came the advent of the construction management project delivery system whereby construction management firms emerged as entities not responsible for design and/or construction, but performing only managerial functions on behalf of the owner from the inception phase to the completion of the construction phase. Inspection and quality control that had traditionally been performed by architects and engineers were now performed by construction management firms (Arditi et al 1997).

According to Juran (1993), the evolutionary process of total quality management seems to alternate between a focus on quality and a focus on the costs to attain that quality. And the evolution of TQM is as follows:

1. Product quality
2. Product process quality
3. Service quality process
4. Business planning

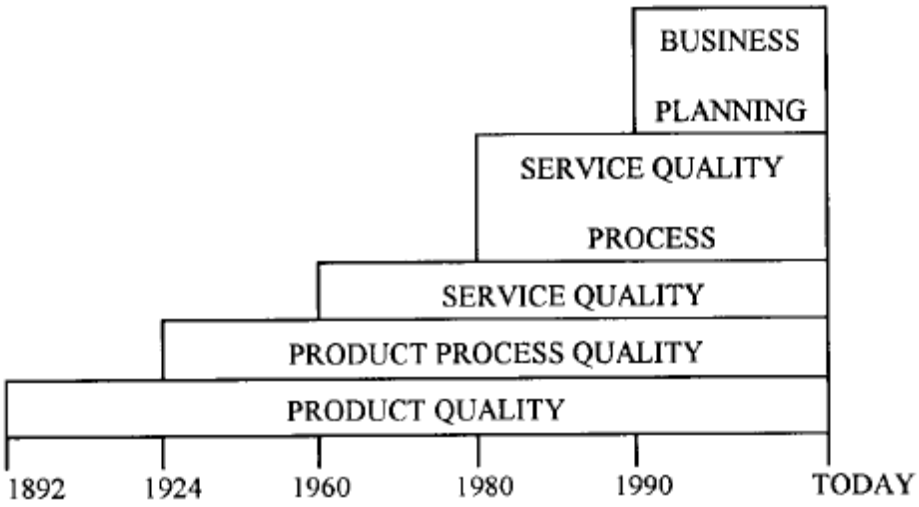

Figure 2.1: The evolutionary process of total quality management (Juran, 1993)

2.4.2 Perspectives on Total Quality Management

Total quality management is often termed a journey not a destination (Low and Teo, 2004). In view of that, numerous studies have been conducted in the field of TQM and its implementation and as such different researchers have adopted different frameworks based on their own understanding and objectives (Zhang, 2000). However, these studies on TQM (e.g., Saraph et al., 1989; Flynn et al., 1994; Yosuf and Aspinwall, 1999) developed their ideas from quality leaders such as Deming (2000), Juran (Juran and Gryna, 1993), Crosby (1980), and Ishikawa (1985).

According to Zhang (2000), the theoretical essence of the Deming approach to TQM concerns the creation of an organizational system that fosters cooperation and learning for facilitating the implementation of process management practices, which, in turn, leads to continuous improvement of processes, products, and services as well as to employee fulfillment, both of which are critical to customer satisfaction, and ultimately, to firm survival.

Deming (2000) placed stress on top management taking responsibility in quality management initiatives, process and systems. He advocated identifying and measuring customer requirements creating supplier relationship, and the use of functional teams. He preached the use of specific tools, statistical process control and PDCA (Plan-Do-Check-Act) cycle as a means of quality improvement. According to him, there are two causes of errors or variations: “common cause” and “special cause”. His management method was to reduce the inevitable variation that occurs from “common cause” which he defines as errors or variations caused by operating machines or products or system and can be reduced by managements. With the “special cause “he said it

relates with the employees, that is to say, it is caused by lack of knowledge or skills and poor performance and can be handled by the employees.

Deming (2000) prescribed TQM in 14 points, which he claimed to be a set of principles (of transformation) to remain competitive in providing products and services and encompasses continuous improvement of product and service, leadership and commitment supplier focus, training and zero defect (Zhang, 2000).

According to Juran and Gryna (1993), Juran believes that TQM is the system of activities directed at achieving delighted customers, empowered employees, higher revenues, and lower costs.

He emphasizes that quality problems are due to management rather than employees, and for that matter, quality attainment requires wider action from all functions of the firm. Juran's approach place much emphasis on teams (QC circles and self-managing teams) which can promote quality improvement, top management commitment and empowerment, participation, recognition and rewards. He proposed quality management theories such as' trilogy' of management processes: quality planning, quality control, and quality improvement for managing and improving quality, 'The Triple Role Concept' to confirm the need for customer focus. He stressed that customers are the underlying factor of quality improvement.

He explained that every party in a process has three roles: supplier, processor, and customer, and these three roles are carried out at every level of the processes in a firm. He also introduces quality cost and defined it in four (4) broad categories as internal failure cost, external failure cost, appraisal cost and preventive cost which can be used to evaluate the firm's costs related to quality.

Crosby (1980) identified a number of important principles and practices for a successful quality improvement program, which include, for example, management participation, management responsibility for quality, employee recognition, education, reduction of the cost of quality (prevention costs, appraisal costs, and failure costs), emphasis on prevention rather than after-the-event inspection, doing things right the first time, and zero defects (Zhang, 2000). To attain zero defects, Crosby suggested that prevention must be given preference over inspection.

Crosby (1980) prescribed a 14-step quality program that focused on how to change organizations using management and organizational processes rather than statistical tools and techniques. Thus, his program is primarily behavioral and its audience is mainly top management (Rahman, 2004).

Ishikawa's approach to quality management goes beyond the product and it includes after-sales service, the quality of system and the firms quality culture and the quality of individuals in the firm. Like the others, he also suggested that customer focus, supplier focus, continuous improvement, employee management, and Quality circles are the key to total quality management (TQM) implementation. He also developed the seven QC tools (Pareto chart, Cause and effect diagram, Stratification chart, Scatter diagram, Check sheet, Histogram) for quality improvement (Ishikawa).

In summary, his concept encompasses the following principles: quality first not short-term profits first; customer orientation not producer orientation; customer-breaking down the barrier of sectionalism; using facts and data to make presentations-utilization of statistical methods; respect for humanity as a management philosophy, full participatory management; cross-functional management (Kobina A. 2012).

Even though the approaches to TQM are different, they share common points on the management of the process: leadership and commitment, training and education, using teams, planning and quality measures for continuous improvement and having the appropriate culture. They believe that it is the management's responsibility to provide commitment and leadership, empowerment through training and education, and the appropriate support to technical and human processes. It is necessary that management encourages the participation of the employees in quality improvement, and develops a quality culture by changing perception and attitudes toward quality (Kobina A. 2012).

Again, all the authors emphasize that the customer defines quality which consequently creates the need for customer satisfaction which leads to an improved competitive position. Equally consistent is the view that the costs of waste and rework are high and should be eliminated. Similarly, employees should be recognized and rewarded for their quality improvement efforts. They also stressed on evaluation and feedback, prevention of products defects, and not inspection and detection of defective products (Kobina A. 2012).

2.4.3 ISO Quality Management System

In 1987, the International Organization for Standardization released the ISO 9000 quality standard series. The ISO quality standards are a series of internationally accepted guidelines as to how companies should set-up quality assurance systems (Kartha, 2004). The standards are designed to guarantee a consistent level of quality of products and services provided by

companies through the use of procedures, controls, and documentation, to identify mistakes and streamline its operations (Kartha, 2004).

The ISO quality management system is generic in nature and applicable to all companies, regardless of the type and size of the business, including small and medium enterprises (SMEs) (Sroufe and Curkovic, 2008; Kartha, 2004) and is being used by many organizations as a stepping-stone to TQM (Conca et al, 2003; Zhang, 2000; Kartha, 2004).

The original ISO quality standards underwent a major revision in 1994 and 2000 (Sroufe and Curkovic, 2008). The recent revision of the standards, ISO 9000:2000 actually addresses the challenges or issues that the 1994 version could not address.

According to Kobina E. (2012), the new standards have a completely new structure and are based on eight principles that emphasize the core values and concepts of quality management and also incorporate several of the principles underlying the Malcolm Baldrige National Quality Award criteria. Some of the most significant aspects of the revised standard include its emphasis on using a process-related structure, using information from the system to facilitate quality improvement, and including customer satisfaction in improvement activities.

The eight quality management principles as defined by ISO (1994), with explanations as to how they should be interpreted in the standards, are as follows:

- ***Customer focus***, resulting in meeting customer requirements and striving to exceed them;
- ***Leadership***, aiming to create an internal environment in which people are fully involved;
- ***Involvement of people*** who are the essence of an organization;
- ***Process approach***, resulting in improved efficiency to obtain desired results;
- ***System approach*** to management, leading to improved effectiveness and efficiency through identification, understanding and management of interrelated processes;
- ***Continual improvement***, which becomes a permanent objective of the organization;
- ***Factual approach*** to decision-making, based on the analysis of data and information; and
- ***Mutually beneficial supplier relationships***, based on an understanding of their interdependence.

As per the data obtained from a training manual on QMS development and implementation based on ES ISO 9001:2008 by the Ethiopian Standards Agency (ESA); the degree of utilization of opportunities of implementing ISO 9001 QMS is very low in developing countries in general and in Ethiopia in particular. Out of 1,101,273 certificate issued in 2012 worldwide, the share of developing countries (Africa and Central and South Asia) is 42,970 (3.9% of the total certificates) (Aida T., 2015).

According to ISO (1994), the biggest impediment to improve quality in industries of developing countries is the firm's lack of awareness of its economic benefits. There are a number of misconceptions that resulted this such as:

- High quality costs more
- Emphasis on quality leads to reduced productivity
- Quality is affected by the work culture of the labor force and
- Quality can be assured by strict inspection

Besides the above misconceptions, there are also other reasons that could contribute to the very low numbers of certificate in Ethiopia such as:

- Lack of capacity i.e. unavailability of capable institutions (both governmental and private) that can promote and provide technical support for implementation of ISO 9001 QMS.
- Lack of making cost-benefit analysis items of ISO 9001 QMS development, implementation and certification costs and its internal and external advantages.
- Considering implementation of ISO 9001 QMS for Certification only and unaware of its internal benefits of making firms effective and efficient even when there is no need for certification.
- Linking systems standards such as ISO 9001 QMS to big and complex industries only against generic nature of the system standards which enables any firm to adopt the system regardless of its type, size and product it provide (Aida T., 2015).

2.4.4 TQM versus ISO Quality Management System

Sun (2000) found that ISO standards and TQM are different practices for quality management. The standard aims of ISO 9000 are to standardize certain processes and maintain the quality

level while TQM aims to continuously improve quality level. They cannot replace each other rather the proper combination of the two will produce more benefits (Sun, 2000).

Malhotra (1998) claims that, the main goal of ISO 9000 is to produce an effective quality system and maintain quality level in organization/Services. Due to standard procedures, ISO 9000 is relatively easier to be implemented and maintained than any other QMS's. Its certification does not contribute significantly to product quality and company performance improvement.

On the other hand, TQM is mainly concentrating to continuously improve product quality and customer satisfaction by individual and organizational involvement. So it aims to improve quality. Since TQM is mainly a philosophy, it takes long time before it is fully implemented and maintained. Many TQM programs came into a halt (Malhotra, 1998).

TQM demands the total commitment of top executives. However, they sometimes fail to develop. In other cases, executives support the initiative but do not demonstrate their commitment with appropriate behavior. ISO demands too many documentation works. It sometimes referred to be a waste of effort and give a resultant image of ISO as 'quality on paper only' and bureaucratic. Many companies implement ISO mainly because of customer and market demand only. They do not care the actual meaning of that certificate. ISO lacks responsiveness to customers demand by emphasizing too much on the current process, with little room for process alternation and restructuring (Malhotra, 1998).

The family of ISO 9000 standards has faced criticism that the certification process fails to deal with some important aspects of TQM practices such as leadership, strategic planning and employee empowerment (Rao, S. et al., 1997). Therefore, questions have been raised whether an ISO 9000 registration can result in an effective implementation of quality management practices. However, it is argued that if the clauses of ISO 9001 are interpreted in depth and detail, they contain all the requirements that are associated with quality management practices. For example, clauses 4.1, 4.2 and 4.18 deals with management responsibility, quality system and training, respectively, which require practices that are in line with leadership, strategic planning and employee empowerment practices of quality management (Rao, S. et al., 1997).

Bradley (1994) makes the distinction that, while the ISO 9000 standard requires all employees to be aware of and understand the quality policy, TQM bears the additional requirement that they share its aims. Moreover, ISO 9000 has little or nothing to say about comparative or competitive issues. Therefore it could not be referred as a strategic tool, unlike TQM which, in its full form, embraces customers, competitive performance and benchmarking. TQM must therefore be linked

directly to an organization's strategic planning process on a continuing basis and used as a vehicle for the realization of this strategic plan (Taylor, W.A. and Meegan, S.T. 1997).

In examining ISO 9000 and TQM, Laszlo (1996) stressed that ISO 9000 and TQM are totally different approaches, where ISO 9000 implementation is associated with line workers, while TQM is more related with top management. Moreover, the focus of ISO 9000 is on proving compliance and gaining certification, while TQM focuses on continuous improvement and achieving and maintaining customer satisfaction. Furthermore, Yung (1997), in differentiating between ISO 9000 and TQM, claims that the concept of TQM is broader and deeper than ISO 9000. TQM is identified to be for internal organizational use and tends to go beyond customer satisfaction, while ISO 9000 is only for external assessment needs in order of achieving customer satisfaction (Yung, 1997).

Juran (1993) suggested that the implementation of ISO 9000 by itself is not sufficient for an effective quality system, since it guarantees neither the manufacturing of a good quality product nor customer satisfaction. Terziovski et al. (1997) and Curkovic and Handfield (1996) examined ISO 9000 and stressed that the ISO 9000 criteria are a subset of the requirements of TQM.

According to Ho (1994), the similarities and differences between TQM and ISO 9000 were explained by a Venn diagram, as shown in Figure 2.2. The interpretation of sub-sets 1-4 are as follows:

1. S1: ISO 9000 – For many firms, the first step in creating a total quality environment is likely to be the establishment of a quality management system such as ISO 9000 series, Ford Q-101, Rover RG2000, etc. Establishing such a system is the initial building block.
2. S2: People – It is vital in a total quality organization to capture the hearts and minds of everybody within the organization, starting at the top and permeating, via a chain of customer-supplier relationships throughout the whole organization and beyond. Therefore, management commitment, training, teamwork, leadership, motivation, etc., would each have a vital and complementary role to play in establishing a total quality environment.
3. S3: Improvement tools – There is no enterprise that cannot be improved. A vital part in creating a total quality environment is to recognize the need for continuous improvement programs and here BS 7850: Part 2 should be a real and tangible help. A list of such tools and techniques is:
    - Data collection form
    - Affinity diagram
    - Benchmarking
    - Brainstorming

- Cause and effect diagram
- Flow chart
- Tree diagram
- Control chart
- Histogram
- Pareto diagram
- Scatter diagram

4. S4: Satisfying customers – TQM is not just to meet customer requirements. It concerns how to give them satisfaction. Some companies, like Rover Cars, use the term "Extraordinary customer satisfaction" as their corporate mission. Customer requirements may include availability, delivery, reliability, maintainability and cost effectiveness, among many other features. If we are dealing with a supplier-customer relationship crossing two organizations, then the supplier must establish a "marketing" activity charged with this task. The marketers must, of course, understand not only the needs of the customers, but also the ability of their own organization to meet customers' demands.

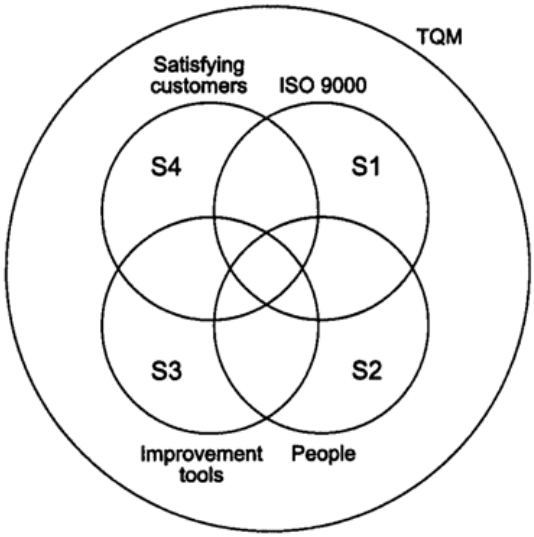

Figure 2.2: The Venn diagram between TQM and ISO 9000 (Ho,1994)

As it is highlighted in Figure 2.2, ISO 9000 could be considered as an element of TQM program and from this point of view, it could be argued that ISO 9000 is a starting point towards TQM (Ho 1994).

Continuous improvement can only be achieved by directing organizational efforts towards planning and preventing problems occurring at source. This concept leads to the third stage of quality management development which is quality assurance. Examples of additional features acquired when progressing from quality control to quality assurance are, for example, a comprehensive and formal quality management system along the lines of the ISO 9000 series to increase uniformity and conformity. However, considering ISO 9000 as a quality system and

accordingly, as a quality assurance approach, it could be emphasized that TQM is beyond ISO 9000 (Ho 1994).

Arora (1996) described ISO 9000 as a pillar in a company's approach to TQM since it includes important elements such as training, statistical process control and management commitment. Arora added that ISO 9000 is an important part of TQM. To support those claims, Lai (1996) mentions that TQM is an approach to quality that goes beyond ISO 9000. He added that ISO 9000 and TQM are not different alternatives to each other, and are not mutually incompatible. ISO 9000 builds a strong foundation for a TQM environment, emphasizing customer needs, employee involvement, and making continuous improvements (Lai, 1996).

Moreover, some of the authors (McAdam and Jackson, 2002, Williams, 1997, Askey and Dale, 1994) revealed that ISO 9000 certification provides the building blocks for successful and effective implementation of TQM. Further, McAdam and McKeown (1999) found the majority of the organizations in their study progressed from ISO to TQM and considered ISO to be an important step towards the TQM journey.

Bohlen (1993) argues that the requirements of ISO 9000 could be easily satisfied if they were a part of TQM, rather than being on their own. Consequently, it is recommended that organizations can achieve ISO 9000 first to create stability and consistency in the organization's work; then they can implement TQM in order to enhance employee motivation and operational efficiency. Some authors (Bradley, 1994, McAdam and Jackson, 2002, Dick, et. al., 2001) supported the idea of starting with ISO 9000 as the first step towards TQM.

Taylor (1993) found that 33 per cent of organizations which had introduced ISO 9000 also had TQM in place and of those which did not, 43 per cent were either planning to introduce TQM or were considering it. On the other hand, 42 per cent of the organizations with TQM were planning to introduce ISO 9000.

In addition, Zhang (1999) agrees with the recommendation that organizations should go beyond ISO 9000 to incorporate other models of TQM. To investigate the benefits of implementing both ISO 9000 and TQM instead of only one of them, Rao et al. (1997) undertook a study of firms implementing TQM in the USA, India and China. The study suggested that ISO 9000 firms had better quality management practices and results than the firms that were not registered to ISO 9000.

Sun (1999) analyzed data obtained by the London Business School and Chalmers University of Technology, covering 20 countries. The study concluded that implementing ISO 9000 alone did not contribute much to quality improvement in organizations. However, implementing both ISO

9000 and TQM contributed the most. Moreover, Prabhu at al. (2000) investigated the impact of ISO 9000 certification and TQM on organizational performance. The study concluded that organizations, which systematically adopt best practice starting with ISO 9000 and continuing with TQM, are achieving a higher level of organizational performance.

ISO 9000 represents a trend in quality management, which cannot be ignored in today's business environment. In fact, those companies wishing to remain competitive and improve their quality systems are recommended the use of ISO 9000 as a foundation for a much broader system of TQM. This is based on the fact that ISO 9000 is an important part of TQM, and the implementation of both approaches together will lead to organizational success and competitive advantage. It is clear that both approaches tend to complement each other. ISO 9000 can be implemented first to create stability and consistency in the organization's work, then the implementation of TQM can enhance employee motivation and operational efficiency, and achieve overall organizational success and performance (Jamshidian, and Shahin, 2004).

In highlighting the differences between TQM and ISO 9000, it is believed that these two programs are not mutually exclusive (Reiman and Hertz, 1993). The following is a summary of their major differences.

Focus

TQM: Internally on management commitment, and employee training and education, and externally on meeting customer requirements exactly.

ISO 9000 registration: On consistency in the production of a product or service.

Objective

TQM: To improve continuously every facet of organization culture.

ISO 9000 registration: To provide a common basis for assuring buyers that specific practices are in conformance with the provider' s stated quality systems.

Sensitivity to environment

TQM: Considers customer needs and satisfaction as a part of their strategy to gain competitive advantage.

ISO 9000 registration: Does not address what should be improved in order to gain a company's competitive position (Reiman and Hertz, 1993).

As such, ISO 9000 series is regarded as a stepping stone to TQM and TQM, in turn, considered a journey (Lakhal, 2014; Quazi and Padibjo, 1997).

Unlike ISO 9001 registration that requires a third-party audit, TQM prides itself in non-reliance on a third-party check. However, this does not preclude the need for compliance checking for process and system improvement (Hawkes and Adams, 1995).

Most ISO 9001 registered construction companies do not want to subject their employees to the cultural shock of TQM implementation immediately afterwards (Low and Teo, 2004). Their strategy is an organizational-wide effort to absorb the ISO 9001 quality management principles and gradually reinforce continuous improvement to keep enhancing customer satisfaction (Alič, 2014).

Truly, ISO 9000 is a subset of TQM; it has some common points with TQM, which may help companies already certified to ISO 9001 to be more similar in character to a TQM company. Construction companies should think beyond ISO 9001 if they are to maximize this capability which appeared to be dormant at the moment (Mokopi, 2017).

A quality management system is a fundamental pillar in an organization's approach to TQM and it helps to ensure that any improvements made are held in place. However, ISO9001 registration is not a prerequisite of TQM. Some organizations, in particular, those from the nonmanufacturing sector, have analyzed and improved their systems and working practices and have then gone straight to TQM (Chase et al., 2001).

In spite of their different objectives, both systems have some common elements. Both are parts of Quality Management System and this is the reason many researchers consider ISO 9000 as a first step towards TQM (Taylor, 1995; Tummala and Tang, 1996; Sun, 2000).

2.5 Benefits of Total Quality Management (TQM)

Before mentioning the benefits of Total Quality Management Systems, it's vital to describe the problems and examples of failures due to lack of quality management system.

Failure of management to plan for the future and to foresee problems has brought about waste of manpower, of materials, and of machine-time, all of which raise the manufacturer's cost and price that the purchaser must pay. The consumer is not always willing to subsidize this waste. The inevitable result is loss of market. Loss of market begets unemployment. Failure of your own management to accept and act on their responsibilities for quality is the prime cause of your trouble (Deming, W.E., 2000).

According to a blog by Brad Fagan (2016), the three catastrophic quality failures listed below cost human life, caused environmental destruction and turned their products into literal explosive devices.

1. The Samsung Note 7 Disaster: The Note 7 had been receiving positive reviews and had a strong marketing campaign but there was just one problem – the phones exploded. It tells us that market share, brand loyalty and trust can take years to build, but it only takes a moment to lose it. That's why quality failure can have such a devastating impact on your business.
2. The 2008 Global Financial Crisis – the world's largest quality failure: The 2008 Global Financial Crisis has been labeled as the "greatest quality failure of all time" by Senior Risk and Compliance Executive Paul Moore who was fired in 2004 for warning senior managers about the danger of taking risks. Regardless of what the old model of business management will tell us, modern businesses cannot prioritize profits ahead of quality. A profit focused approach will only encourage employees (from the top down) to cut corners, which can be dangerous not only or your brand image, but also on human life - depending on which kind of business sector you're in.
3. BP's 2010 Deep-water Horizon Disaster: This is one of the most catastrophic failures by any company, ever. This wasn't one failure, it was four and could have been easily prevented if BP had a 'quality first' mentality that focused on risk prevention. It's obvious that this wasn't their focus, considering that this wasn't an 'unfortunate freak accident' but a number of systemic failures that pointed back to an erroneous business culture. As oil is a volatile substance that can wreak havoc in a number of different ways, BP should have known better than anyone that a top down approach to quality needs to be maintained at all times (Brad, F., 2016).

According to Bryde and Robinson (2005), most contractors have failed in meeting stakeholders' needs on cost, quality and time objectives. The failure of these objectives are caused by design deficiencies, products failure and poor workmanship and these problems are common and faced by most countries irrespective of the differences in their economies (Bryde and Robinson, 2005). Notwithstanding, construction projects have also recorded several work- related accidents and injuries due to lack of proper quality management system. Globally, construction employees have three times more chances of dying and two times of getting injured than any worker of other economic activity. In Nigeria, the statistics reveal that thousands of workers are being injured and even killed annually due to the industrial related accidents, where the construction industry has recorded twenty percent of the occupational injuries and fatalities. Correspondingly, the study conducted by Dr Dung investigating the reasons for construction accidents in Vietnam. Poor quality and un-safety of different temporary structure systems are revealed as the major

causes of construction injuries. Construction accidents may occur on a project site due to collapse of construction parts or elements, unsafe working areas, human behavior and misuse of machineries (Amaka C., 2013).

According to Mahajan G. (2016), because of the poor quality management systems lots of failures where occurred. Defects within new buildings are areas of non-compliance with the Building Code of India, various Indian Standards and published acceptable tolerances and standards. Defective building construction not only contributes to the final cost of the product but also to the cost of maintenance, which can be substantial. Defective construction may lead to the complete failure of a structure.

Errors on construction sites due to process management failure occur frequently and can be costly for the contractors and owners of constructed facilities. In fact, 6-15% of construction cost is found to be wasted due to rework of defective components detected late during construction and 5% of construction cost is wasted due to rework of defective components detected during maintenance. The nature of these errors is quit diverse. 20-40% of all site defects have their roots in errors arising during the construction phase , 54% of the construction defects can be attributed to human factors like unskilled workers, due to lack of proper training, or insufficient supervision of construction work. Furthermore, 12% of the construction defects are based on material and system failures. These observations suggest that a thorough inspection of construction sites is needed and that current site inspection approaches need to be improved in identifying defects on construction sites effectively. Quality of work can be achieved by proper quality control process at a minor cost when compared with the total cost of the project (Mahajan G., 2016).

Incidences of building collapse in Nigeria are posing serious challenges to all the stakeholders in the building industry- building consultants, governments, developers, landlords and users. Typical examples of collapsed buildings include collapse of Multi-Storey Building in Mokola, Ibadan,Oyo State (1974), building under construction at Benjamin Opara Street, Port Harcourt, Rivers State, (2006) and many others. On the Night of November, 2012, an uncompleted 3 storey building collapsed in a water logged area of Owerri during a heavy downpour. Substandard cement was used, supervised by a chemist! On May, 15th, a 4 storey building under construction collapsed in Agbama Estate in Umuahia killing undisclosed number of squatters under the floors. Investigation revealed that building regulations permit a maximum of 2 floors in the area. On 5th September, 2013, a 4 storey building under construction, collapsed at 24 Obanye Street in Onitsha, during a downpour.

Causes of building collapse are traceable to many factors. Firstly, buildings collapse due to human errors such as faulty design, faulty construction, and use of substandard building materials, negligence, omissions, ignorance, fraud and corruption. The second factor is natural occurrence such as flood, earthquakes, heavy wind e.t.c. (Chendo I.G & Arc. N. I. Obi, 2015).

According to a research by Hiwot B. (2012), most of the condominium houses as identified by the occupants observed by the researcher and later confirmed by the consultant and HDPO have defects. The most identified defects during handing over, are defects related to sanitary fixtures, door handles and locks and vertical and horizontal cracks.

Besides, owners found the deflection on ceiling, irregularity of wall and floor and leaking of sanitary pipes difficult to undertake finishing works. After occupancy, more defects such as those related to electrical utilities and sanitary fittings especially leaking of water inside the house start to appear. Leaking of water originates mostly from sanitary lines located in the house or in a neighbor's house, through openings around windows, which should have been sealed, and through roofs. Most of the defects are major defects, which need replacement of the whole or some parts. Accordingly, the study reveals that the majority of respondents are forced to undergo maintenance. This in turn brings additional cost of purchasing materials and repairing the defects.

Associated with all these defects, the households find the quality of the houses fair to poor in terms of its quality. As a result, the occupants are not satisfied with the houses they are living in. However, HDPO gives slight concern for customer satisfaction instead give priority to fulfill the policy to supply more houses within a short time period. AAIHDP on one hand does meet its objective on housing delivery but fail to ensure delivery of quality houses (Hiwot B., 2012).

As stipulated on the statement of the problem of this research, poor construction quality management system sometimes causes failure to structures and these results in harm in health & safety to the workers & the population, damage to properties & large amount of cost for rework & scrap. Furthermore, building collapse may also occur due to lack of quality management and this has been seen in many parts of the capital, Addis Ababa, and the rest of the country. To mention some of them:

- A three story building which had been under construction for ten months collapsed In Addis Ababa, Summit Pepsi Industrial area on April 27, 2017. This is the second time a building has collapsed in the same area while being constructed (Addis Fortune Magazine, 2017).

- A portion of a building under construction at the headquarters of the Federal Government Communications Affairs Office collapsed during concrete-slab pouring. On the afternoon of October 21,2018, in Arat Kilo the collapse affected one-third of the total 600sqm construction area of the four-basement and two-storey building. The structure is expected to be used as an auditorium and is designd to host a gym, showroom and offices in addition to a multi-purpose hall with the capacity that holds more than 340 people (Addis Fortune Magazine, 2018).
- A building in Gonder University collapsed. The eight-story building was under construction in Tewodros campus of Gonder University. Nine people are reported to have suffered serious injury while one female is pronounced dead at the scene (Borkena website, 2017)
- A building collapse in Ethiopia's Arba Minch city, 435 Km south of the capital Addis Ababa, has killed four people and injured 11 others. Those killed were tenants in the two-storey guesthouse. Arba Minch mayor said the owner of the building has been put under arrest for constructing an unsafe building structure that had possibly led to the collapse of the building (Xinhua website, 2017).

Taking the above problems and examples of failures due to lack of quality management systems into consideration, let us discuss the benefits of Total Quality Management system.

The potential benefits offered by Quality Management techniques are varied and the consensus from various studies is that it has been successfully applied in other industries and can be very beneficial in the construction industry (Chindo and Adogbo, 2011).

The application of quality management programs enables companies to improve long-term relationships, product and process improvement, create a harmonious team spirit, more customer focused, employee job satisfaction, increased revenues, reduction in quality costs, decreasing waste and rework, better coordination of activities, improved customer service and market competitiveness, enhance professionalism and skills in all spheres of the construction sector, encourage open addressing of problems, better control over the construction process, improved safety, subcontractors with proper quality management systems, and closer relationships with subcontractors and suppliers and help to achieve the intended project objectives and benefits (Low and Teo., 2004; Khan, 2003; Chindo and Adogbo, 2011).

Low et al (2004) suggested that the benefits of TQM include reduction in quality costs, better employee job satisfaction because they do not need to attend to defects and client complaints,

recognition by clients, work carried out correctly right from the start, subcontractors with proper quality management systems, and closer relationships with subcontractors and suppliers.

Citing from Love et al (2004), a major benefit of initiating a TQM program reported by eight Australian construction firms was that there was an increasing awareness and focus by all employees on satisfying both internal and external customers. There was also greater focus by top management on the activities and the needs of lower level employees in the organization. Other benefits reported included improved:

- Project performance (e.g. reductions in rework, waste);
- Client satisfaction (e.g. repeat clients);
- Market share;
- Relations with customers/suppliers (e.g. partnering);
- Staff morale (training and education);
- Measurement of performance (e.g. internal and external benchmarking); and
- Organizational competitiveness (e.g. success in bidding) (Love et al., 2004).

From the above report, all companies reported that the benefits of TQM were not visible during the early stages of implementation. Companies that had started their TQM initiatives in the late 1980s and early 1990s had not realized the financial benefits/rewards inherent within TQM until the late 1990s and early 2000 (Love et al, 2004).

According to Aida T. (2015), QMS provides an organization with increased opportunity to:

- ✓ Improve internal performance – the way it directs and controls its business activities, and
- ✓ Externally-to survive in the competitive business environment.

The internal benefits as mentioned by Aida T. (2015) are

- ✓ Improved management confidence
- ✓ Improved awareness of company objectives
- ✓ Improved communications
- ✓ Responsibilities and authorities are adequately defined
- ✓ Improved traceability to root causes of quality problems
- ✓ Improved utilization of resources
- ✓ Fewer, rejects therefore, less repeated work and warranty costs
- ✓ Errors rectified at the earliest stage, and not repeated
- ✓ Continual improvement

- ✓ Increased productivity
- ✓ Increased profits and company growth

External benefits according to the research by Aida T. (2015) are

- ✓ Easy access to international market through demonstration of competence and improving competitiveness
- ✓ Improved customer satisfaction
- ✓ Consistency in quality of products and services
- ✓ Customer confidence
- ✓ Improved company image (Aida T., 2015)

While QMS helps in meeting the above expectation, we have to keep in mind that it is only a means to achieve the objectives we set for business and is not an end in itself. Therefore, it is up to us to take a more systematic approach to our business objectives.

Aida also concluded that, Quality Management system in the construction industry benefited the clients, the consulting firms, the contractors, and also will benefit other stakeholders and the country as a whole (Aida T., 2015).

According to Juran (1997), the almost universally accepted goals of total quality are lower costs, higher revenues, delighted customers, and empowered employees. Figure 2.3 from Juran Institute's Leadership for the Quality Century workshop graphically illustrates this.

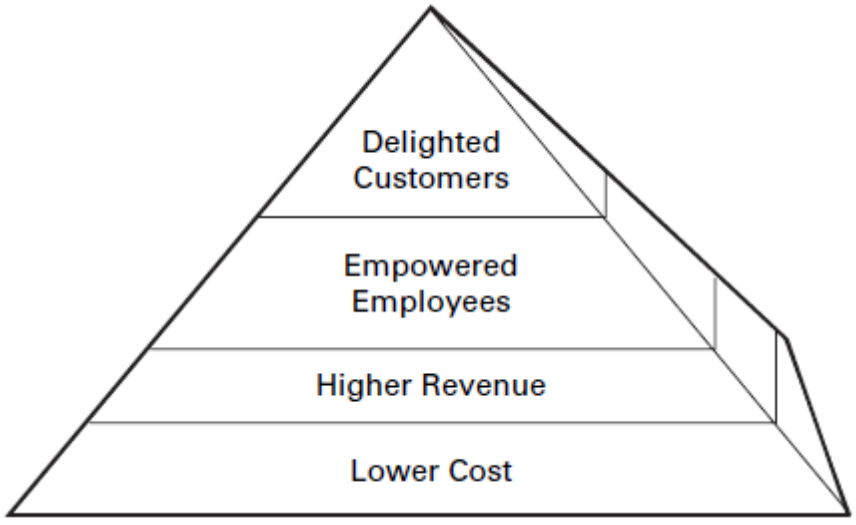

Figure 2.3: Results of total quality management. (Leadership for the Quality Century, 1997, Juran Institute, Inc., Wilton, CT.).

2.6 Difficulties in Implementing Quality Management Program (TQM)

According to Kumar N. (2014), construction, being different from manufacturing and other industries, has many unique problems that cause hindrances in adoption of TQM. Some of the major problems identified are:

- Lack of teamwork
- Poor communication
- Inadequate planning and scheduling

The causes identified by Kumar N (2014) for the above problems are:

- No team-building exercises at the inception of projects
- Lack of understanding of team members' expectations
- Little or no team-oriented planning and scheduling.

Defects arising in construction are mostly caused by poor management and communication. It is unrealistic to assume that mistakes appearing on site are actually made on site. These mistakes may be traced back to the purchase of incorrect or incompatible materials and the failure to retrieve the outdated drawings (Tekleberhan K. 2014).

According to Yusoff et al (2006), there is evidence of disappointing results in many organizations' attempt to implement quality management due mainly to obstacles in implementation. Obstacles in implementation arise from improper attitudes and perception of management and employees, inadequate resources and training as well as inappropriate environments for implementation.

Bubshait and Al-Atiq (1999) enumerated eight obstacles to Quality Management as seen by contracting firms and they include: High cost, especially initial cost, Resistance to change at various levels in the organization, Loss of productivity of the workforce due to the effort exerted in learning the new system and implementation, besides their regular duties, Management interference, Limited ability of personnel, Remote job sites, making it hard to control and track the quality system implementation in all sites, Communication problems between personnel because of language differences and Cultural differences within the workforce.

According to Love et al (2004), employees (particularly site based employees) showed some resistance to the introduction of TQM for a host of reasons, which included fear of the unknown, perceived loss of control, personal uncertainty, "it may means more" syndrome, and an unwillingness to take "ownership" and be committed to change. Other barriers that were identified included:

- Perceived threat to foreman and project manager roles;
- Disinterest at the site level;
- Lack of understanding of what TQM was, particularly on site as many perceived it to be synonymous with QA;
- Geographically dispersed sites;
- Fear of job losses;
- Inadequate training;
- Plan not clearly defined;
- Employee skepticism; and
- Resistance to data collection (e.g. rework costs, non-conformances material waste, etc.).

Harrington and Voehl (2012) point out that, some of the construction problems such as fluctuation of demand and custom work (non-steady state) create difficulties in TQM implementation and TQM could only help organizations cope with such fluctuations. In other words, while TQM could be solution for the construction industry, some of the construction industry problems are themselves obstacles for TQM implementation.

2.6.1 Resistance to Implement Quality Management Program (TQM)

Historically, the construction industry has been reluctant to implement change. This process of change is especially difficult in the competitive environment in which construction takes place and where the bottom line is still the primary motivation of construction companies. Further, companies are prepared to only implement those aspects of Total Quality Management (TQM) programs that will provide them with competitive advantage and improve their overall financial performance. Some of the factors which may cause resistance in the implementation of TQM in construction are discussed below.

1. **Product Diversity**

All buildings constructed are unique. Quality is seen as consisting of those product features which meet the personalized needs of the customers and thereby provide product satisfaction, supplemented with a proviso of freedom from deficiencies (Low S. et al, 2004).

2. **Organizational Stability**

According to Low S. et al (2004), the construction industry has a high number of organizational collapses, especially during a downturn in the economy. Thus, commitment toward TQM strategies and policies that may take several years to provide ‘‘pay offs’’ may be perceived as useless or a misdirection of resources. As compared to the head office, the building site is

transitory. Teams specially formed for a project may cease to exist after contractual obligations end.

3. Misconception of Cost of Quality (COQ)

Construction projects are capital- intensive and cost of quality acquires a great significance. According to Juran (1993), the cost of quality can be considered in the terms of economic of conformance quality.

The quality cost breakdown according to Feigenbaum (1983), who first described the concept in 1956, is;

Quality costs = Quality control costs + Failure costs, where

Quality control costs = Prevention costs + Appraisal costs, and

Failure costs = Internal failure costs + External failure costs

Prevention Costs: - Refer to the cost of quality control activities undertaken before and during production. In other words, prevention cost is the cost of efforts undertaken to prevent failures.

Appraisal Cost: - Is given by the costs incurred for quality control or quality assurance after production – for example, the cost of inspection, testing and examination to assess that the specified quality is being maintained.

Internal Failure Costs: - These are costs of deficiencies discovered before delivery which are associated with the failure (nonconformities) to meet explicit requirements or implicit needs of external or internal customers. Also included are avoidable process losses and inefficiencies that occur even when requirements and needs are met. These are costs that would disappear if no deficiencies existed. The internal failure cost is the cost resulting from a product or service failing to meet the quality requirements – for example, warranties and return, liability costs, product recall cost, and direct cost or allowances.

External Failure Costs: - These are costs associated with deficiencies that are found after product is received by the customer. Also included are lost opportunities for sales revenue. These costs also would disappear if there were no deficiencies (Feigenbaum, 1983).

According to Oakland (1995), the categories of the cost of quality (COQ) have been rationalized into the cost of conformance (COC) and the cost of non-conformance (CONC):

$$COQ = COC + CONC$$

The cost of conformance (COC) is the process cost of providing products or services to the required standards, by a given specified process in the most effective manner, i.e. the cost of the

ideal process where every activity is carried out according to the requirements first time, every time. The cost of non-conformance (CONC) is the failure cost associated with the process not being operated to the requirements, or the cost due to variability in the process (Oakland, 1995).

Similarly, Baden-Hallard (1993) defined the cost of quality as costs associated with conformance to requirements and costs associated with nonconformance to requirements. Costs in the construction industry are being compounded by prevention and appraisal costs coupled with nonconformance costs.

PMBOK shares similar idea about COQ by defining as follows, Cost of quality refers to the total cost of the conformance work and the nonconformance work that should be done as a compensatory effort because, on the first attempt to perform that work, the potential exists that some portion of the required work effort may be done or has been done incorrectly. The costs for quality work may be incurred throughout the deliverable's life cycle.

For example, decisions made by the project team can impact the operational costs associated with using a completed deliverable. Post-project quality costs may be incurred because of product returns, warranty claims, and recall campaigns. Therefore, because of the temporary nature of projects and the potential benefits that may be derived from reducing the post-project cost of quality, sponsoring organizations may choose to invest in product quality improvement. These investments generally are made in the areas of conformance work that act to prevent defects or act to mitigate the costs of defects by inspecting out nonconforming units (PMBOK, 2013).

Contractors often perceive TQM as an extra cost, but they do not realize that it is not the quality that costs but rather the nonconformance to quality that is expensive. The sources of costs associated with the non-achievement of quality include the costs of rework, correcting errors, reacting to customer complaints, having deficient project budgets due to poor planning, and missing deadlines (Culp 1993).

Biggar (1990) argues that the costs associated with implementing a TQM system could be substantial, depending on the size and nature of the company. However, Biggar (1990) pointed out that the costs incurred from not achieving quality can cost owners up to 12% of the total project cost.

According to Arditi and Gunaydin (1997), the cost of quality is considered by both Crosby and Juran to be the primary tool for measuring quality. In their approach, it is used to track the

effectiveness of the TQM process, select quality improvement projects, and provide cost justification to doubters. By bringing together these easily assembled costs of review, inspection, testing, scrap, and rework, one can convince management and others of the need for quality improvement. It is effective in its intended purpose of raising awareness about quality and communicating to management the benefits of TQM in terms of dollars.

The study undertaken by the BRE, (1982) demonstrates that cost benefits can be achieved following the introduction of quality. As shown in Figure 2.4, at least 15 percent savings on total costs of construction can be achieved through eliminating re-work and wasted work. This is accomplished by increased attention or concern for prevention of rejects or wastes on remedial works.

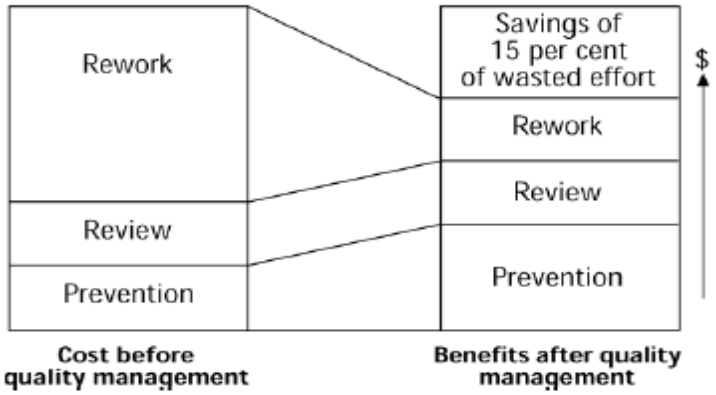

Figure 2.4: Costs and benefits of quality management (BRE, 1982)

In addition to this, according to the study by Aida T.(2015), The challenges possibly faced in the implementation of Quality Management Systems in the selected construction companies was:-

- People do not adapt to change easily.
- It is very difficult to convince people to change the previously used way of doing things.
- Most employees resist the new formats, Working Instructions and procedures.

2.7 Critical Success Factors (CSFs) for TQM

To successfully implement TQM it is important to identify the factors required for the implementation process. Saraph et al (1989) defined CSFs as "critical areas of managerial planning and action that must be practiced to achieve effective quality management in a business unit". These factors may be constructs with latent variables which cannot be measured directly, but can still be assessed indirectly from their manifestation.

According to a study by Haile Y. et al., (2014), the CSFs of TQM differ from one study to another. This lack of absolute common critical success factor, which explains the manner in which the TQM practices in order to bring about improved organization performance, has been the problem of many researchers.

Saraph et al., (1989) in a pioneering study developed a quality management instrument, identifying eight (8) critical success factors of TQM: Role of divisional top management and quality policy, Role of quality department, Training, Product/service design, Supplier quality management, Process management/operating, Quality data and reporting and Employee relations. Their study had considerable influence on later studies, and subsequent research has resulted in the development of different frameworks and constructs based on varying perceptions and objectives (Zhang, 2000). Although these frameworks or models have different TQM approaches, they all lay emphasis on leadership, strategic planning, customer and market focus, human resources focus, process management, continuous improvement, supplier management and business results in one way or the other (Dale et al., 20003; Conca et al., 2004).

Oakland (2003), identified the constructs or critical success factors into two categories of factors; soft and hard dimensions of TQM. "Hard" components of TQM concentrate on the tools and techniques, systems and the supplementary measurement and control of the work process, ensuring conformance to performance standards and the reduction of variability whereas "soft" components relate to areas of behavioral concerns such as increasing customer orientation, employee management, organizational and quality culture. These dimensions are interrelated and together are very important for the successful implementation of TQM.

A great deal of research has been conducted in the field of TQM and its implementation. The study by Sila and Ebrahimpour (2002) reviewing 347 articles on TQM from 1989 to 2000 identified seventy six studies to extract factors for successful implementation of TQM. Out of these, they compiled twenty five TQM constructs which are widely used by researchers to measure TQM implementation. Their study revealed eight common cores of the factors viz: customer focus and satisfaction, employee training, leadership and top management commitment, teamwork, employee involvement, continuous improvement and innovation, and quality information and performance.

Literature also reveals that different countries have adopted similar TQM factors as criteria for quality awards under different titles. However, the criteria for all these quality awards are

derived from three basic frameworks: the Malcolm Baldrige National Quality Award (MBNQA), the European Quality Award (EQA) now called European Foundation for Quality Management (EFQM) Excellence Award and the Deming Prize (DP) (Kobina A. 2012).

A comparative description of the TQM constructs derived from major studies on TQM, the quality management program (three basic award frameworks) in the MBNQA, EFQM, and TQM construct and questionnaire sources are described on Table 2.1.

Table 2.1: TQM Construct and Questionnaire Sources

No.	TQM Construct	Critical Success Factors Identified in Literature	No. of Items For Questionnaire	Sources Of Items for Questionnaire
1	Top management commitment and leadership	• Top management commitment and leadership	7	Saraph et al(1989), Kaynak,H(2003) Baidoun et al (2003), Aspinwall et al (2005), ISO:9001:2000
2	Human resource management	• Employee relations • Employee involvements • Education and Training • Recognition and Reward	12	Kaynak(2003), Baidoun et al(2003) Seraph et al(1989), Conca et al(2004) ISO:9001:2000
3	Customer focus & satisfaction	• Customer management	7	Baidoun et al (2003), Conca et al(2004), Rao et al(1999)
4	Supplier quality management	• Supplier quality management	7	Conca et al(2004), Kaynak(2003) ISO:9001:2000
5	Process management	• Process management Product/service design	6	Baidoun et al(2003), Conca et al(2004) ISO:9001:2000
6	Information Analysis and Evaluation	• Information and Analysis • Evaluation	6	Conca et al(2004), Kaynak(2003) ISO:9001:2000
7	Planning	• Planning • Vision and Plan statement • Communication	8	Conca et al(2004), Seraph et al (1989) ISO:9001:2000
8	Continuous Improvement	• Continuous Improvement • Benchmarking • Statistical process control	8	Conca et al(2004), Baidoun et al(2003) ISO:9001:2000
9	Teamwork	• Teamwork • Role of the Quality Department • Learning	4	Flynn et al(1994)

2.7.1 Selection of factors for survey

From the summary of the literature review of the 12 frameworks, a total of 20 critical factors with their frequencies of occurrence indicated against them (Table 2.2).

The factors were regrouped to ensure that factors addressing similar issues were combined into one construct. A final list of nine constructs for this study: 1. Top management commitment and leadership; 2. Quality planning; 3.Customer focus; 4. Human resource management; 5. Process management; 6. Continuous improvement; 7. Supplier management; 8. Information Analysis and Evaluation; 9.Teamwork

Table 2.2: Frequency of Occurrence of Critical Success Factors in Literature.

No	Critical Success Factors	Frequency	References
1	Top management commitment and leadership	13	Saraph et al(1989), Kaynak,H(2003), Baidoun et al (2003), Aspinwall et al (2005), ISO:9001:2000
2	Customer focus & satisfaction	12	Baidoun et al (2003), Conca et al(2004), Rao et al(1999)
3	Employee relations	11	Kaynak(2003), Baidoun et al(2003), Seraph et al(1989), Conca et al(2004),ISO:9001:2000
4	Teamwork	11	Flynn et al(1994
5	Education and training	9	Kaynak(2003), Baidoun et al(2003), Seraph et al(1989), Conca et al(2004), ISO:9001:2000
6	Continuous improvement	8	Conca et al(2004), Baidoun et al(2003),ISO:9001:2000
7	Supplier quality management	8	Conca et al(2004), Kaynak(2003), ISO:9001:2000
8	Process management	7	Baidoun et al(2003), Conca et al(2004),ISO:9001:2000
9	Information and analysis	3	Conca et al(2004), Kaynak(2003),ISO:9001:2000
10	Planning	1	Conca et al(2004), Seraph et al (1989),ISO:9001:2000
11	Product/service design	1	Baidoun et al(2003), Conca et al(2004),ISO:9001:2000
12	Role of quality department	1	Flynn et al(1994
13	Employee involvement	1	Kaynak(2003), Baidoun et al(2003), Seraph et al(1989), Conca et al(2004), ISO:9001:2000
14	Benchmarking	1	Conca et al(2004), Baidoun et al(2003),ISO:9001:2000
15	Vision and plan statement	1	Conca et al(2004), Seraph et al (1989),ISO:9001:2000
16	Evaluation	1	Conca et al(2004), Kaynak(2003),ISO:9001:2000
17	Communication	1	Conca et al(2004), Seraph et al (1989),ISO:9001:2000
18	Statistical process control	1	Conca et al(2004), Baidoun et al(2003),ISO:9001:2000
19	Learning	1	Flynn et al(1994)
20	Recognition and reward	1	Kaynak(2003), Baidoun et al(2003), Seraph et al(1989), Conca et al(2004),ISO:9001:2000

The critical success factors are further categorized on Table 2.3 below;

Table 2.3: Constructs with their inherent Success Factors

No	TQM Construct	Critical Success Factors (CSFs)
1	Top Management Commitment and Leadership	Top Management Commitment and Leadership
2	Human Resource Management	Employee Relations
		Employee Involvements
		Education and Training
		Recognition and Reward
3	Customer Focus & Satisfaction	Customer Management
4	Supplier Quality Management	Supplier Quality Management
5	Process Management	Process Management
		Product/Service Design
6	Information Analysis and Evaluation	Information and Analysis
		Evaluation
7	Planning	Planning
		Vision and Plan Statement
		Communication
8	Continuous Improvement	Continuous Improvement
		Benchmarking
		Statistical Process Control
9	Teamwork	Teamwork
		Role of the Quality Department
		Learning/Training

2.7.1.1 Top Management Commitment and Leadership

According to Low and Teo (2004), the degree of visibility and support that management takes in implementing a total quality environment is critical to the success of TQM implementation. Without upper –management involvement, commitment and leadership, a TQM program cannot succeed.

Allocation of budgets, planning for change and provision of monitoring structures of progress of works are normally done by top management which clearly accentuate the importance of top management involvement in TQM implementation. Lack of top management commitment is one of the reasons for the failure of TQM (Zhang, 2000).

All implementations should begin with leadership and management commitment. They are absolutely essential for the success of any TQM program. Prior to management commitment, management should have a strong understanding of TQM. This commitment must be coupled with support to make it happen. Once management is committed to TQM, it will provide the necessary resources of time and money to permit improvement (Harrington and Voehl, 2012).

Harrington and Voehl (2012) also state that senior management, in the form of a Quality Steering Committee, might need to draft a vision and mission statements, which summarizes the organization's philosophy with emphasis upon customer satisfaction and quality. An advisory committee is responsible for establishing and developing the policies and procedures for the TQM implementation process. The committee members should be capable of determining the needs of the organization, opportunities for improvement, and goals for improvement initiatives.

The same argument from Arditi and Gunaydin (1997), the success of a TQM program first of all depends on management practices. TQM is a culture and philosophy that must permeate an organization as the method of management. It can thrive only under a senior management that establishes TQM as a top priority.

According to Arditi and Gunaydin (1997), the usual method of management practice in construction industry is management by control. All managers, beginning at the top, are given certain goals for the next year. They, in turn, set goals and impose controls on each of their subordinates. In construction terms, cost, schedule, and possibly quality goals are established for each project. Project managers are rewarded on the basis of meeting these goals. This method has been somewhat successful. It is simple, logical, and consistent. But there are problems when the work gets displaced by the controls themselves. Also, competition to meet short-term goals can lead to internal conflict, adversarial relationships, reduced communication, and accusations when goals are not achieved, and even fabricated reports of conformity.

Culp (1993) support the statement of Arditi and Gunaydin (1997), stating that TQM requires employees to do things differently; therefore, participation by management is essential. To achieve the changed behavior of the staff and improve quality, it is very important to change the organizational environment. Without these fundamental cultural changes, an organization's attempt at TQM will fail. This fundamental change cannot be achieved unless management has a long-term obsession with quality work and continued improvement

According to Chase et al. (2003), upper management, starting with the CEO, has the responsibility to : Learn about quality along with others; Endorse the concept of TQM; Assist in the development of corporate quality policies and goals, Actively lead the way by participating in the activities of the quality steering committee and company training; Provide the necessary resources of time and money to permit improvement (this makes some people nervous because of the initial investment in training, without immediate visible results); Provide suitable

recognition for those who contribute to the quality mission; "Walk the talk," i.e., demonstrate through their behavior that quality is indeed the top priority for the company.

Aida T. (2015) recommended on her study that top management shall be more committed to the development and implementation of Quality Management System and continually improving its effectiveness by communicating to the employees and all members of the organization the importance of meeting customer, statutory and regulatory requirements, ensuring that quality objectives are established, conducting management reviews, ensuring the availability of resources and arranging training programs regularly for employees.

2.7.1.2 Human Resource Management

Management participation in quality activities is not enough to contribute to quality improvements as costs of total quality is difficult to control by management alone (Khan, 2003). Employees are encouraged to show commitments to quality issues. When workers themselves are committed to delivering quality, they take greater initiative towards meeting product and process specifications; detecting and eliminating bottlenecks; improving product and process designs and setting realistic yet challenging performance targets. This is better enhanced if resources are provided for employees for effective training and developmental activities.

According to Arditi and Gunaydin (1997), with TQM, quality becomes everyone's responsibility and the training must be targeted for every level of the company. Customized training plans or programs should be organized for management, engineers, technicians, home and field office staff, support personnel and field labor in line with quality objectives and goals of the organization. The training can be in a form of in-service, external experts on quality, seminars on quality improvement programs or TQM philosophy.

The aim of empowerment as defined through Deming's (1994) theory of management is to increase joy in work and pride in the outcome for all employees. Top management also plays an important role to encourage employees' empowerment and involvement. As stated by Arditi and Gunaydin (1997), top management applies participative management practice which encourages employees to contribute ideas towards identifying and setting organizational goals, problem solving, and other decisions that may directly affect them. Participative management encourages an organization to look outward to the costumer and the costumer's needs.

The same argument by Harrington and Voehl (2012), management should encourage suggestions and make the open working environment, so honest comments can be made without fear of

punishment. More specifically, management should implement a procedure for taking action on those suggestions. Failure of management to act on suggestions within a reasonable time will discourage employees from spending time in preparing their suggestions.

In order to enhance level of involvement, Harrington and Voehl (2012) also suggest eliminating fear, which also in line with one of Deming's point. Fear makes employees reluctant to voice their opinions or question policies, procedures, and decisions. In other words, fear prevents employees from being involved.

Aida T. (2015) recommended on her study that the success of any organization depends on the work force that it have. Therefore, the organizational performance of the company depends on the performance of employees that are satisfied with what they do. If management recognizes employees suggestion and employees are also involved in decision making; there will be motivated and committed employees in the organization.

Aida added that, management should do the following practices in order to make their staffs motivated:

- Take the time to meet with and listen to employees.
- Giving personal gratitude when an employee has put in extra effort on a project or achieved a goal.
- In order to asses areas for improvement there should be upward feedback.
- Create an award program in the organization or in a specific department.

2.7.1.3 Customer Focus and Satisfaction

Mahisa G. (2014) stated that, in the TQM philosophy, total customer satisfaction is the goal of entire system, and a persistent customer focus improves a firm's performance. The function of the construction organization is to provide customers with facilities that meet their needs. Customers may be either internal or external. The external customer is the consumer or client, in other words the end user of the products or services being offered. An internal customer is a second process or department within the organization, which depends on the product of the first. These internal customers receive products and information from other groups of individuals within their organization. Thus, satisfying the needs of these internal customers is an essential part of the process of supplying the final external customer with a quality product. Every party in a process has three roles: supplier, processor, and customer.

Juran M. (1993) defined this as the triple role concept. These three roles are carried out at every level of the construction process. It is also established that increased market competition has led many firms to emphasize customer focus hence customer satisfaction to gain a competitive edge. The greater the degree of market competition, the more positive the relationship between the quality management practice of customer focus and organizational performance.

Harrington and Voehl (2012) argue that customer satisfaction in the construction industry can be achieved by implementing the following steps:

a. Make the customer (internal and external) aware of the organization's quality management initiative;
b. Determine customer expectations;
c. Measure the customer's degree of satisfaction; and
d. Take action to improve satisfaction.

Arditi and Gunaydin (1997) have argument in broader way, by stating; the construction project should be considered as a process where all customers must be satisfied. These customers include internal customers (employees, units, departments within an organization) and external customers (owner, designer, contractor, etc.).

Juran M. (1993) stated that, satisfying the needs of customers is an essential part of the process of supplying the final external customer with a quality product. Juran claims that the parties in a process (supplier, processor, and customer) have a "triple role".

Figure 2.5 shows Juran's "triple role" concept applied to construction. The designer is the customer of the owner because the designer has to receive the project requirements from the owner in order to provide a feasible design.

The designer supplies plans and specifications to the constructor; in this case the constructor is the designer's customer because the constructor uses the designer's plans and specifications, then conducts the construction process, and finally supplies the completed building to the owner. The owner is now the constructor's customer. Quality in each phase is affected by the quality in the preceding phases. Therefore customer service in each phase is important for the overall quality performance of the process. Based on the findings of the study by Aida T. (2015), some of the respondents are not satisfied with the service they get from the firms.

Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectation. By doing this they can improve the customer loyalty leading to more projects. Aida T. (2015),

recommended that in order to satisfy customers need and win more projects the consultants should:

- Research and understand customer needs and expectations
- Make sure that the objective of the organization are linked to customer needs and expectations
- Communicating customer needs and expectations throughout the organization
- Measure customer satisfaction and acting upon the result

If customers are satisfied that means the consultants can get more projects from their clients. This indicates that the overall organizational performance will increase.

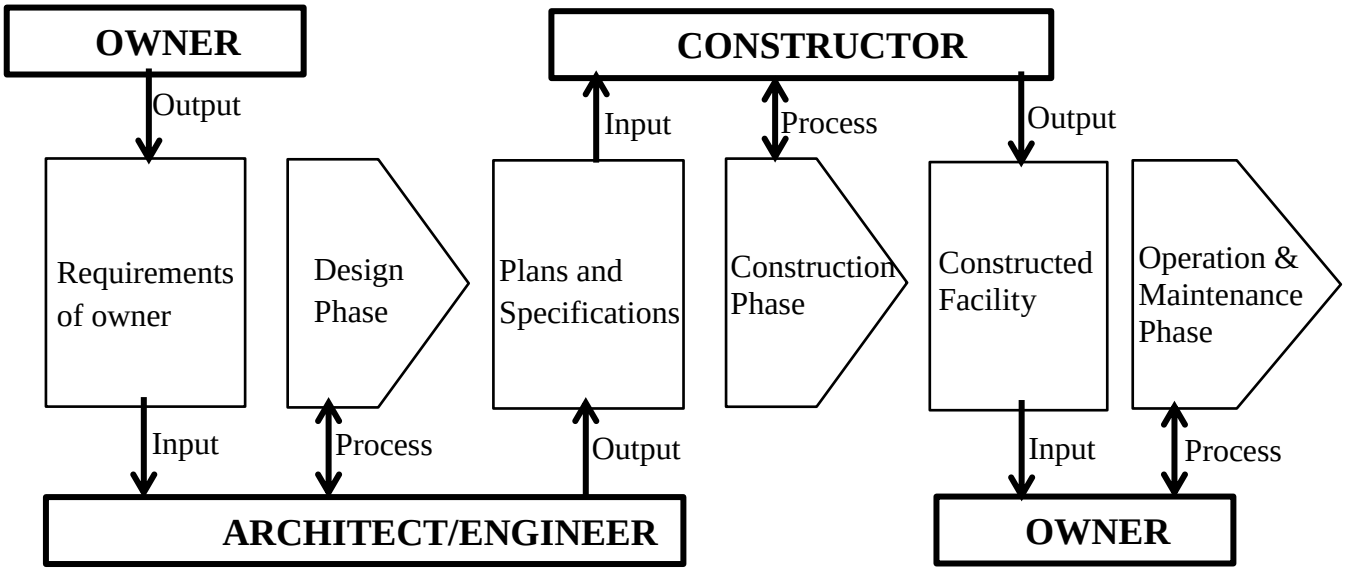

Figure 2.5: Construction Process (Arditi D. et al, 1997)

2.7.1.4 Supplier Management and Involvement

Mahisa G. (2014) stated that, supplier quality is an important dimension of quality management as defective incoming materials and parts lead to process and product quality problems. Purchased materials and parts often become the major contributors to quality problems. Most research identified good supplier relationship as a necessity of maintaining competitive advantage which leads to quality supplier of products and services.

To maintain relation with sub-contractors Pheng and Ke-Wei (1996) stated that by breaking down the barriers to communications and making subcontractors understand that TQM is in their

best interest as well as the main contractor's, they can both achieve cost savings in their construction works and thereby increase profits. To achieve this, the main contractor must first have his own house in order, meaning a top-to-bottom commitment to quality management. Second, communicating TQM to subcontractors requires a translation into "field friendly" language and practices. It has to be understandable in their world.

Harrington and Voehl (2012) suggest, maintaining close and long-term relationships with suppliers results in achieving the best economy and quality. Having close working relationships with a small number of suppliers means that each supplier can be given larger orders, which helps win their loyalty. Conducting frequent and routine visits and other communications can help to enhance the relationship between the supplier and the organization. Maintaining a close relationship and open communication with the suppliers help them to have a good understanding and a feel for their customers' requirements. This can result in better products satisfying the needs of the organization.

Traditionally, in the construction industry, contractors, subcontractors, and vendors are all pitted against one another to compete on the basis of low-bid contracts. Yet, the fourth of Deming's 14 recommendations for reaching a high level of quality stresses that companies must end the practice of awarding business on the basis of price tag alone.

According Arditi D. & Gunaydin M. (1997), successful projects in the future are likely to be decided based on quality, life-cycle costs (not initial cost), and supplier responsiveness, which can only be achieved through partnership relationships; these relationships will involve fewer suppliers, and they are expected to be based on mutual trust. This is already being proven true in certain areas of the industrial construction market. Long-term partnering agreements have been formed between a number of owners and contractors. Some owners are requiring their contractors to have formal TQM programs, and both owners and contractors are requiring their vendors to implement TQM if they wish to be considered for future work.

2.7.1.5 Process Management

A process is a way of getting things done. A process consists of the tasks, procedures and policies necessary to carry out an internal or external customer need (Mahisa G. 2014). According to the TQM philosophy if the process is correct, so will be the end result (product). Thus the organization should work to improve the process so as to improve the end product or service.

Harrington and Voehl (2012) stated that, process improvement is referred to as statistical methods or statistical process control because measurement and analysis of data are very important for process improvement. Accurate data are very important for both employees and management to make better decisions regarding process improvement. Quality improvement teams can be formed in any organization to examine the processes.

The use of statistical methods was found to be in Gunaydin's survey (1995) the least important factor that affects quality in the construction process and ranked at the very bottom of the importance lists in the design and construction phases by designers, contractors, and construction managers. It can be concluded that all the professionals involved in this study agree that the use of statistical methods has relatively very little effect on the quality of the construction project.

Aida T. (2015) illustrated the model of process based quality management system as follows on Fig 2.6.

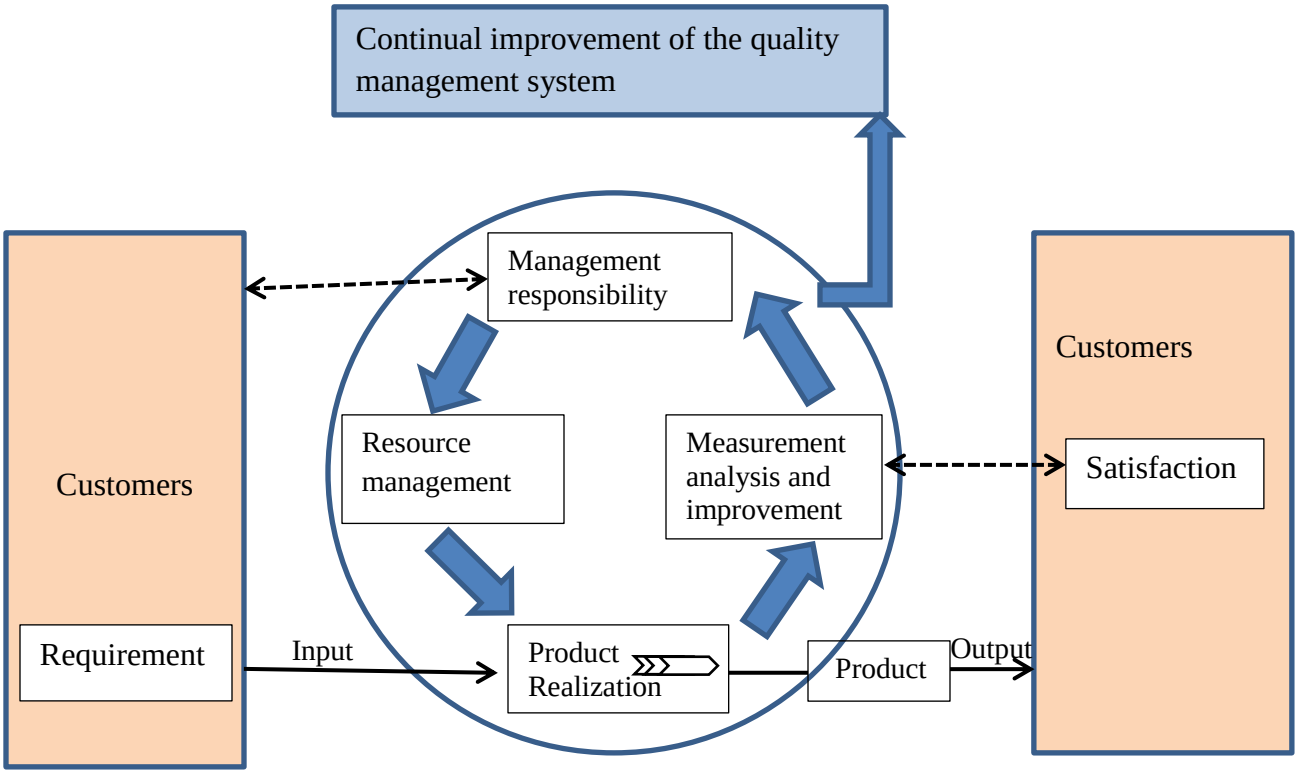

Figure 2.6: Model of a process based quality management system (Aida T., 2015).

2.7.1.6 Information Analysis and Evaluation/Audit

Documentation and control of document is an important element which facilitate in the review process, assessment and attainment of quality management in a firm. According to ISO 8402,

(1994), it is systematic and independent examination to determine whether quality activities and related results comply with planned arrangements, and whether these arrangements are implemented effectively and are suitable to achieve objectives. Quality audit can be used for quality system, processes, products, and services. One purpose of a quality audit is to evaluate the need for improvement or corrective action.

There are several peer reviews, however, the important once are organizational peer review and projects peer review. The reviews can be focusing on procedures and practices in an organization, designs (aesthetics, functionality capacity, calculations and capacity), standards and regulations, and construction processes. Quality programs should also be reviewed and its status and adequacy to the firm should also be checked regularly. Audit/Review can also be done on Progress and the incorporation of improvements and "lessons learned" into the plan for future years (ISO 8402, 1994).

2.7.1.7 Planning

Mahisa G. (2014) stated that, strategic quality management concepts must be put into practice by the inclusion of quality objectives in the strategic planning process and through strategic planning frameworks, like quality function deployment (QFD), which provides specific instructions for approaching, executing, and evaluating the development of strategic concepts. This should be used to plan, develop and implement quality strategies that should result in improving customer and employee satisfaction**.**

Mahisa G. (2014) also defines vision as a written statement stating what the company ultimately intends to become. The mission states what a company is in business to do. Goals are broad targets that stem from the vision and mission. There can be goals in many areas, such as safety, customer satisfaction, business growth, and worker satisfaction. Guiding principles are general statements that reflect in broad terms the company's value system and approach to quality. They address issues such as:

- What are the company views and attitudes toward quality?
- How does the company want to relate to the customer?
- How is the company to treat subcontractors and suppliers?
- How does the company want to relate to its employees?
- What are company views toward professional and technical competence?

Each company needs these clearly defined statements of vision, mission, goals, and policies. These are normally written, disseminated to, understood by, and bought-into by management and the work force (Chase, et al., 2001).

2.7.1.8 Continuous Improvements

Continuous improvement is essential for the very survival of a company due to ever changing tastes of customers and pressures from competitors. Incremental and breakthrough improvements enhance productivity by decreasing costs and/or improving performance. Performance is enhanced through greater responsiveness, shorter cycle times for new products or services, better products, unique marketing, engineering or production strategies (Khan, 2003).

Mahisa G. (2014) stated that, the goal of continuous improvement is common to many managerial theories. This process consists of nine steps as below:

1. Identify the process,
2. Organize a multi-disciplinary team to study the process and recommend improvements,
3. Define areas where data is needed,
4. Collect data on the process,
5. Analyze the collected data and brainstorm for improvement,
6. Determine recommendations and methods of implementation,
7. Implement the recommendations outlined in step six,
8. Collect new data on the process after the proposed changes have been implemented to verify their effectiveness, and
9. Circle back to step five and again analyze the data and brainstorm for further improvement.

The nine-step cycle emphasizes on: focusing the progress, measuring the process, brainstorming for improvement and verification and re-measurement. Mahisa G. (2014) also suggested that, the incremental improvement of the process is achieved through process improvement and control. In every construction organization there are major processes by which all the work is accomplished. However, there are innumerable parts in the construction process. Through the use of flow diagrams, every process can be broken down into stages. Within each stage, input changes to output, and the methods and procedures directing the change of state (i.e. the

construction procedures) can be constantly improved to better satisfy the customer at the next stage.

In the words of Oswald and Burati (1992), "Total Quality Management is often termed a journey, not a destination." This is because of its nature as a collection of improvement-centered processes and techniques, which are performed in a transformed management environment. The concept of "continuous improvement" holds that this environment must prevail for the life of the enterprise, and that the methods will become routinely used on a regular, recurring basis.

Major shifts in the levels of performance can be achieved through innovation. Deming's (2000) "plan-do-check-act" (PDCA) cycle is a systematic procedure for improving methods and procedures by focusing on correcting and preventing defects. Avoiding defects by building in quality is usually less costly than the typical approach of attempting after the fact to determine defects through inspections. The PDCA cycle can maintain any improvement and prevent deterioration (Harrington and Voehl, 2012).

According to Pheng and Ke-Wei (1996), the keys to continuous improvement in the construction process are:

- Learn to work smoothly in teams, i.e. respect the principle of internal supplier to internal customer chains.
- Be proactive to sense reasonable future change and be prepared. Do not wait until you are pressured into change or to act.
- Aim process improvement at the singular goal of meeting clients' expectations.
- Set benchmark at above average incremental process improvement to systems or subsystems and implement/monitor programs.
- Look for root causes when diagnosing the system malfunction or project process bottlenecks.
- Recognize the integrated and interdependent nature of project system and its parts.

It is only from this fundamental mindset, committed posture and attitude shift that real progress will emerge. The end results will boost productivity immensely as well as concurrently cut waste and save costs arising from doing it right first time.

Juran M. (1964) documented the structured approach that many companies use to achieve breakthrough improvements. In recent years rapid change has become a way of life. Many

companies now employ this and similar approaches to create improvements by the hundreds and even thousands.

2.7.1.9 Teamwork

Quality teams provide companies with the structured environment necessary for successfully implementing and continuously applying the TQM process (Arditi and Gunayadin, 1997). The eventual aim of the team approach is to get everyone, including contractors, designers, vendors, subcontractors, and owners involved with the TQM process. Team work is necessary to encourage competitive activities internally among employees and externally with respect to suppliers and customers.

According to Arditi and Gunayadin (1997), teamwork among construction parties such as structural, electrical, environmental, civil engineers, architects, and owners is essential to reach the quality goals for design and construction. Again, a well-planned team structure ensures that quality training is conducted and the continuous improvement processes are well executed in a construction firm.

Any training program should include an orientation to the basic concepts and procedures of TQM. This provides employees with a fundamental knowledge which can later be linked to more advanced topics. TQM requires a participative, disciplined, and organized approach to improving the process, thus team training is also very important. The training program should cover topics as cause-and-effect analysis, team problem solving, interpersonal communication and interaction, fundamental statistical methods, cost of quality measurement, and the collection and evaluation of quantitative information (Harrington and Voehl, 2012).

"Extent of teamwork of parties participating in the design phase" was found to be the most important factor that affects quality in Arditi & Gunaydin's study of TQM in US construction projects. In the same study, construction managers and designers ranked this factor as the most important factor. This result shows that teamwork among parties such as structural, electrical, environmental, civil engineers, architects, and owners is essential to reach the quality goals for design. In the construction phase, "extent of teamwork of parties participating in the construction process" was found to be very important and ranked 2^{nd} by constructors and 4^{th} by construction managers. It appears that the importance of teamwork in the design phase was relatively more pronounced than in the construction phase.

According to Arditi et al (1997), the importance of training is also recognized by every quality expert. Under TQM, quality becomes everyone's responsibility and the training must be targeted for every level of the company. There should be customized training plans for management, engineers, technicians, home and field office staff, support personnel and field labor. It can be argued that the transient construction work force is quite different from the relatively stable manufacturing work force. This transient nature may make it more difficult to train workers, particularly craft labor, for the construction industry. However, there are many aspects, such as training and awareness that are similar between the safety consciousness of construction firms and the implementation of TQM concepts.

A study of TQM by Arditi et al, (1997) in more than 200 companies found that skills in human interaction, leadership, and initiative are instrumental to the success of any quality improvement effort. The demands on these interpersonal skills increase as the complexity and sophistication of the technical systems increase. The training effort follows a specific plan, and its implementation and effectiveness are carefully tracked. It is initiated in a limited number of pilot teams. The success stories of the pilot teams are then used to fuel the remaining training effort. Follow-up training is essential, and is part of the overall training plan and a job requirement for each individual.

2.8 Tools and Techniques for TQM

Total quality management has been developed around a number of critical factors. However, TQM is much more than a number of critical factors; it also includes other components, such as tools and techniques for quality improvement. The techniques and tools are vital to support and develop the quality improvement process (Tarí and Sabater, 2003).

It is evident that some firms fail when they implement TQM because suitable quality management methods such as tools and techniques for quality were not used (Zhang, 2000; Tarí and Sabater, 2003).

Researchers have identified a number of tools and techniques for quality improvement. Tool is defined as a device with a clear function and usually applied on its own whereas a technique has a wider application and is understood as a set of tools (Tarí and Sabater, 2003), hence, Ishikawa (1985), Dale et al. (2003), identify tools and techniques most widely used by firms as shown in Table 2.4.

Table 2.4: Commonly Used Tools and Techniques, Tari and Sabater (2003)

The seven basic quality control tools	The seven management tools	Other tools	Techniques
Cause and effect diagram	Affinity diagram	Brainstorming	Benchmarking
Check sheets	Arrow diagram	Control plan	Departmental purpose analysis
Control chart	Matrix diagram	Flow chart	
Graphs	Matrix data analysis method	Force field analysis	Design of experiments
Histogram			Failure mode and effects analysis
Pareto diagram	Process decision	Questionnaire	
Scatter diagram	Program chart	Sampling	Fault tree analysis
	Relations diagram		Poka yoke (mistake proofing)
	Systematic diagram		Problem solving methodology
			Quality costing
			Quality function deployment
			Quality improvement teams
			Statistical process control

2.8.1 Basic quality control tools

It is prudent to start with the more simple tools and techniques: Check-sheet, Check list, Histogram, Pareto Diagram, Cause-and-Effect Diagram (Fishbone Diagram), Scatter Chart and Flowchart.

1. **Check-sheet**

Check-sheet is used to record events, or non-events (non–conformances). They can also include information such as the position where the event occurred and any known causes. They are usually prepared in advance and are completed by those who are carrying out the operations or monitoring their progress. The value of check-sheet can be retrospective analysis, so they help with problem identification and problem solving (Kobina A. 2012).

2. **Checklist**

Checklist is used to tell the user if there is a certain thing, which must be checked. As such, it can be used in the auditing of quality assurance and to follow the steps in a particular process (Kobina A. 2012).

3. **Histogram**

Histogram provides a graphical representation of the individual measured values in a data set according to the frequency of occurrence. It helps to visualize the distribution of data and there are several forms, which should be recognized, and in this way they reveal the amount of variation within a process. It should be well designed so that people who carry out the operation can easily use them (Kobina A. 2012).

4. **Pareto Analysis**

It is a technique employed to prioritize the problems so that attention is initially focused on those, having the greatest effect. It was discovered by an Italian economist, named Vilfredo Pareto, who observed how the vast majority of wealth (80%) was owned by relatively few of the population (20%). As a generalized rule for considering solutions to problems, Pareto analysis aims to identify the critical 20% of causes and to solve them as a priority (Kobina A. 2012).

5. **Cause and Effect Diagram (Fishbone Diagram)**

Cause and Effect Diagram, which was developed by Ishikawa (1985), is useful in breaking down the major causes of a particular problem. The shape of the diagram looks like the skeleton of a fish. This is because a process often has a multitude of tasks footing into it, any one of which may be a cause. If a problem occurs, it will have an effect on the process, so it will be necessary to consider the whole multitude of tasks when searching for a solution (Kobina A. 2012).

6. **Scatter Diagram**

The relationship of two variables can be plotted in the scatter diagrams. They are easy to complete and obviously linear pattern reveals a strong correlation (Kobina A. 2012).

7. **Flowcharts**

Flow chart is used to provide a diagrammatic picture using a set of symbols. They are used to show all the steps or stages in a process project or sequence of events. A flowchart assists in documenting and describing a process so that it can be examined and improved. Analyzing the data collected on a flowchart can help to uncover irregularities and potential problem points (Kobina A. 2012).

2.8.2 Familiar Models and Tools to Evaluate the Level of TQM

Quality improvement initiatives such as Total Quality Management (TQM), Six Sigma, and Lean Six Sigma could improve the quality of the project's management as well as the quality of the project's product. Commonly used process improvement models include Malcolm Baldrige, Organizational Project Management Maturity Model (OPM3®), and Capability Maturity Model Integrated (CMMI®) (PMBoK 2013).

There have been different models used for implementation and evaluating of TQM. Some of them are;

A. European Foundation for Quality Management (EFQM) model

The EFQM excellence model is European model based on Total Quality Management – TQM (Oakland, 2003). It is designed for all organizations that are interested in continuous improvement and progress towards excellence. The main purpose of the EFQM model is self-assessment of the organization in order to achieve continuous improvement of quality. It helps identify strengths and opportunities for improvement and encourages solutions. It allows for an independent view on the organization and its functioning.

The EFQM model is a basis for assessment and evaluation of a business aspiring to receive the European Quality Award (EQA). It is based on 9 criteria; (1) leadership, (2) policy & strategy, (3) people, (4) partnership, (5) resources, (6) processes (7) customer results, (8) people results, (9) key performance results (Josef G. et. al, 2014).

One of the major differences between the Malcolm Baldrige National Quality Award and the European Quality Award is the emphasis the EQA puts on self-assessment. The EQA makes the principle of self-assessment an entry requirement for companies applying for the award. A second difference between the EQA and the MBNQA, which Conti feels is a weakness in the EQA, is the apparent absence of the fundamental internal results category. Some people argue that internal results are implicit in other categories, but Conti feels that "it is inadmissible that such an important category should be absent or implicit in some other category." (Juran M. 1993).

B. Construction Quality Assessment System (CONQUAS)

It was developed by Building & Construction Authority (BCA) of Singapore. It is applicable only for new building projects which are at the start of the construction works. The system objectively measures constructed works against workmanship standards and specifications. In order to measure the project quality, the system uses a sampling approach to represent the whole project. The samples are distributed as uniformly as possible throughout the project, and the number of samples is dependent on the size of the building. The emphasis in this system is on 'doing it right the first time'. Once a project has been evaluated and once a score assigned, there is no re-scoring – that is, rectification and correction made after the assessment is not taken into consideration. Over the years, the CONQUAS system has gained acceptability as a benchmarking tool across several countries (BCA 2017).

For the scoring, the project is divided into three major components – structural, architectural and mechanical & electrical (M&E) works. These components are further divided into different sub-components. For example, under structural components the different sub-components are formwork, rebar, finished concrete, etc. Under architectural components, inspection of internal finishes, roofs and external walls etc. are carried out (Kumar N. 2014).

The advantage with this system is that there is no subjectivity involved in the measurement of workmanship. Thus, product quality can be easily measured by gathering data for different projects over the country. The data can be used for establishing trends of product including opportunities for preventive action. The companies implementing CONQUAS have an opportunity to benchmark their workmanship quality on an international basis. Besides, the companies with a consistently high score gain competitive advantages and build their reputation in the domestic and international market (Kumar N. 2014).

According to BCA (2017), CONQUAS was designed with three objectives:

(a) To have a standard quality assessment system for construction projects.

(b) To make quality assessment objective by:

- Measuring constructed works against workmanship standards and specification.
- Using a sampling approach to suitably represent the whole project.

(c) To enable quality assessment to be carried out systematically within reasonable cost and time.

C. Malcolm Baldrige National Quality Award (MBNQA)

During the 1980s there was a growing interest in the United States in promoting what is now called total quality. Many leaders in the United States felt that a national quality award, similar to the Deming Application Prize of the Union of Japanese Scientists and Engineers, would help stimulate the quality efforts of U.S. companies (Juran M. 1993).

A number of individuals and organizations proposed such an award, leading to a series of hearings before the House of Representatives Subcommittee on Science, Research, and Technology. Finally, on January 6, 1987, the Malcolm Baldrige National Quality Improvement Act of 1987 was passed. The act was signed by President Ronald Reagan on August 20, 1987 and became Public Law 100-107 (Juran M. 1993).

It was established to enhance competitiveness of American companies by seeking out best known methods as example to others. The Malcolm Baldrige National Quality Award was envisioned as a standard of excellence that would help U.S. organizations achieve world-class

quality. The Malcolm Baldrige Criteria for Performance Excellence have played a major role in achieving the goals established for the Baldrige Award. They now are accepted widely, not only in the United States but also around the world, as the standard for performance excellence (Juran M. 1993).

There are 7 categories that are assessed for excellence in the selection process for the award i.e. (1) leadership, (2) strategic planning, (3) customer & market focus, (4) information & analysis, (5) human resources focus, (6) process management & (7) business results (Juran M. 1993, Mahesh H. 2005).

D. Organizational Project Management Maturity Level (OPM3)

According to Project Management Institute (2008), the maturity model has five levels; initial, repeatable, defined, managed & optimizing. Clusters of OMP3 are standardization & integration of process, project success criteria, project alignment & prioritization, allocating resources to projects, performance metrics, commitment to the project management process, people & competence, organizational fit, teamwork, continues improvement.

E. Six Sigma

Six sigma methodology was formalized in the mid-1980s at Motorolla. It is a methodology for minimizing mistakes and maximizing value. Every mistake an organization or person makes ultimately has a cost – a lost customer, the need to do a certain task over again, a part that has to be replace, time and resources wasted, efficiency lost, or productivity squandered. The sigma scale is a universal measure of how well a critical characteristic performs compared to its requirements. The higher the sigma score, the more capable the characteristic is. For example, if a critical characteristic is defective 31% of the time, we say that this characteristic operates at two sigma. But if it runs 93.3% compliance, we say that it operates at three sigma. Accordingly six sigma means 0.00034% defective and that is only 3.4 defects per million (Craig G. 2005).

The word Sigma is a statistical term that measures how far a given process deviates from perfection. The central idea behind Six Sigma is, if you can measure how many "defects" you have in a process, you can systematically figure out how to eliminate them and get as close to "zero defects" as possible and specifically it means a failure rate of 3.4 parts per million or 99.9997% perfect (Tutorials Point Pvt. Ltd, 2015).

Although six sigma is a little bit exaggerated for construction companies, it fits to manufacturing and service organizations where only 100% quality is acceptable. It is a little bit overstated to implement in construction companies unless we minimize and adjust the sigma level.

Ahmed S. (2012) identified four core phases of training to match the four main points of the six sigma strategy: How to measure, analysis, improve, and control the process that produce increased customer satisfaction, company savings, and a healthier bottom line. These four phases of training would include statistics, quantitative benchmarking, and design of experiments.

The main focus of six sigma, like many other quality initiatives, is on cost and waste reduction, yield improvements, capacity improvements, and cycle-time reductions. Heavy emphasis is put on satisfying customer needs. Organizations try to estimate the financial impact of each operation. These companies also establish clear performance metrics for each improvement in costs, quality, yields, and capacity improvements (Juran M. 1993).

Juran M. (1993) differentiated the six sigma initiatives and many total quality management programs is the assignment of full-time staff. The team leaders and facilitators (often called black belts and master black belts) are chosen carefully and work 50 to 100 percent of their time on the improvement projects. The training for these people is also extensive, usually 4 or 5 weeks of intensive, highly quantitative training. Some companies have actually implemented training programs lasting up to 6 months for their new black belts.

According to Mahesh (2005), the three sigma concept is related to a process yield of 99.973 per cent and represented a defect rate of 2,600 per million, which was adequate for most manufacturing organizations until the early 1980s. Two things occurred in the early 1980s that required a higher-level quality from American manufacturers. One of these was the introduction of mass produced miniature electronics, from transistor radios to televisions, which were produced in large quantities for mass-market consumption.

The second and more compelling force for domestic quality improvement was the opening of global markets and subsequent introduction of Japanese electronics into foreign and American markets. The lower price and higher quality of the Japanese goods made these imports attractive to the global consumer.

To illustrate why 99 per cent quality level is not acceptable, consider the following facts:

- At major airports, 99 per cent quality means two unsafe plane landings per day;
- In mail processing 99 per cent quality means 16,000 pieces of lost mail every hour;

- In power generation, 99 per cent quality will result in 7 hours of no electricity each month;
- In medical surgery, 99 per cent quality means 500 incorrect surgical operations per week;
- In water processing, 99 per cent quality means one hour of unsafe drinking water per month; and
- In credit cards, 99 per cent quality will result in 80 million incorrect transactions in UK each year (Mahesh, 2005)

Six Sigma has two key methodologies:

- DMAIC: It refers to a data-driven quality strategy for improving processes. This methodology is used to improve an existing business process.
- DMADV: It refers to a data-driven quality strategy for designing products and processes. This methodology is used to create new product designs or process designs in such a way that it results in a more predictable, mature and defect free performance.

There is one more methodology called DFSS - Design for Six Sigma. DFSS is a data driven quality strategy for designing or redesigning a product or service from the ground up.
Sometimes a DMAIC project may turn into a DFSS project because the process in question requires complete redesign to bring about the desired degree of improvement (Tutorials Point Pvt. Ltd, 2015).

F. The Deming Application Prize

Another major contribution to the development of total quality has been the Union of Japanese Scientists and Engineers' Deming Application Prize. In his definitive book, Companywide Quality Control, Kondo describes the creation and evolution of the Deming Prize (Kondo 1995).
In recognition of Deming's friendship and contributions to Japan, the Deming Prize was established in 1951 at JUSE's (Union of Japanese Scientists and Engineers) suggestion to encourage the development of QC in Japan. The prizes were originally funded with Deming's generous gift of the royalties from transcripts of his eight-day QC course lectures and the Japanese translation of his book, Some Theory of Sampling, along with other donations (Kondo 1995).
There are two types of Deming Prize—the Deming Prize for individuals and the Deming Application Prize for companies and divisions. Deming Application Prizes are awarded to

companies or operating divisions that have achieved outstanding results through the skillful application of CWQC (companywide quality control) based on statistical methods and are considered likely to continue to do so in the future, where CWQC is defined as "the activity of economically designing, producing, and supplying products and services of the quality demanded by customers, based on customer-focused principles and with full consideration of the public welfare" (Kondo 1995, p. 38).

There are several differences between the Malcolm Baldrige National Quality Award and the Deming Application Prize. There is no limit to the number of companies that may receive a Deming Application Prize in any one year. There is a stronger emphasis on the use of statistical methods than in the Baldrige Award. The company decides itself when it is to receive an objective assessment of whether its activities have reached the level capable of passing the Deming Application Prize examination. Usually the company engages a team of consultants from JUSE to provide on-going consulting support during the 4 or 5 years preceding the official examination (Juran M. 1993).

Kondo (1995), points out that one of the main differences between the Deming Application Prize and the Malcolm Baldrige National Quality Award is that the checklist of items applicants must satisfy to win a Baldrige Award is far more detailed, extending to 23 pages. Due to interest from around the world, the Deming Prize Committee created new regulations in 1984 making it possible for countries outside Japan to apply.

G. Ethiopian Quality Award Organization

Ethiopian Quality Award Organization is established on March 12, 2009 by Walta Information Center and Addis Ababa University after coming to believe that construction, manufacturing and service providing industries need to endorse and adopt the concept of quality. Consequently, the founders elaborated duties, administration and other related issues to consolidate its power by preparing a charter. The charter, which has 5 parts & 63 articles, is edited & evaluated by stakeholders and officially announced on November 15, 2009. The organization envisions of becoming a worldwide known quality award organization by 2030 (EQA magazine, 2017).

According to article 12 of the charter, the organization undertakes the following activities:-

1. It administers the Ethiopian National Quality Award and other awards following assessment based on criteria set in the EQA Excellence Model.
2. It organizes special award programs depending on the nature of the sectors.

3. It delivers consultation services and trainings on quality and other quality management related disciplines.
4. It arranges events like workshops, symposiums and panel discussions on themes related with quality.
5. It conducts and supports researches on quality by admitting fellows who may be based in partner organizations such as Addis Ababa University (EQA magazine, 2017).

Figure 2.7 illustrates the EQA excellence model and weightage of each criterion. The criteria have been divided in to two main categories; Business drivers (Enablers) which has 50% and Results which also has 50% weightage.

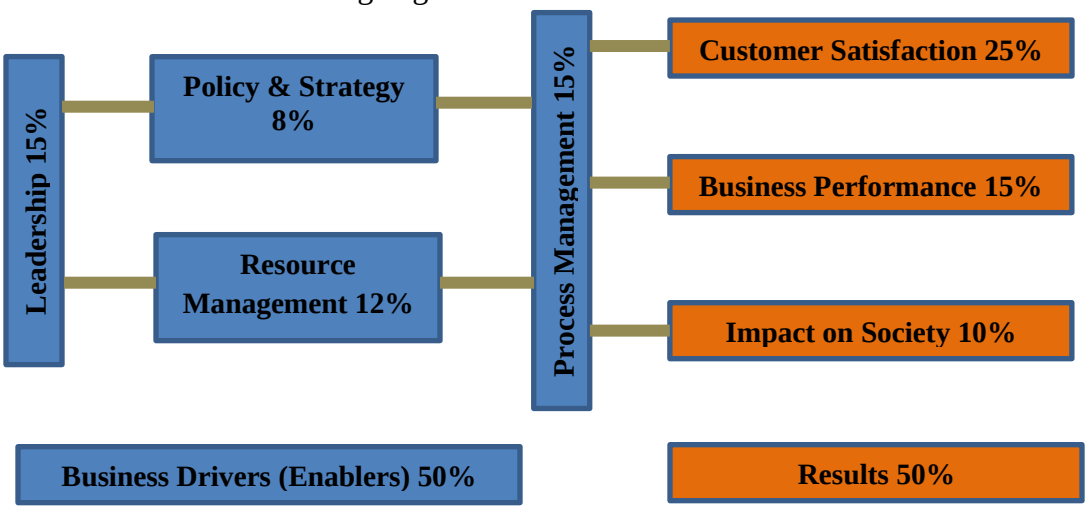

Figure 2.7: EQA excellence model (EQA magazine, 2019)

Within the 11 years of the organization, six award ceremonies have been conducted so far and the 7th will be conducted on 2019/20. There were 322 participant organizations from which 21 have won first level award, 19 organizations won second level & 66 have been awarded appreciation certificate (EQA 10th year anniversary magazine, 2019).

Most of the awarded organizations are beer factories, universities, food processing factories and mining companies. Only one construction company, Tekleberhan Ambaye Construction, has received the award so far on the 4th award ceremony.

According to EQAO, several results have been achieved both in the organization and the companies after the award has been started. To mention some of them:

- Due to EQA's world class evaluation criteria, it enables several companies to see themselves and check and review their process.
- It enables the companies to apply sustainable progress in their quality perspective.
- It empowers experience sharing between organizations.

- It increases the organizations customers' satisfaction and employee motivation.
- It enables the award winning organizations to be more competent in the market and win better recognition from the customers.
- EQAO have got a lot of experiences from its 11 years journey. And this will help the organization to grow and progress further in the future (EQA, 2019).

The organization has set future directions or missions. To mention some of them; correcting the organization structure, creating awareness about quality, making quality a national agenda, making the organization's award to be a well-known brand (EQA magazine, 2017).

Figure 2.8 illustrates the award process of the organization from registration to the award ceremony. Organizations that have interest in participating in the award of EQAO shall follow this process (EQA magazine, 2019).

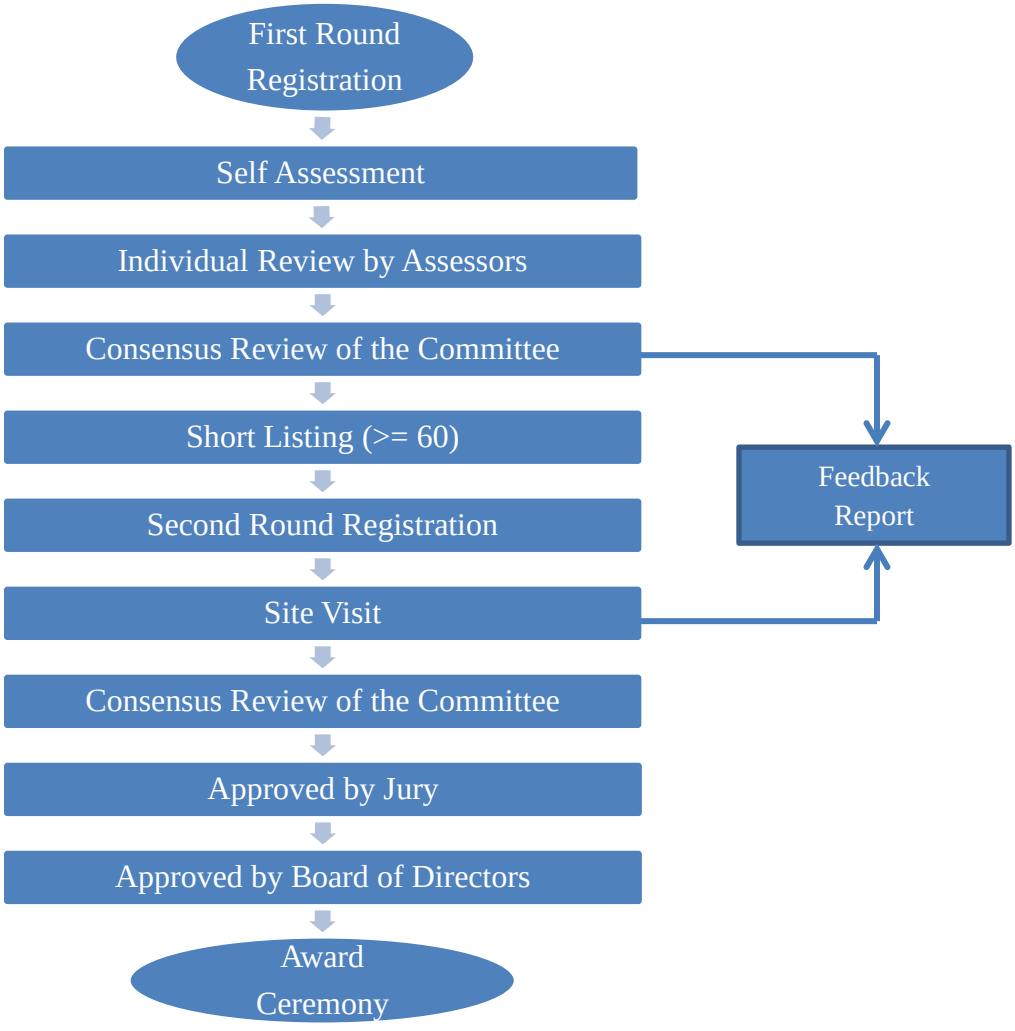

Figure 2.8: EQA award process (on the 6th award ceremony, 2019)

2.9 Summary & Gaps Identified

Different countries used quality award systems worldwide. To mention some of them;

- European Foundation for Quality Management (EFQM) model which was started in Europe and used worldwide.
- Construction Quality Assessment System (CONQUAS) which was started in Singapore and also used worldwide.
- Malcolm Baldrige National Quality Award (MBNQA) which started in the USA
- Organizational Project Management Maturity Level (OPM3)
- Six Sigma – Started by the Motorolla company
- The Deming Application Prize – Started by the Union of Japanese Scientists and Engineers

However, quality award system is new to our country. Recently, it was established on March 12, 2009 and started as Ethiopian quality award (EQA). Within the 11 active years of the organization, 6 award ceremonies have been conducted so far and 322 organizations have been participated from which 21 have won first level award.

Lots of challenges have been faced by EQAO since the beginning of the award. Lack of awareness about quality by the community and organizations as well, foreign influence and lack of income are some of the challenges encountered by the organization. If the challenges could be minimized, it will have great achievement ahead.

To successfully implement TQM it is important to identify the factors required for the implementation process. These factors may be constructs with latent variables which cannot be measured directly, but can still be assessed indirectly from their manifestation.

The CSFs of TQM differ from one study to another. This lack of absolute common critical success factor, which explains the manner in which the TQM practices in order to bring about improved organization performance, has been the problem of many researchers.

Overall, from the literature review, critical success factors (CFSs) for TQM implementation were selected and classified in 9 as follows. Besides, the questionnaire has been developed by breaking down the success factors in to measurable questions.

1. Top Management Commitment and Leadership
2. Customer Management
3. Human Resource Management

4. Supplier Quality Management
5. Process Management
6. Information Analysis and Evaluation
7. Planning
8. Continuous Improvement
9. Teamwork

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology adopted for the study. Research methodology involves the universal rules and procedures upon which this research is based and against which the data collected is interpreted and the results evaluated.

As noted earlier in chapter one, one of the aims of this research is to develop a framework for the introduction of Total Quality Management in construction firms in Addis Ababa. Generally, to achieve the aim of a study, one of the important areas to consider is the kind of method that is adopted. For this reason, the research methodology adopted in this study is in three distinct phases, but complementary to each other. The three phases upon which these methods were applied to are;

- Preliminary phase;
- Second phase; and
- Finally, data analysis phase

3.2 Preliminary Phase

Information on TQM was gathered from literature and the sources of the reviewed literature were in two categories:

- ✓ **Primary source:** This includes policy documents, Academic research journals, research papers, articles and reports etc.

- ✓ **Secondary source**: - This includes textbooks, journals, newspapers and magazines, dictionaries and glossaries, encyclopedias, handbooks, etc.

The Preliminary phase was to recognize & analyze to get a deeper understanding of theoretical concepts related to the construction of TQM. The purpose of it is to enhance the understanding of the theory regarding quality management in the construction industry and also to give an overall view of the research statement and helps the researcher to meet the objectives.

The information gathered from the preliminary phase helped guide the second phase of the fieldwork, which is distribution of questionnaires and collection of data from the key respondents.

3.3 Second Phase

The second phase of the study includes:

- Research method employed;
- Design of research instrument and;
- Data collection

In collecting data for analysis the strategy and approach to deploy are very crucial for and effective and reliable data to address the purpose of the research.

3.3.1 Research Strategy and Approach to Data Collection

There are two types of research strategies; quantitative and qualitative. According to Abiy Z., et. al, (2009), qualitative research involves studies that do not attempt to quantify their results through statistical summary or analysis. Qualitative research seeks to describe various aspects about behavior and other factors studied in the social sciences and humanities. In qualitative research data are often in the form of descriptions, not numbers. But sometimes results of qualitative research are subjected to relatively less rigorous quantitative treatment. Often the goal of qualitative research is to look for meaning. It is thus a type of empirical enquiry that entails purposive sampling for gathering data. It typically involves in-depth interviews, group discussions, artifact studies, projective techniques, and observations without formal measurement. A case study, which is an in-depth examination of one person, is a form of qualitative research. Qualitative research is much more time consuming, but provides more richness to the data.

On the other hand, quantitative research is the systematic and scientific investigation of quantitative properties and phenomena and their relationships. The objective of quantitative research is to develop and employ mathematical models, theories and hypotheses pertaining to natural phenomena. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of an attribute. Quantitative researchers favor methods such as surveys and experiments, and will attempt to test hypotheses or statements with a view to infer from the particular to the general (Abiy Z. et. al., 2009).

This approach typically concentrates on measuring or counting and involves collecting and analyzing numerical data and applying statistical tests. For this study, both methods were used (more qualitative) in order to give a broad generalized set of findings concisely and

parsimoniously (economically or frugally) by measuring reaction of large number of people to limited questions which helps in comparison and statistically aggregating of data (Zhang, 2000) and it requires the use of standardized instrument so that the varying perspectives and experience of people can fit a limited number of predetermined response categories, to which numbers are assigned and measured statistically.

This research was based on survey because; it enabled many researchers to use smaller groups of people to make inferences about larger groups which was expensive to study (Holten and Burnett, 1997). Again, researchers on TQM such as Seraph et al. (1989), Badri et al. (1995), Black and Porter (1996), Flynn et al., (1994), Quazi et al., (1998), Terziovski & Samson (1999), Zhang (2000) and Conca et al., (2004) used surveys in their studies.

3.3.2 Questionnaire Development

The data for this research was collected through the use of 60 questionnaires targeting CEOs, General Managers and Quality Managers in construction firms. The questionnaire was developed in two sections.

- Section one was developed to elicit information to address objectives one (i) and two (ii).
- Section two was also developed to address objectives three (iii), four (IV) and five (V).

3.3.2.1 Section One

Section one is divided into two parts, Parts A and B. Part A is to identify the types of companies and the kind of personnel from whom information is being sought and indeed this is to establish the credibility of the data. The information included in Part A was work experience of personnel, position in company, types of construction works performed, years in business, annual volume of work and number of employees. Part B covers questions on nine (9) key areas of Total Quality Management (TQM) to compute importance index (I.I.) and this includes perception of quality, data acquisition methods, quality improvements, review/audits, training, teamwork, tools and techniques, quality policy and one question on obstacles in quality management implementation.

3.3.2.2 Section Two – TQM Constructs Development and Measure

Regarding the development of the instrument for the quality factors (construct), the method adopted by Saraph et al (1989), Zhang (2000), Conca et al., (2004) was chosen for the study. This method was developed by psychologists and it has been widely accepted in the development of an instrument for measuring variables in social sciences (Conca et al., 2004). For this thesis, the method was pursued in three stages namely,

- Stage 1- identification of critical success factors
- Stage 2 – measurement of construct by selecting initial quality items
- Stage 3 – performing reliability analysis. See data analysis in section 3.3.3.4

Stage 1

Stage one involves carrying out review of literature in order to identify critical success factors on TQM. The process of developing the questionnaire was based on the review of empirical works done by (Saraph et al. (1989), Badri et al. (1995), Black and Porter (1996), Flynn et al (1994), Aspinwall et al., (2005). Nine constructs were developed with twenty preliminary quality items selected.

Stage 2

Stage two involves ensuring that the instrument covers all the relevant spheres of quality management and the whole proposed survey instrument is well worded and understood. Thus, content validity. An instrument has content validity if researchers agree that the instrument is made up of a group of items covering the issues to be measured (Conca et al., 2004). The final questionnaire had 71 initial quality items for evaluation (See Table 3.1). In all, Seventy seven (77) items or questions were developed and measured within a five point Likert scale of 1-5 where;

1=not significant; 2=slightly significant; 3=moderately significant; 4=very significant; 5=exceedingly significant. (Table 3.1, Appendix A)

3.3.3 Data Collection Sampling Technique & Population

From Ministry of Urban Development, Housing and Construction (MUDHo) website, the total numbers of Grade -1 contractors are registered and working in Ethiopia for 2008 EC budget year is 179. From this predefined population size, the researcher's intention is to study building construction firms (GC-1 & BC-1).

Hence, road contractors, water work contractors & special contractors are excluded from selection. Therefore, the number of GC-1& BC-1 was determined and it is 144. A total of 60 GC-1 & BC-1 were selected using simple random sampling technique. The actual sample size of a study is a compromise between the level of precision to be achieved, the research budget and any other operational constraints, such as time. The questionnaires were sent out using the face to face method for data collection to the targeted managers.

3.3.3.1 Sample Size Determination

The 60 respondents of the study were selected from the 144 companies (population) using random sampling method. For the companies the researcher determines the sample size by using the Slovin's (1960) formula (Equation 1).

$$n = \frac{N}{(1+NE^2)} \qquad \text{Equation (1)}$$

Where:

- N is the population size,
- E is the margin of error (10%), assuming high homogeneity of the population
- 1 is constant value

After the samples of the firms have been determined, the researcher used the above sample size determination formula to determine the sample size from the population of the construction firms.

Therefore, the sample size out of the total population size of 144 based on the above formula is 60. Based on the above samples the researcher uses simple random sampling method to select the sample using Microsoft Excel Spreadsheet by using the syntax "RANDBETWEEN (bottom, top)" by assigning integers for the population and select randomly.

3.3.3.2 Survey Participants

The survey participants in this study are General Managers, Project Managers/Operations Managers and the Chief Executive Officers (CEOs) of the construction firms. These respondents are selected assuming that the selections of key respondents shall be generally based on those who have knowledge about the problem and subject area of the research. According to Kumar et al., (1993), indications are that their responses will minimize response error.

3.3.4 Distribution and Collection of Data

The developed questionnaires were distributed to and retrieved in person from construction firms in Addis Ababa Regions. This process of distribution and retrieving of the questionnaires in person was taken for two reasons as suggested by Ahadzie (2007), first, to make sure that the questionnaires get to the intended recipients and secondly, to help improve the response rate. The top managements of these construction firms (the chief executive or project manager or site engineer) were given one questionnaire for a response. Some of the questionnaires were

collected back within a week while others were collected later from the respondents. And some of the questionnaires were distributed through email and returned the same.

Out of the 60 questionnaires distributed, 56 were returned. However, 3 were found to be invalid for analysis as a result of improper filling yielding an effective response rate of 88.3%. This response rate is considered adequate as, according to Oladapo (2005), Idrus and Newman (2002) and Ellhag and Boussabaine (1999), a response rate of 30% is good enough in construction studies.

3.3.5 Data Analysis

Statistical package for social scientist (SPSS.20) was used to analyze the data retrieved from the survey as the research was more of quantitative in nature and the importance index (I.I.) was computed using Microsoft Excel spreadsheet.

This study utilized internal consistency method in determining the instrument reliability with the Cronbach's coefficient, Alpha, as the relevant coefficient to evaluate. Measurement for reliability was done to determine the measurement scale that had been developed. This would produce consistent results if measurement is done on a repeated basis. The next section explains how reliability was performed.

3.3.6 Reliability

Reliability refers whether you get the same answer by using an instrument to measure more than once (Zhang, 2000). Reliability is a statistical tool to measure how reproducible the surveying instrument data is (Zhang, 2000).

According to Mark et. al., 2009, reliability refers to consistency. Although for a questionnaire to be valid it must be reliable, this is not sufficient on its own. Respondents may consistently interpret a question in your questionnaire in one way, when you mean something else! As a consequence, although the question is reliable, it does not really matter as it has no internal validity and so will not enable your research question to be answered. Reliability is therefore concerned with the robustness of your questionnaire and, in particular, whether or not it will produce consistent findings at different times and under different conditions, such as with different samples or, in the case of an interviewer-administered questionnaire, with different interviewers (Mark et. al., 2009).

Mitchell (1996) outlines three common approaches to assessing reliability, in addition to comparing the data collected with other data from a variety of sources. Although the analysis for each of these is undertaken after data collection, they need to be considered at the questionnaire design stage. They are:

- Test re-test;
- Internal consistency;
- Alternative form.

Test re-test estimates of reliability are obtained by correlating data collected with those from the same questionnaire collected under as near equivalent conditions as possible. The questionnaire therefore needs to be administered twice to respondents. This may create difficulties, as it is often difficult to persuade respondents to answer the same questionnaire twice. In addition, the longer the time interval between the two questionnaires, the lower the likelihood that respondents will answer the same way. We, therefore, recommend that you use this method only as a supplement to other methods (Mitchell 1996).

Internal consistency involves correlating the responses to each question in the questionnaire with those to other questions in the questionnaire. It therefore measures the consistency of responses across either all the questions or a sub-group of the questions from your questionnaire. There are a variety of methods for calculating internal consistency, of which one of the most frequently used is Cronbach's alpha (Mark et. al., 2009).

Four methods are used in measuring reliability namely; the split-halves, test-retested, alternative form and internal consistency methods (Zhang, 2000: Hair et al., 2006). For the purpose of this research internal consistency method is used because it is the most widely used reliable estimate in empirical research (Zhang, 2000; Conca et al., 2004). It is more reliable because it requires simple administration (Suresh Chander et al., 2001). The internal consistency of each factor was determined by examining each item inter-correlation and computing the Cronbach's Alpha. The minimum advisable level is 0.7 (Nunnally, 1978; Cronchbach1951) although it may be reduced to 0.6 in exploratory research and anything less than 0.6 is usually eliminated (Hair et al., 2006; Conca et al., 2004). The proposed success factor whose calculated Cronbach's α greater than the critical point of 0.70, is said to be highly reliable and internally consistent.

3.3.7 Important Indices

Fowler and Floyd (1995), defines ranking as a comparison among given options, within pairs of options, by cardinality of importance (first, second, third), or that score items one at a time using a common scale, and it also determines the importance of that factor. In this section, Importance Indices were used to rank the success factors. The Importance Index (I.I) of determination of significance of factors was adopted because, Enshassi et al., (2007) asserted that to analyze data on ordinal scale (e.g. Likert scale 1-5), the application of Importance Index is also suitable.

Important Index (I.I) facilitated the identification of the level of criticality or significance of the critical factors contributing to the successful implementation of TQM in the construction industry. A ranking of important indices were undertaken to ascertain the most prominent of the factors. The important index determination was adopted from Lim and Alum (1995) and Enshassi et al., (2007) in their study of construction productivity: issues encountered by contractors in Singapore and factors affecting labor productivity in building projects in the Gaza strip respectively.

Having identified factors critical for successful implementation of Total Quality Management in construction industry through factor analysis, it is necessary to rank these factors according to their relative importance (significance) from the contractors view point and it was determined by the formula below.

$$\textit{Important Index (I. I)} = \frac{(5n_5 + 4n_4 + 3n_3 + 2n_2 + n_1)}{(5(n_5 + n_4 + n_3 + n_2 + n_1))} * 100 \quad \ldots\ldots\ldots \text{ Equation (2)}$$

Where: n_1 = number of respondent who answered 'Not significant'

n_2 = number of respondent who answered 'Slightly significant'

n_3 = number of respondent who answered 'Moderate significant'

n_4 = number of respondent who answered 'Very Significant'

n_5 = number of respondent who answered 'Exceedingly Significant'

The importance Index (I.I) for each item was calculated. And the group/construct or factor index for each was calculated by taking the average of the importance index of the items in each construct or factors.

CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter focuses on analyzing & discussing the gathered data from respondents through questionnaire. The descriptive statistics of the data provide quantitative insight to this investigation and as such provides an invaluable contribution to the aims of this research. To this regard, the analyses presented here are based on data from the demographics of respondent firms. And again, an in-depth analysis is presented to understand the factors which are critical in the implementation of TQM in building construction industry in Addis Ababa. The results are actually structured to determine the critical success factors and assess the level of importance of the critical success factors using Important Indices. The findings have been presented here in a statistical format such as charts and tables to enable examination and description on the pattern of the responses.

4.2 Profiles of Respondent Firms

4.2.1 The Demographics

Respondents were asked to specify the category of their respective firms and from this, 50.9% are general contractors (GC) and 49.1% are building contractors (BC).

The respondents were also asked how long their firms had been into construction business. From this, 1.9 % indicates that they have been in the business for less than 5 years. Whereas, 17.0% said they have been in the business for 6 to 10 years. Majority of these firms (45.3%) have being in this business for about 11 to 20 years. 35.8% have been in the business for over 20 years. We can deduce that most of the respondent firms have reasonably long experience in the industry.

Figure 4.1 summarizes the response on the average annual turnover of the construction firms. 15.09 % indicated that their annual turnover is 51 – 100 million ETB. 26.42% indicated that their annual turnover is between 101 & 200 million ETB. 13.21% indicated that their annual turnover is between 201 & 300 million ETB and the remaining 45.28% stated that they have annual turnover more than 300 million ETB. This shows that most of the firms have been involved in big projects.

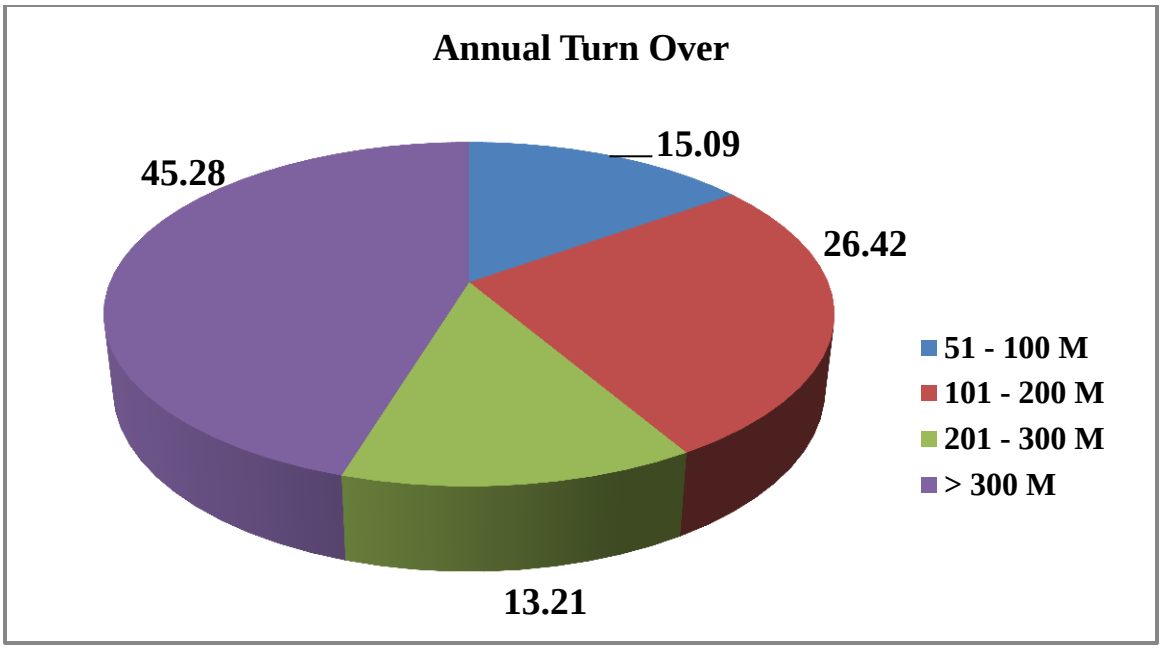

Figure 4.1: Annual turnover of construction firms in million ETB

4.3 Profile of Respondents

The respondents' profile provides descriptive information on the individual respondents. Specifically, it provides information on position, experience and educational level. This information was necessary to confirm the validity of the results obtained and to develop an understanding of the background of the respondents accompanying with experience in the construction industry.

4.3.1 Position of the respondents

The position held by respondent in their respective organization is detailed in Table 4.1. The evaluation of position by respondents was necessary to confirm the validity and reliability of response because I assumed that the more they are educated, the more their knowledge about the subject matter is. However, this assumption may not be always true. Majority of the respondents, 24.5%, have project managerial position.

Table 4.1: Position of respondents in the construction firms

Position	Frequency	Percent
Project Coordinator	10	18.9
Engineering Head	1	1.9
Project Manager	13	24.5
Contract Administration Head	3	5.7
Office Engineer	2	3.8

General Manager	2	3.8
Deputy Manager	2	3.8
Construction Head	6	11.3
Quality Manager	7	13.2
Construction Engineer	1	1.9
Site Engineer	2	3.8
Supervision Head	1	1.9
Production Manager	1	1.9
Planning & Monitoring Department Head	1	1.9
Construction Director	1	1.9
Total	**53**	**100.0**

4.3.2 Educational background of the respondents

The Table 4.2 provides the educational background of the respondents. The educational background ranges from technical to Master's Degree. Majority, 75.5%, had Bachelor's Degree. The assumption is that the more the respondents are educated, the more their knowledge about the subject matter is. However, this assumption may not be always true.

Table 4.2: Educational qualification of respondents in the construction firms

Qualification	Frequency	Percent
Technical	3	5.7
BSC/BA	40	75.5
MSc/MBA	10	18.9
Total	**53**	**100.0**

4.3.3 Experience of the respondents

Generally, the assumption is that, the greater the experience of the respondents in the sector, the greater the understanding of the questions. However, this may not be always true since most of the professionals' experience is based on the norm of the traditional construction industry. The highest frequency for the response was (11-12 years) experience as shown in Table 4.3. This group accounted for 56.6 % of the respondents. Critically looking at Table 4.3, 77.4% of the respondents have over 5 years of experience.

Table 4.3: Experience of respondents in construction

Experience	Frequency	Percent
0-5	2	3.8

6-10	11	20.8
11-20	30	56.6
>20	10	18.9
Total	**53**	**100.0**

4.4 Quality Management Practices

The Following are the results gathered from the Quality Management Practices in the construction firms in Addis Ababa. There were 32 questions grouped into nine (9) key areas for to respond.

4.4.1Perception of Quality

One question was asked in this section to evaluate the organizations perception of quality.

1. What is your organization's perception of quality?

From the survey, it is found that 22.6% responding firms perceive quality as elimination of defects, 5.7% constituting 3 of the respondents gave a tool to increase profits as their response. According to majority of respondents (26.4%), their perception of quality is customers' satisfaction. This means that, a little bit more emphasis is given to customers' needs. Even though the respondents gave stress on the necessity of customers' satisfaction theoretically, the actual experience didn't show the above fact.

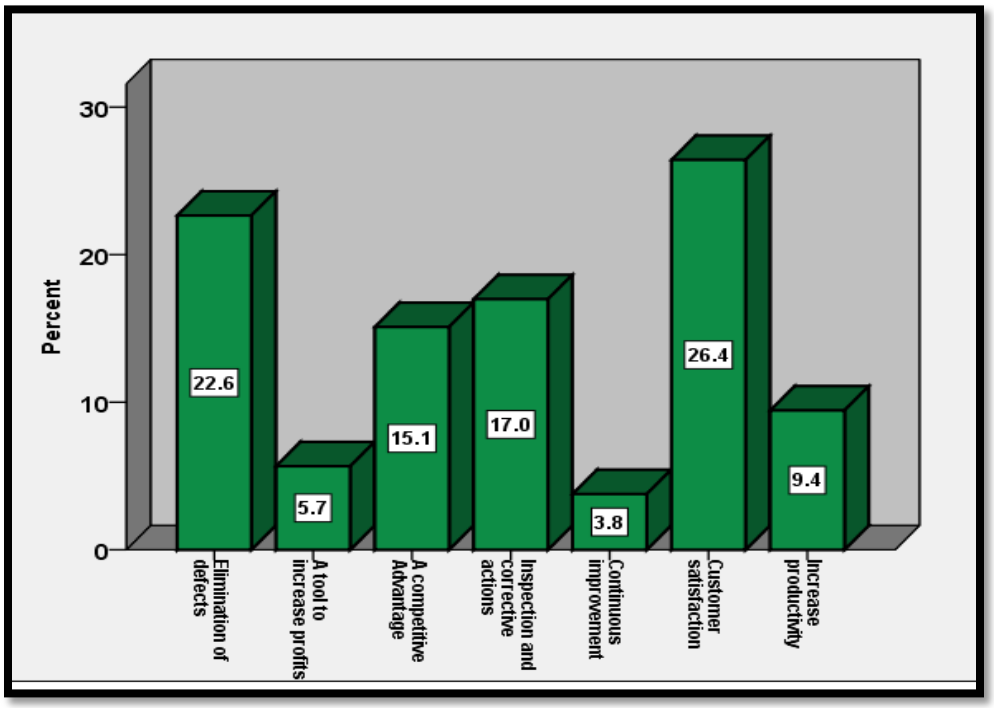

Figure 4.2: Construction firms' perception of quality

2. Is your company accredited with quality system like ISO 9000?

From Figure 4.3, we can see that most of the companies (69.8%) replied that they are not ISO certified and only 30.2% are ISO certified. Most of the firms are not ISO certified or are not willing to be certified and their reasons for not accredited is listed on the next question.

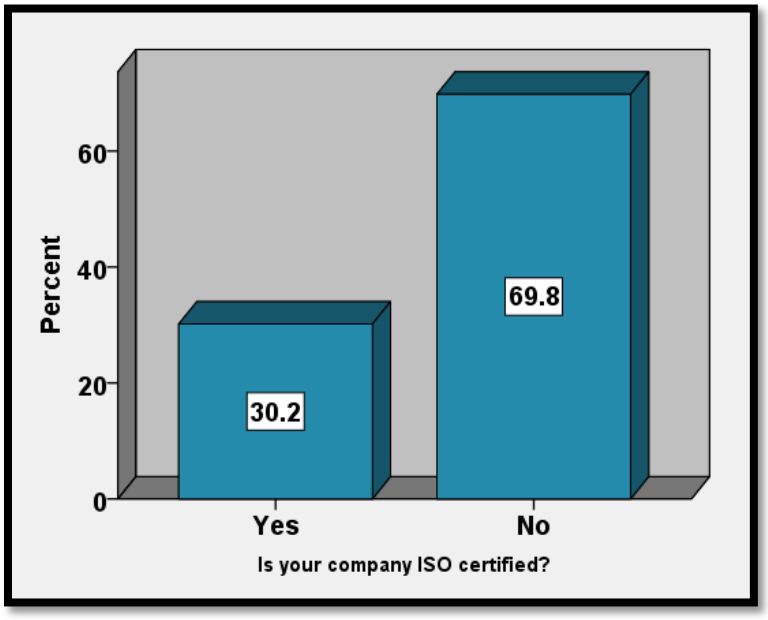

Figure 4.3: Response to ISO certification

3. If no, what are the reasons for not getting accreditation?

As can be seen from Figure 4.4, the majority of the respondents (32.4%), reason out that it is complicated to get accreditation while 29.7% of the respondents said it is not suitable for construction. The reasons provided are not reasonably convincing since ISO certification is holistic in its nature and it has been implemented successfully in construction firms in many countries and in some of local construction firms as well.

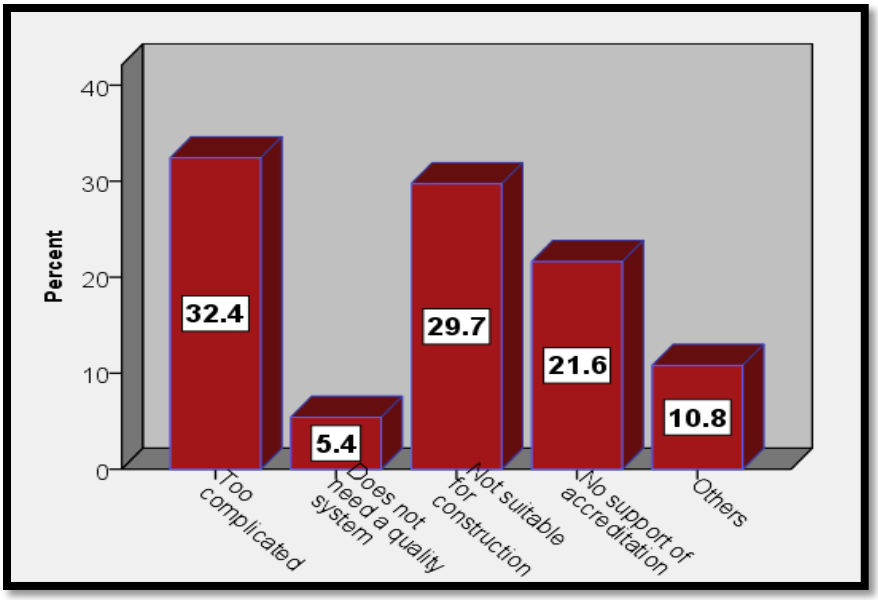

Figure 4.4: Response on reason for not accreditation

4. Does your company have quality manual?

As shown on Figure 4.5, 29 respondents (54.7) replied that their company have quality manual whereas 45.3 or 45.3% have no quality manual. Even though most of the firms replied that they have quality manual, their actual practices do not demonstrate this fact.

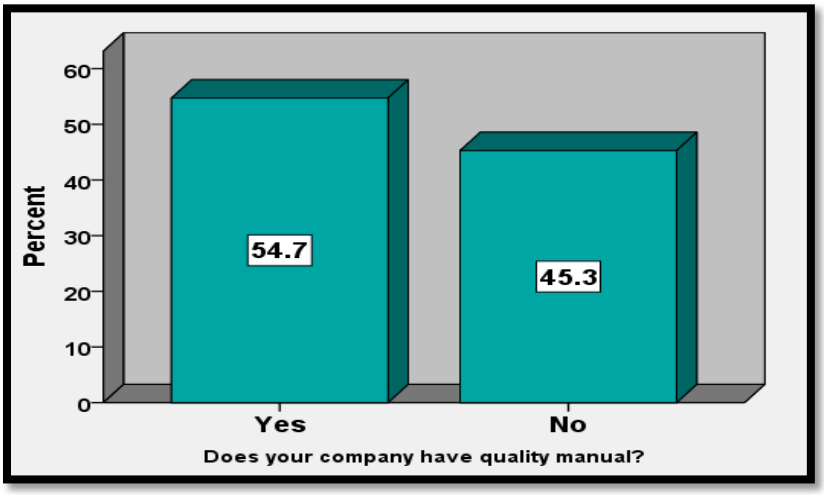

Figure 4.5: Response about quality manual

4.4.2 Data Acquisition

5. Do you collect data to measure the performance of operations?

Out of the total population, 37 respondents (69.8%) replied that they collect data to measure the performance of operations while 16 respondents (30.2%) do not collect data. However,

collecting data only is not enough for assuring quality. Analyzing the data and using it for improvement is an essential process.

Table 4.4: Response on collection of data to measure performance of operations

Response	Frequency	Percent	Cumulative Percent
Yes	37	69.8	69.8
No	16	30.2	100.0
Total	**53**	**100.0**	

6. How does your company measure performance?

Out of the 37 respondents who replied they collect data to measure performances, 32.4% said "fewer customer complaints" is how they measure performance operations. Whereas, 21.6% and 13.5% replied that "increase productivity and profit margins" as their method for data collection respectively. Finally, 32.4% replied that "timely completion of projects" as their method of data collection for performance operations. As stated above on question 5, collecting data is only the first step and firms shall analyze the data and use it for improvement and benefited from it.

Table 4.5: Response on method of performance of operations measurement

Response	Frequency	Percent
Fewer customer complaints	12	32.4
Increase productivity	8	21.6
Profit margins	5	13.5
Timely completion of projects	12	32.4
Total	**37**	**100.0**

7. How would you rate customer focus and satisfaction in your organization?

All the respondents agree on the customer focus and satisfaction by rating very important (90.6%) and important (9.4%).

Table 4.6: Response on customer focus & satisfaction rate

Response	Frequency	Percent
Very important	48	90.6
Important	5	9.4
Total	**53**	**100.0**

8. Do you have a system for gathering customer suggestion?

As can be seen on the Table 4.7, 73.6% of the respondents said that have a system for gathering customer suggestion whereas 26.4% do not have a system. Even though all the firms were agreed on the importance of customer focus & satisfaction on question 9, they do not practice it since 26.4% of them do not have a habit of gathering customers' suggestions and comments on the services they are providing.

Table 4.7: Response on system for gathering customer suggestion

Response	Frequency	Percent
Yes	39	73.6
No	14	26.4
Total	**53**	**100.0**

9. If yes, how do you gather customers' suggestion?

From the 39 respondents who said they have a system for gathering customers' suggestion, 2 (5.1%) respondents replied that customer feedback forms is how they gather customers' suggestion while 20 respondents (51.3%) said they use questionnaire surveys. 16 respondents (41.0%) said they use other methods, which is project meeting, as a method for gathering customers' suggestion. It is important to note that, gathering customers' suggestions or comments only is not enough and they should use the data for improvement which is not always witnessed.

Table 4.8: Response on how to gather customer suggestion

Response	Frequency	Percent	Cumulative Percent
Customer feedback forms	2	5.1	5.1
Questionnaire surveys	20	51.3	56.4
Complaints forms	1	2.6	59.0
Other methods	16	41.0	100.0
Total	**39**	**100.0**	

10. Do you have a system for gathering employees' suggestion?

79.2% of the respondents said that have a system for gathering employees' suggestion whereas 20.8% do not have the system. Similarly, as the above listed discussions, gathering suggestions

only is not adequate. The firms shall use the data for improving weaknesses and strengthen good practices.

Table 4.9: Response on system for gather employees' suggestion

Response	Frequency	Percent
Yes	42	79.2
No	11	20.8
Total	**53**	**100.0**

4.4.3 Quality improvement program

11. Does your organization have a quality improvement program?

From Table 4.10, 9 respondents (17.0%) replied that they do not have a quality improvement program and 28 respondents (52.8%) said that such a plan is under consideration. 5 respondents (9.4%) have a quality improvement program which is implemented recently whereas 11 respondents (20.8%) have a quality improvement plan as part of corporate policy for some time now. Since limited access of data of the respondents like this, accuracy of the figures cannot be granted for sure.

Table 4.10: Response on quality improvement program

Response	Frequency	Percent
No	9	17.0
Such a plan is under consideration	28	52.8
A quality improvement program has been implemented recently	5	9.4
A quality improvement plan has been a part of corporate policy for some time now	11	20.8
Total	**53**	**100.0**

12. What type of quality improvement program do you have?

From the 44 respondents who replied either they have a quality improvement program or considering implementing it, 9 respondents (20.5%) replied that they use quality assurance and the remaining 35 respondents (79.5%) said that they use quality control system as their quality improvement program. The implementation of this practice cannot be confirmed since their documents were not accessed.

Table 4.11: Response on quality improvement program

Response	Frequency	Percent
Quality Assurance	9	20.5
Quality Control	35	79.5
Total	**44**	**100.0**

13. Does your quality improvement plan have the full support of top management?

As we can see from Figure 4.6, 54.5% of the respondents said that their quality improvement plan has the full support of top management while 45.5% replied that there is no full support of the top management on their quality improvement plan. Even though most of the firms replied that they have the full support of top management, we cannot take this for granted since internal documents were not accessed and from the actual experience in the industry.

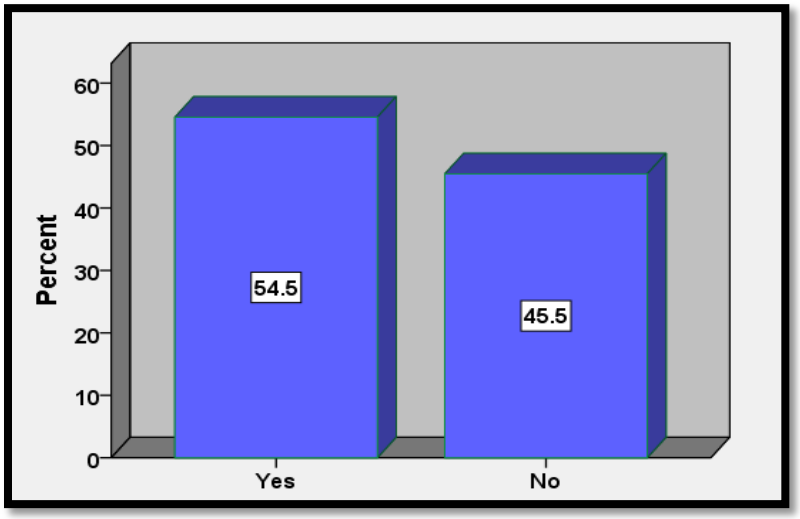

Figure 4.6: Response about full support of top management on quality improvement plan

14. The major objectives of your quality program are:

As can be seen on Figure 4.7, 27.3% of the respondents described that increasing productivity is the major objective of their quality improvement program whereas 15.9% said cost reduction is the major objective of their quality improvement program. 4.5% of the respondents replied that their major quality improvement program is involvement of employees in the quality building effort and similarly 4.5% of the respondents said that the major objective of their quality improvement program is compliance with statutory environment and safety requirement. Finally,

most of the respondents (47.7%) replied that customer satisfaction is their major objective of quality improvement program which we couldn't observe the demonstration of these programs in the actual experience, though.

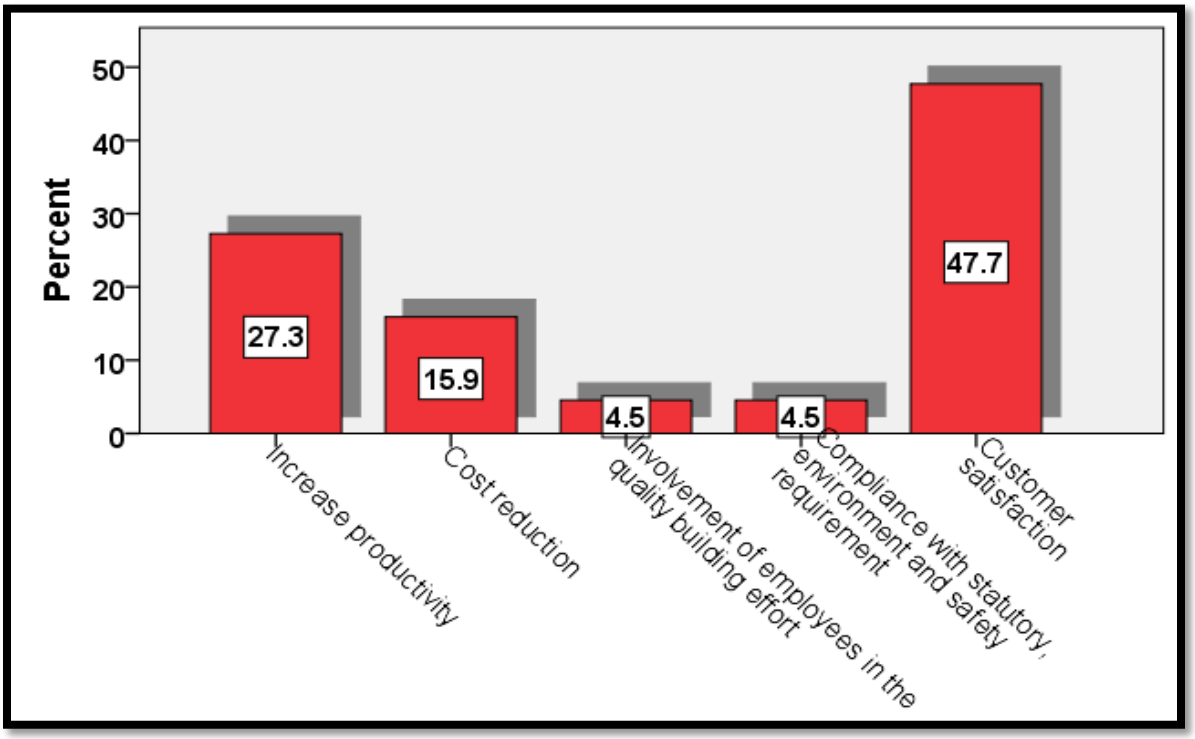

Figure 4.7: Response about the major objectives of quality program

4.4.4 Quality reviews/Audits

15. Do you have a well-established internal quality audit procedure?

For this specific question, 27 respondents (50.9%) replied that they have a well-established internal quality audit procedure. Whereas 26 respondents said they don't have. However, since there was no access to internal documents of the firms, the results obtained cannot be taken for sure.

Table 4.12: Response on well-established internal audit procedure

Response	Frequency	Percent
Yes	27	50.9
No	26	49.1
Total	**53**	**100.0**

16. If yes, how often do you ensure that internal quality audits are carried out effectively?

From the 27 respondents who replied they have a well-established internal quality audit procedure, 2 respondents (7.4%) said they perform internal quality audit once a month while 12 respondents (44.4%) answered that they perform quality audit quarterly. Similarly 12 respondents (44.4) said that they perform the audit once a year (annually). Only 1 respondent (3.7%) chose other duration by writing "we have no regular time" on the questionnaire. This result also cannot be granted for sure since the actual data of the firms were not accessible. However, it is apparent that the experience of local contractors regarding quality audits is very poor and we can witness this from project sites & offices.

Table 4.13: Response on how often internal audit procedure carried out

Response	Frequency	Percent
Once a month	2	7.4
Quarterly	12	44.4
Once a year	12	44.4
Other	1	3.7
Total	**27**	**100.0**

17. Do you check for design conformance to standards/regulations?

As we can see from the Table 4.14, 44 respondents (83.0%) replied that they check for design conformance to standards/regulations whereas 9 respondents (17.0%) do not.

Table 4.14: Response on check for design conformance to standards

Response	Frequency	Percent
Yes	44	83.0
No	9	17.0
Total	**53**	**100.0**

18. If yes, how often do you check design for conformance to standards/regulations?

From the 44 respondents who replied that they check design conformance to standards, 9.1% said that they check design conformance after every design and 28 respondents 63.6% replied that they check design conformance before commencement of projects. The remaining 27.3% said that the do design conformance checking during the construction stage. This seems not real

since it is a day to day experience that design problems usually detected at the middle of the construction works.

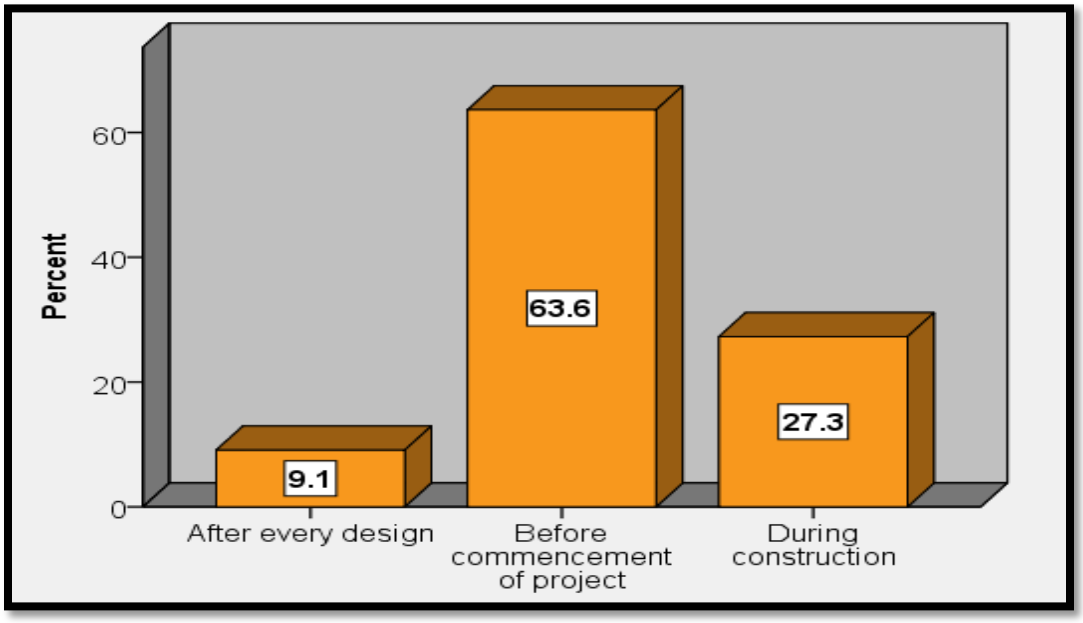

Figure 4.8: Response on how often checking for design conformance to standards/regulations

4.4.5 Training

19. Is formal training in quality improvement given to employees?

From Figure 4.9, 7 respondents (13.2%) said that there is no training given to employees on quality improvement in their organization while 32 respondents (60.4%) replied that there is some training available. And 14 respondents (26.4%) replied that a formal training about quality improvement is given to employees. However, I've a doubt about this result since I didn't see the construction firms delivering a proper training from management to laborers.

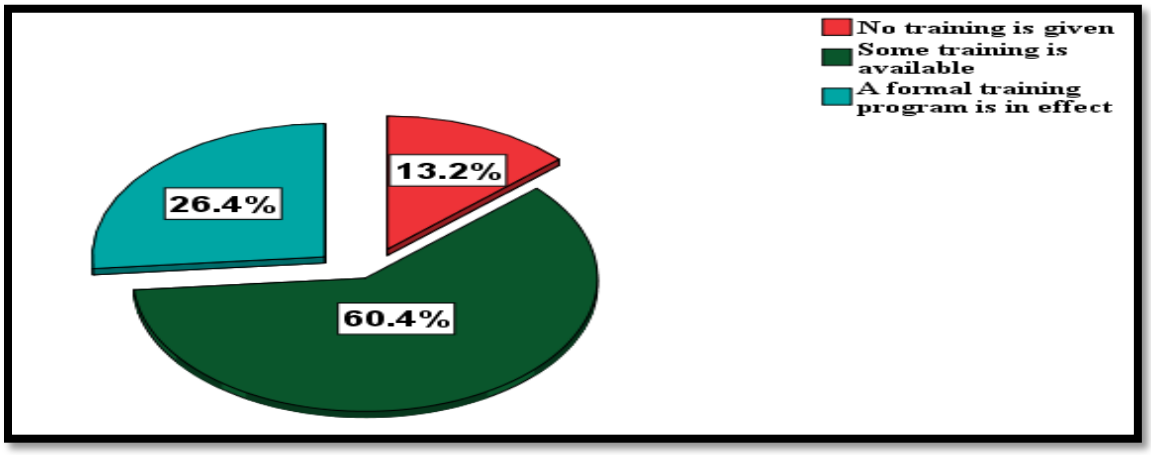

Figure 4.9: Response on training in quality improvement given to employees

20. How do you train your employees?

From the 46 respondents who replied that training on quality improvement is given to the employees in their organization, 23.9% replied that on-site/on job training is to the employees and 41.3% replied that seminars/workshops on quality improvement training is given to the employees. The rest 34.8% said that they give short courses. Since there is no follow up and report by a third party, the existence of the training program cannot be granted for sure.

Figure 4.10: Response on how training in quality improvement is given to employees

21. How often does training organized for employees?

From the 46 respondents who replied that training on quality improvement is given to the employees in their organization, 39.1% said that the training is organized once a year while 28.3% replied that training is organized twice a year and 21.7 replied that the training is organized once every two years. The remaining 10.9% replied other, which is found to be irregular time (not fixed time). The frequency of organizing trainings also cannot be assured without the presence of third party follow up and report. Hence, the reliability of the responses will be taken in to question and shall be further confirmed by case studies.

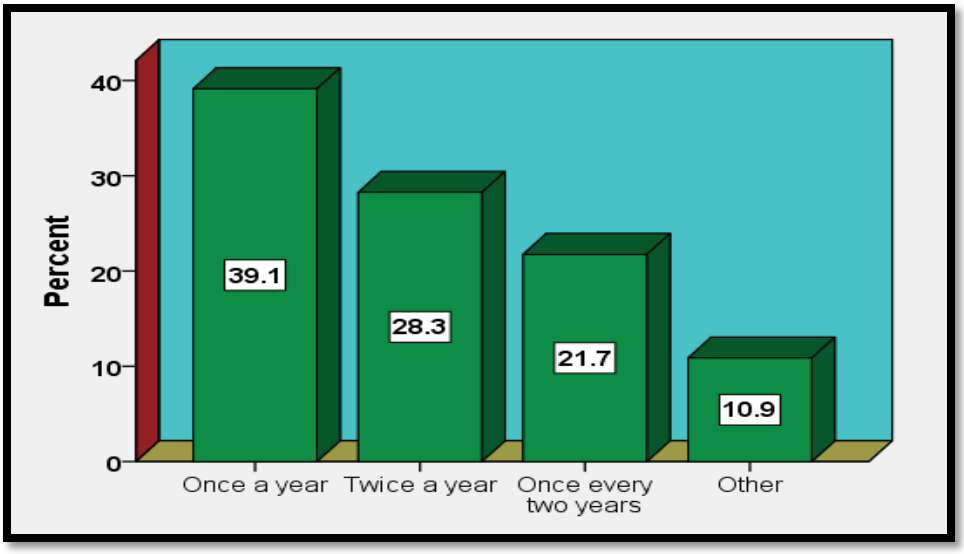

Figure 4.11: Response on how often training organized for employees

4.4.6 Teamwork

22. How does your organization solve problems?

In regarding responses to how the organizations solve problems, 62.3% of respondents said individuals are assigned to solve problems. While 26.4% replied that their organizations set up a multi-disciplinary team for each problem. The other 11.3% said that their organizations use a permanent team which is available to solve problems. However, I've never witnessed assignment of permanent team for problem solving by a construction firms in my experience.

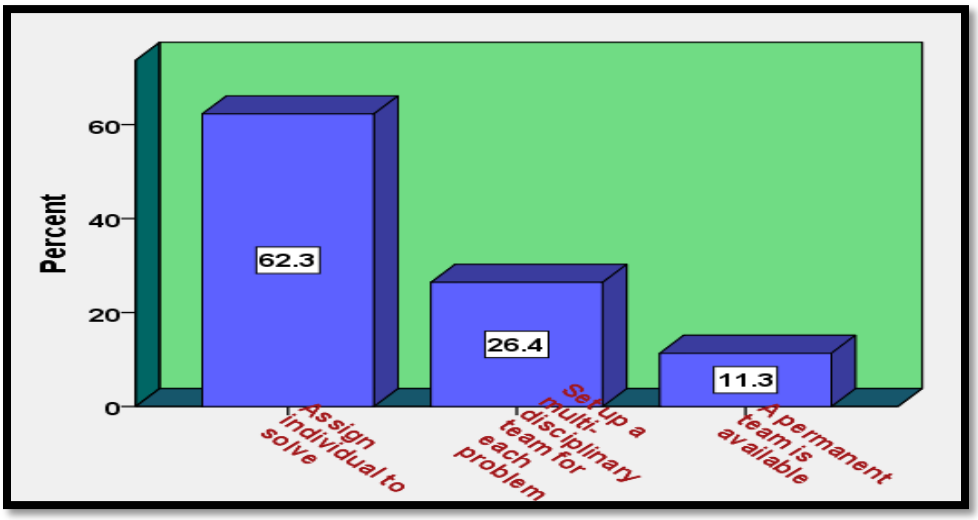

Figure 4.12: Response on how organizations solve problems

4.4.7 Tools and techniques

23. What are the tools used in measuring improvement?

Out of the 53 respondents, 3.8% stated that, there are no tools implemented so far in their organization. 9.4% said that the tools they use in measuring improvement are benchmarking. 5.7% use value engineering technique. While 81.1% replied that they use check sheets as a tool for measuring improvement.

A checklist/check sheet is the most used tool in these firms from the above response (Table 4.15). Hence quality management is better implemented. It is not surprising having the check sheets as the highest tool used because in construction that is the favorable & easy tool to use. Yet, benchmarking & value engineering is new concepts to our construction industry and I don't think the respondents who replied the implementation of these methods gave the accurate information.

Table 4.15: Response on the tools used in measuring improvement

Response	Frequency	Percent
There are no tools implemented so far	2	3.8
Benchmarking (comparison with standards)	5	9.4
Value engineering /reengineering (improve the value of products & services)	3	5.7
Check sheets	43	81.1
Total	**53**	**100.0**

4.4.8 Quality policy

24. Does the firm have quality manual or document? (Policy, Standards, etc.)

As can be seen on Table 4.16, 45.3% replied that they have quality manual or document 54.7% said that they don't have quality manual or document in their organization. Since there was no access to the firms' internal documents, this result cannot be granted for sure too.

Table 4.16: Response on the tools used in measuring improvement

Response	Frequency	Percent
Yes	24	45.3

No	29	54.7
Total	**53**	**100.0**

25. What is the firm's mission statement in relation to quality?

In response to this question, 54.7% replied that quality is captured in the mission statement whereas 3.8% said that there is standalone (separate) policy for quality in their firm. The other 41.5% replied that neither mission statement captured quality nor there is standalone policy for quality in their firm. Even though quality was captured in most of the firms' mission statements, the actual experience didn't show this on ground.

Table 4.17: Response on the firms' mission statement in relation to quality

Response	Frequency	Percent
Quality is captured in the mission statement	29	54.7
There is a standalone policy for quality	2	3.8
Mission statement does not capture quality	22	41.5
Total	**53**	**100.0**

4.4.9 Problems affecting total quality management implementation

26. Does your company have total quality management system? If no, go to question 32

Only 1 respondent (1.9%) replied that there is total quality management implementation in the firm while the rest 52 respondents (98.1%) replied that there is no total quality management implemented so far. There seems a contradiction between responses of question 2 and 26. However, ISO certified companies may or may not implement TQM system as explained on Section 2.4.4. In addition to this, the result shows us that most of the firms are either reluctant to implementing quality management systems especially TQM or have no clue about it.

Table 4.18: Response on total quality management implementation

Response	Frequency	Percent
Yes	1	1.9
No	52	98.1
Total	**53**	**100.0**

27. If yes, what were the difficulties occurred during total quality management (TQM) implementation in your firm? Not limited to one answer

The respondent replied that the following are the difficulties encountered during Total Quality Management implementation process.

- Unique nature of construction and too many uncontrollable factors
- Difficulty in measuring results
- Field employees considered TQM as irrelevant
- Subcontractors and suppliers not interested
- Transient work force

The above difficulties mentioned by the construction firm can be tackled by providing proper training to the employees and subcontractors provided by assuring top management commitment and involvement.

28. If no, what were the reasons and hindrances not to implement TQM? Not limited to one answer

This response helps to know main reasons of the firms for not considering implementation of TQM. The response given by the 52 respondents about the reasons and hindrances not to implement TQM is summarized in the following chart and table. We can see that the option "never heard of TQM" has the highest response (23 responses). The result shows that most of the respondents are new to TQM concept. Hence, awareness creation shall be performed about quality management system & TQM. However, without trying the implementation of TQM, reasons such as: unique nature of construction and other uncontrollable factors, employees & suppliers resistance, lack of time and transient work force cannot be provided as hindrances not to implement TQM.

Table 4.19: Response & frequency on reasons and hindrances not to implement TQM

Response	Frequency
Never heard of it (TQM is a buzzword)	23
Unique nature of construction and too many uncontrollable factors	22
Field employees considered TQM as irrelevant	3
Subcontractors and suppliers not interested	9

Transient work force	7
Lack of time	1
It's expensive to implement	2
Lack of expertise/resources in QMS	13
Lack of top-management commitment/understanding	9
Workers may be resistant to change	17
Others	2

4.6 Success Factors for Quality Management in Construction Firms

4.6.1Reliability

The internal consistency of the set of measurement items refers to the degree to which items in the set are homogenous (Badri, 2007). It can be determined using a reliability coefficient such as Cronbach's Alpha (Cronbach, 1951). It is usually computed for a scale based on a set of items under the scale or construct. It can also be calculated for any subset of the items under a particular scale or construct.

Reliability analysis was performed for the items of each of the nine construct using internal consistency method by determining the Cronchbach's Alpha. Table 4.20 shows the construct and the original items under each construct.

As mentioned previously on section 3.3.6, internal consistency reliability is a measure of consistency between different items of the same construct. If a multiple-item construct measure is administered to respondents, the extent to which respondents rate those items in a similar manner is a reflection of internal consistency. This reliability can be estimated in terms of average inter-item correlation, average item-to-total correlation, or more commonly, Cronbach's alpha. As an example, if you have a scale with six items, you will have fifteen different item pairings, and fifteen correlations between these six items. Average inter-item correlation is the average of these fifteen correlations. To calculate average item-to-total correlation, you have to first create a "total" item by adding the values of all six items, compute the correlations between this total item and each of the six individual items, and finally, average the six correlations. Neither of the two above measures takes into account the number of items in the measure (six items in this example). Cronbach's alpha, a reliability measure designed by Lee Cronbach in 1951, factors in scale size in reliability estimation, calculated using the following formula:

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K}\sigma_{Y_i}^2}{\sigma_X^2}\right)$$ Equation (3)

Where K is the number of items in the measure, σ^2x is the variance (square of standard deviation) of the observed total scores, and σ^2y is the observed variance for item i. The standardized Cronbach's alpha can be computed using a simpler formula:

$$\alpha_{\text{standardized}} = \frac{K\bar{r}}{(1 + (K-1)\bar{r})}$$ Equation (4)

Where K is the number of items, $\bar{r}$ is the average inter-item correlation, i.e., the mean of K(K-1)/2 coefficients in the upper triangular (or lower triangular) correlation matrix (Anol, 2012). The Cronbach's Alpha calculation for this research has been done using SPSS software and the result has been listed on Table 4.20.

Table 4.20: Internal consistency of Critical Success Factors

Constructs/Critical Success Factors	Number of Items	Cronbach's Alpha
Top management commitment and leadership	7	0.914
Employee involvement and human resource management	12	0.929
Customer focus & satisfaction	10	0.866
Strategic quality planning	14	0.932
Process management	6	0.896
Supplier management & involvement	8	0.868
Continuous improvement	8	0.874
Teamwork	6	0.837
Information analysis and evaluation	6	0.884

The minimum advisable level is 0.7 (Nunnally.1978; Zhang, 2000; Saraph et al., 1989) for new instrument. From table 4.20, reliability coefficient ranges from 0.834 to 0.932 which is greater than the recommended value of 0.7. The ratings are within the set limit even though they are slightly lower than some of the works cited. In Zhang (2000) for instance the coefficient ranges

from between 0.84-0.92; Saraph et al., (1989) between 0.71- 0.94 and higher than Conca et al.,(2004) which ranges from 0.52-0.82.

From the analysis above it indicates that the scales or construct were reliable. Consequently, the responses across either all the questions or a sub-group of the questions from the questionnaire are consistent.

In the TQM philosophy, total customer satisfaction is the goal of entire system, and a persistent customer focus is what will get a firm to better performance. Customers may be either internal or external and for a construction organization to outperform its competitors. There is the need to anticipate and respond quickly to customers' demands with new ideas and technologies and to produce constructed facilities that satisfy or exceed customers' expectations. This gives emphasis to the fact that the visibility and support that management takes in implementing a total quality environment is critical to the success of TQM implementation (Low and Teo, 2004).

Most quality initiatives have failed due to lack of management commitment. Management can be committed to quality through communication, defining quality values, expectation and focus, and provision of resources for quality improvement. However, management participation in quality activities is not enough to contribute to quality improvements as Costs of total quality is difficult to control by management alone (Khan, 2003). Employees are encouraged to show commitments to quality issues.

When workers themselves are committed to delivering quality, they take greater initiative towards meeting product and process specifications; detecting and eliminating bottlenecks; improving product and process designs and setting realistic yet challenging performance targets. This is better enhanced if resources are provided for employees and they are taken through effective training and developmental activities. According to Low and Teo (2004), Teamwork also provides companies with the structured environment necessary for successfully implementing and continuously applying the TQM process. The eventual aim of the team approach is to get everyone, including contractors, designers, suppliers, subcontractors, and clients involved with the TQM process.

4.7 Perceived Importance of Critical Success Factors for TQM Implementation in Building Construction Industry

Important Index (I I) facilitated the identification of the level of criticality or significance of the critical factors contributing to the successful implementation of TQM in the construction

industry. A ranking of important indices were undertaken to ascertain the most prominent of the factors.

The result in Table 4.34 shows the ranking of the nine (9) factors identified which are critical for the implementation of TQM (See appendix B for detailed results). From Table 4.34, it is clearly shown that "Strategic Quality Planning" was ranked first (1st) with an average importance index of 66.25, followed by Teamwork with an average importance index of 66.04. "Customer Focus & Satisfaction" is ranked third (3rd) with an average importance index of 65.02. "Supplier Management & Involvement", "Employee Involvement & Human Resource Management", "Process Management", "Information Analysis & Evaluation", "Top Management Commitment & Leadership" and "Continuous Improvement" factors were ranked 4th - 9th position with an average importance indices of 63.07, 62.55, 62.39, 60.06, 59.84, 57.08 respectively.

From the table, it can be noted that the three most highly ranked factors; "Strategic Quality Planning", "Teamwork" and "Customer Focus & Satisfaction" factors are "Soft" Aspect of TQM, while the three least ranked factors; Information Analysis & Evaluation, Top Management Commitment & Leadership and Continuous Improvement are "Hard" Aspect of TQM. The majority of the current quality management practices of these firms actually concentrate on the "Soft" aspect of TQM. However, the top ranked success factors did not necessarily mean that they are implemented in the firms accordingly. The respondents replied and ranked the success factor only based on their belief and what they think are necessary.

Table 4.34: Ranking of Critical Success Factors

Success Factor	Average Importance Index	Rank
Strategic Quality Planning	66.25	1
Teamwork	66.04	2
Customer Focus & Satisfaction	65.02	3
Supplier Management & Involvement	63.07	4
Employee Involvement & Human Resource Management	62.55	5
Process Management	62.39	6
Information Analysis & Evaluation	60.06	7
Top Management Commitment & Leadership	59.84	8
Continuous Improvement	57.08	9

Soft practices are long term factors that are related to management issues and aspects and must be considered and targeted in a company's TQM strategy and subsequent implementation plan (Lewis et al., 2006). Soft practices generally deal with human resource management and concentrates on behavioral sides including training for employees, management leadership, teamwork, supplier relationship and management, creating value to customers, and achieving customer satisfaction (Lewis et al., 2006). In order to maximize the effect of soft practices, they should be enhanced by the hard TQM practices. Soft practices are harder to quantify and, therefore, the measurement and assessment of them is a challenging issue for management (Samson & Terziovski, 1999).

Hard TQM practices are related to improvement tools and systems of quality management and are expected to enhance and support the implementation of soft TQM practices (Lewis et al., 2006a; Oakland, 2003). Hard aspects generally include practices such as quality systems, continuous improvement, process management, and information feedback (Lewis et al., 2006). While soft aspects are regarded as intangible, hard aspects are more tangible and, therefore, easier to be measured and assessed. The importance of hard aspects of TQM should not be underestimated.

Nevertheless, the soft TQM element which is essentially the Human Resources aspect of management is also widely covered by management literature and has tremendous effect on firm's performance. According to Rahman (2004), three (3) out of the six criteria of the MBNQA frame work are extensively covered in the management literature. In fact, prescriptions offered by both disciplines are very similar.

Few studies, such as (Zhang,2000; Rahman,2004; Conca et al., 2004;) have concluded that the soft element of TQM has high impact on organizational performance and as such the soft element should also be considered highly essential for successful implementation of TQM and organizational performance. In other words, "Soft" and "hard" TQM cannot be implemented separately, actually the Soft create an environment for seamless diffusion and implementation of "Hard" TQM (Rahman 2004).

Summary

TQM is regarded as a systems approach that considers every interaction among the various practices and as such whatever model or framework being implemented in a firm or organization despite of it being manufacturing, service or public, construction or firm size, the key point emphasized is that its implementation requires an integrated or holistic approach as there exist synergy among the various practices that are critical to TQM.

As mentioned on the discussions of each response, internal data & documents of the firms were not accessible and the responses may not necessarily show the actual experiences of the firms. The respondents replied based on what they think is necessary and may not be based on the actual experiences of their firms.

A lot shall be done on creating awareness on the subject matter and changing the negative attitudes of the stakeholders on quality and quality management systems. There should be an effort towards a cultural paradigm shift to tackle the “no problem” mindset demonstrated by the people in general, and the construction sector specifically since this is the main problem experienced in the country’s construction industry.

CHAPTER FIVE
FRAMEWORK FOR THE IMPLEMENTATION OF TQM

5.1 Introduction

This chapter discusses how to implement Total Quality Management in the construction firms. The frame work is based on the TQM literature, critical success factors perceived by quality managers in the construction firms, and the quality management practices of the construction firms. Again an insight to the need for framework is provided as well as the requirements needed for the design of the framework. Since the result shows that almost all of the respondent firms do not implement total quality management system, the framework is presented from the starting point and shows the whole roadmap.

According to Dale et al. (2003), framework is usually a well-liked output which serves as a means of presenting ideas, concept, pointers and plans in a non-prescriptive manner. It allows users to choose their own starting point and specific course of action and priorities, and to develop the individual dimensions of TQM at a pace that suits the firm's situation and available resources. In this case, framework should be designed to represent the operations of the organization, the systems to enhance the activities that will be carried out bearing in mind the ultimate goal and style of managing quality in an organization.

5.1.1The Need for a Framework for TQM

The purpose of the framework is to provide guidance to institutions introducing TQM in order to indicate to them the way in which the various critical success factors and features of TQM fit together. Aalbregtse et al., (1991), provided reasons why a framework is needed to implement TQM, namely:

- To illustrate an overview of TQM so as to communicate a new vision of the firm;
- To force management to address a substantial list of key issues which otherwise might not be addressed:
- To provide insight into the firm's strength and weaknesses; and
- Most importantly, to support implementation and to improve the chances that TQM adoption will be successful.

Najmi and Kehoe (2000) described the main characteristics of a framework as follows:

- Acts as a guideline.
- Result oriented.
- Literary and empirically supported.

- Time dependent.
- Continuous improvement oriented.

5.1.2 Framework Design Requirements

In general, the following criteria can be considered as a guide in developing a good framework to suit the construction firms (Yusof and Aspinwall, 2000):

- Systematic and easily understood;
- Simple in structure;
- Having clear links between the elements or steps outlined;
- General enough to suit different contexts;
- Represent a road map and planning tools for implementation;
- Answers "how to?" and not "what is?";
- Implementable at reasonable cost and time.

5.2 Framework for Total Quality Management Implementation in Building Construction Firms

Development of any model or frame work has to start from initial idea and concept (Yusof and Aspinwall, 2000) and following that the framework for the implementation TQM is developed as a four-stage implementation process.

5.2.1 Four stages of implementation

The four-stage process of implementing TQM in construction firms are:

1. Start-up and commitment; Starts with top management commitment, quality system implementation: such as ISO 9000 series
2. Implementation process; Launching of the success factors of Total Quality Management
3. Scheme for improvement; Evaluation of the system, specially improving the weakest points of TQM success factors, and continuously improving.
4. Measurement for improvement; Measuring the performance and auditing

However, the above four stages of implementation can be modeled according to Deming's PDCA cycle i.e. Plan-Do-Check-Act (Fig 5.1).

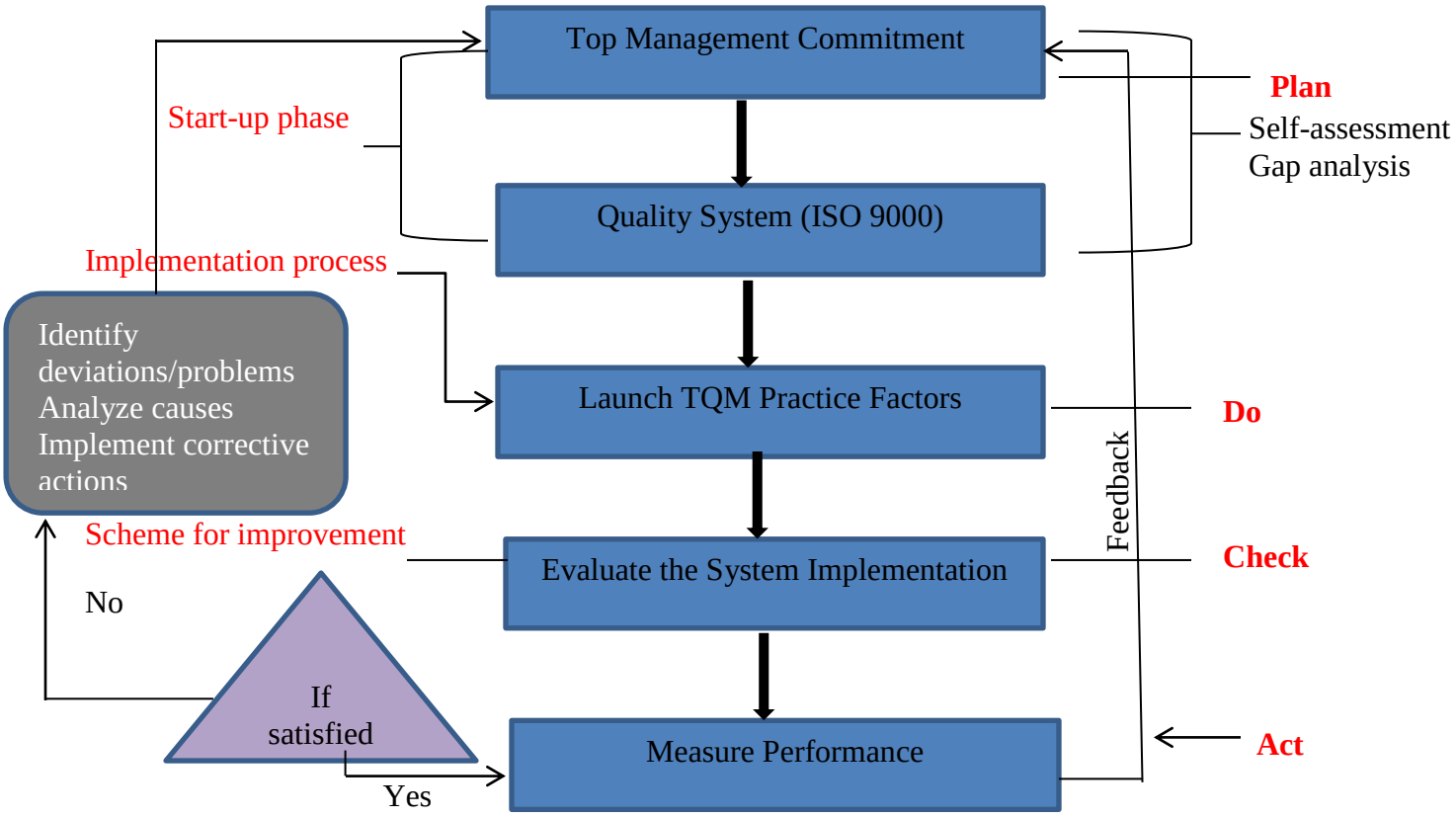

Figure 5.1: Proposed framework for implementing TQM in construction firms

5.2.1.1 Start-up and commitment

The start-up process which is also the planning process requires that top management commitment and involvement is consistent and visible for a successful implementation. It is the driving force for TQM process. It also requires the top management setting up an effective quality management system. However, from the survey conducted, it was deduced that there is a lack of commitment from the top management towards the implementation of the quality system since they concentrated more on fast track plans and profits.

The start-up process will train quality culture and prevent cultural shock in the firm. Top management should convey the firm's vision, mission and strategic direction to employees consistently. Its strategies & planning process should effectively prepare the firm's environment for change process to TQM. The quality system is modeled to suit the management structure of the building construction firms (see fig 5.2). In a typical construction firms, the management and supervisory role is provided by the firms and the subcontractors are responsible for the actual construction work. Consequently, the quality management system is designed to suite the practice.

The quality management system involves three processes: management planning, quality assurance and quality control.

Management planning: This will consist of entire organization planning process including quality planning and strategic planning. This will be undertaken by the top management.

Quality Assurance: This will be the responsibility of the middle management level, and with a construction firms, it is the project management team headed by the operations manager or project manager. Major responsibility is the supervision of work and quality assurance according to the contractual requirements. This includes assuring the completion of the whole project scope in time and within budget and assuring quality of work conforms to the contractual requirements. This can be done using various methods like auditing, and analyzing quality control results, developing and implementing project quality plan etc.

Quality Control: This will be the responsibility of the sub-contractors. Their responsibility will include corrective actions, defect repair, implementing design change. The quality control output will be used in the Quality assurance work.

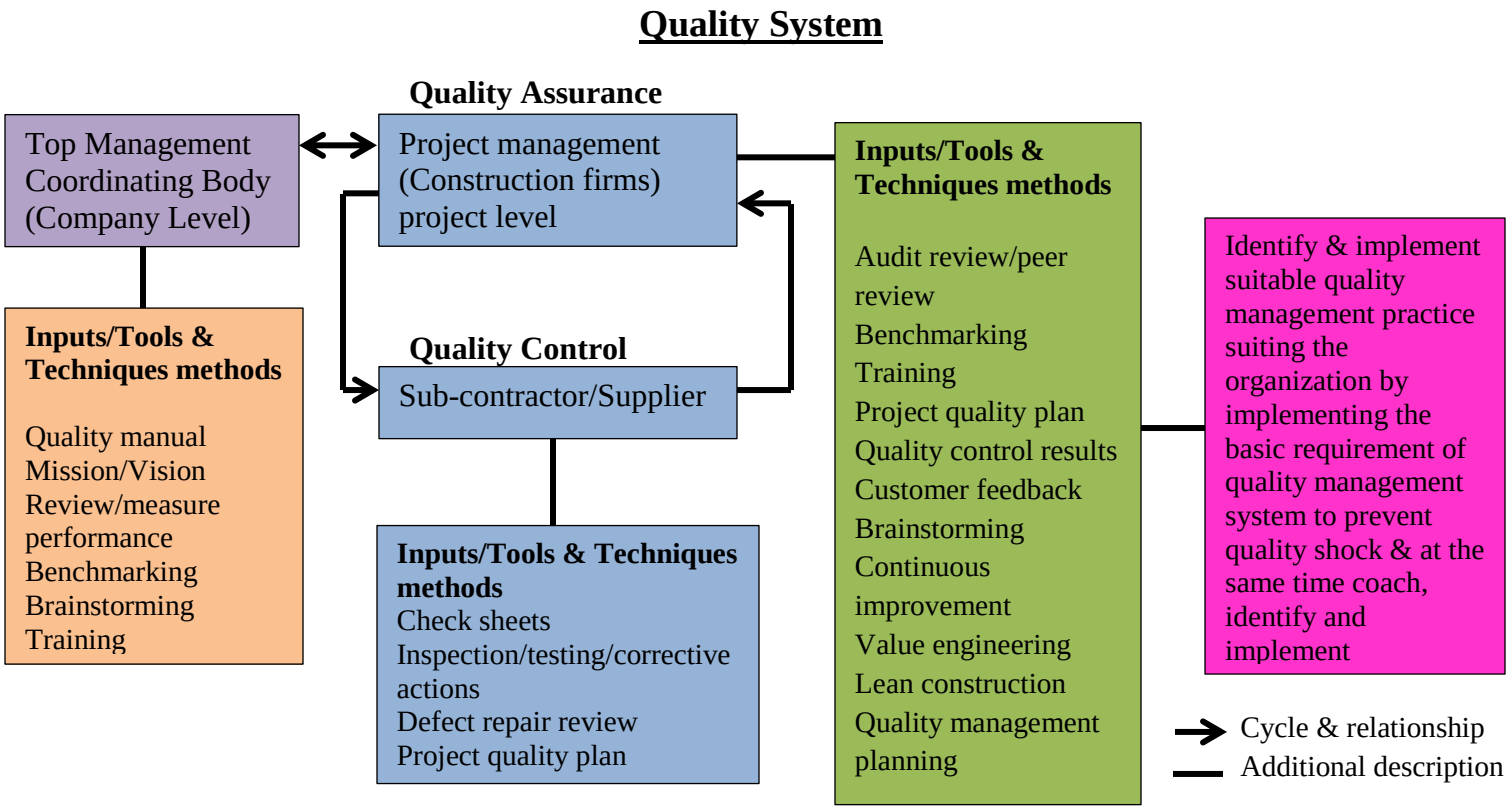

Figure 5.2: Quality System for Construction Firms

5.2.1.2 Implementation process

The TQM factors identified in chapter four consisting of 9 factors manifesting through a set of practices. It is essential that all the 9 factors be considered at this stage and the TQM practices should be practiced in the whole organization. The construction firms shall give special attention to success factors which are at lowest level and improve them. Implementing TQM is implementing these practices.

5.2.1.3 Scheme for improvement

The evaluation of the implementation practices can easily be done by developing an assessment tool. The firm should identify deviations, problems and plan towards corrective actions. From the results we can see that most of the respondents are new to TQM concept. Hence, the firms should improve all aspects of TQM especially the hard aspects.

5.2.1.4 Measurement

The firm may develop its own specific measurement system that can better measure employee satisfaction, customer satisfaction, organizational efficient in the areas of reduction in rework/waste and quality cost, product /service quality and increase in revenue. The firm should continually measure its overall business performance, analyze and compare with the firm's goals. Conclusions made after analysis of results if not favorable i.e. if implementation has not been effective, the PDCA cycle returns to the plan stage. On the other hand, if the implementation produces the desired results, the PDCA still considers to consolidate the results and improve in the never ending PDCA cycle.

Arditi & Gunaydin, 1997, also point out Total Quality flow chart as the following chart and will be helpful in the building construction firms as well.

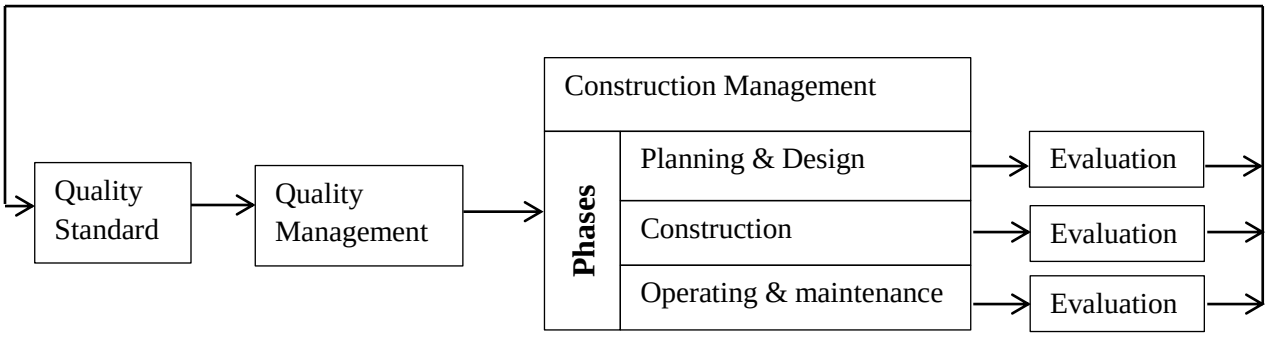

Figure 5.3: Total Quality flow chart

Summary

Although there is no unique framework for implementation, this one will suit the management practice of the construction firms. This is to say that, it is logical and simple model closely based on empirical evidence derived from the analysis. The framework will provide a roadmap for implementation, and it is very dependent on a company needs and current quality initiatives. From the diagram it can be seen that the framework is simple and can be easily understood when various quality initiatives are implemented. Every institution needs a clear and cohesive TQM framework that is understood at all levels of the firm and that supports objectives and the collection of results. Once developed, it is to be implemented, reviewed and modified.

As shown in fig 5.1, this frame work provides an understanding of the components of TQM success in building construction firms. This frame work considers the quality vision, senior management commitment, quality planning, and quality structure as starting points for a TQM process. The framework can be used to assist with the planning, control, introduction and development of a process for implementing TQM. As the framework is non-prescriptive, the sequence to be followed by a firm planning to implement TQM depends on that particular institution’s unique situation.

Evaluations of the quality initiative ensure challenges face to be noted and finally feedback about these results to increase the organization's involvement in improving quality. The framework proposed is derived from the quality management practices of these organizations, problems they faced during the implementation process and the critical success factors perceived to be significant by the quality managers.

CHAPTER SIX
CONCLUSION & RECOMMENDATION

6.1 Conclusion

Based on the findings of the study, the following conclusions are drawn by the researcher:

- Although some of the respondent firms somehow agree on the importance of quality management system, their knowledge about quality management system is very limited and their perception of quality is only of corrective actions rather than preventive actions (quality planning, quality control, quality assurance, and continuous improvement approaches).
- Out of the total respondents, almost all respondents (98.11%) have not implemented total quality management system in their firms.
- The hindrances not to implement TQM as replied by these 98.11% firms who have not implemented total quality management system are;
    - ✓ Never heard of Total Quality Management system
    - ✓ Unique nature of construction and too many uncontrollable factors
    - ✓ Lack of time
    - ✓ It's expensive to implement
    - ✓ Lack of expertise & resource in TQM
    - ✓ Lack of top management commitment & understanding
    - ✓ Workers may be resistant to change

This shows that most of the respondents are new to TQM concept. Without trying the implementation of TQM, reasons such as: unique nature of construction and other uncontrollable factors, employees & suppliers resistance, lack of time and transient work force cannot be provided as hindrances not to implement TQM. Hence, it seems that the main reason for not implementing quality management system is lack of knowledge & poor attitude towards quality rather than the reasons provided above by the respondents.

- Even though one of the objectives of the research was to determine the challenges encountered by the contractors while implementing Total Quality Management System which was set assuming that more firms have experience with TQM, this objective has not been met since almost all (98.11%) of the respondent firms have not implemented TQM.

- Similarly, one of the objectives of the research was to identify critical success factors for Total Quality Management implementation. However, this objective was also not accomplished as almost all of the firms have not implemented Total Quality Management System in their firms.

6.2 Recommendations

Based on the conclusions, the researcher made the following recommendations for stake holders for the successful implementation of TQM.

1. For Construction Firms

- Should dare start implementing quality management system by benchmarking other construction firms or industrial and service providers' experiences that have already started implementing the system. And also they should seek proper consultation & guidance from concerned bodies like Ethiopian Standards Agency and Ethiopian Quality Award Organization.
- Top management must be committed to the development and implementation of Quality Management System and should directly participate in quality management activities
- Construction firms must provide proper training for employees to create awareness about quality management system to minimize employees' resistance to change.
- The firms should understand customers' needs and expectations by doing different researches and make sure that the missions of the organization are linked to customers' needs and expectations.

2. For Clients/Customers

- Clients, private or public, should inquire quality accreditation or quality management system as one of their mandatory technical requirements during construction tendering.

3. Governmental Regulatory Bodies

- Must start implementing TQM themselves in order to be role models and to take the lead in promoting the system for construction firms.
- Should create awareness on quality management system since the main reason for not implementing TQM system is that all of the respondents are new to TQM concept.
- The government should make quality management system implementation as a mandatory obligation during bidding and renewal of construction licenses.

6.2.1 Recommendation for Further Research

The researcher recommends the following areas for further research and investigation which are not considered in this research

1. Further studies should look at the financial aspects of TQM implementation since organizations that want to adopt TQM might be concerned about the financial benefits of the system (the relationship between TQM and organizational efficiency concerning cost, time, and productivity).
2. Since this research discusses TQM implementation on a corporate level, further study should cover TQM implementation in construction project level using a case study approach to find out the perceived importance of quality management system at project sites.
3. Further study may also cover TQM implementation on other construction categories such as; road contractors, water work contractors, special contractors, etc…to find out how other construction categories perceived the importance of TQM.

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APPENDIX A

QUESTIONNAIRE

TOPIC: Total Quality Management Implementation Assessment in Building Construction Firms in Addis Ababa

INTRODUCTION

Total quality management (TQM) has been recognized as an enabler for performance improvement in the construction industry. Many construction companies in the developed countries like in US, Japan, Singapore, UK, and other European countries have been using Total Quality Management (TQM) successfully for a number of years now and reaping rich rewards in improved client, consultant, and supplier relations, reduced "cost of quality", on time and within budget project completions. It is a dynamic process which promotes never ending improvement in the effectiveness and efficiency of all elements of a business to result in an organization doing the right thing first time and all the time in order to ensure complete customer satisfaction.

OBJECTIVES

This research plans:

1. To assess to what extent are Ethiopian building construction companies implementing & committed to Total Quality Management system in the delivery of construction projects.
2. To determine the challenges encountered by the contractors while implementing or hindrances or problems not to implement Total Quality Management system.
3. To identify critical success factors for Total Quality Management implementation.
4. To assess how the construction firms perceive the critical success factors and;
5. To propose Total Quality Management implementation framework system for the construction companies.

Please take a look at the following questionnaire and try to answer correctly and accurately. All the information gathered here will be kept strictly confidential and will be used only for research and analysis purposes without mentioning the person or company names.

For your information the questionnaire is designed with immense flexibility and simplicity. If you require clarification and any further information, please do not hesitate to contact me.

Tel No. 0933-586143

Email address ashenafibir@gmail.com

Thank you in advance for your interest in participating in this research!!!

Sincerely yours,

Ashenafi Birhanu, Graduate Student at Addis Ababa institute of Technology (AAiT)

School of Civil and Environmental Engineering

MSC in Construction Technology and Management Program

Advisor: Prof. Abebe Dinku (Dr-Ing)

Section A

This section of the questionnaire is to identify the Quality Management Activities (QMS)

Please complete the questionnaire by the following:

1- Where there are various options you can click as much as possible as its not limited to one answer

2- Part-1: Personal Information

- Please thick on your organization's category ☐GC ☐BC
- Age of the company Up to 5 years ☐ 6-10 years☐ 11-20 years☐ >20 years☐
- Average annual turnover of the company (in million ETB)
  Up to 50 M ETB☐ 101-200 M ETB☐ >300 M ETB☐
  51-100 M ETB☐ 201-300 M ETB☐
- Please mention your position in your company _____
- Please select your educational qualification

  ☐Technical ☐BSc/BA degree ☐MSc/MBA

  ☐PhD ☐Other (please mention) _____
- Please select your experience in construction

  0 - 5 years ☐ 6-10 years☐ 11-20 years☐ >20 years☐

3- Part-2: Total Quality Management Critical Success Factors

Perception of Quality

1. **What is your organization's perception of quality?**

☐Elimination of defects
☐A tool to increase profits
☐A competitive advantage
☐Inspection and corrective actions
☐Continuous improvement
☐Customer satisfaction
☐Increase productivity
☐Others (please specify)_____

2. **Is your company accredited with quality system like ISO 9000?**

☐Yes ☐No

3. **If no, what are the reasons for not getting accreditation?**

☐Too expensive ☐Too complicated

☐Does not need a quality system ☐Not suitable for construction business

☐No support for accreditation ☐Others (please mention) _____

4. Does your company have a quality manual?

☐Yes ☐No

Data Acquisition

5. Do you collect data to measure the performance of project executions?

☐Yes
☐No

6. How does your company measure performance?

☐Fewer customer complaints
☐Increase productivity
☐Profit margins
☐Timely completion of projects
☐Other methods (please specify) _____

7. What data acquisition methodology do you follow within your organization?

☐Maintenance of data base
☐Employee feedback forms
☐Progress report
☐Other methods (please specify)_____

8. How would you rate customer focus and satisfaction in your organization?

☐Very important
☐Important
☐Somewhat important
☐Not important

9. Do you have a system for gathering customer suggestion?

☐Yes
☐No

10. If yes, how do you gather customers' suggestion(s)?

☐Customer feedback forms
☐Questionnaire surveys
☐Complaints forms
☐Other methods (please specify) _____

11. Do you have a system for gathering employees' suggestion(s)?

☐Yes

☐No

12. If yes, how do you gather employee suggestion(s)?

☐Feedback forms
☐Questionnaire surveys
☐Open forum
☐Other methods (please specify) _____

Quality improvement in your Organization

13. Does your organization have a quality improvement program?

☐No (Please go to question 18)
☐Such a plan is under consideration
☐A quality improvement program has been implemented recently
☐A quality improvement plan has been a part of corporate policy for some time now

14. What type of quality improvement program do you have?

☐Total Quality Management
☐Quality Assurance
☐Quality Control
☐Others (please specify) _____

15. Your organization's quality improvement program can be described as:

☐There is no formal program
☐Periodic short-range solutions or motivational program
☐A formal program is underway with widespread employee awareness
☐Others (please specify) _____

16. Does your quality improvement plan have the full support of top management?

☐Yes
☐No

17. The major objectives of your quality programs are:

☐Increase productivity
☐Cost reduction
☐Involvement of employees in the quality building effort
☐Compliance with statutory, environment and safety requirement
☐Customer satisfaction
☐Others (please specify) _____

Review/ Audits

18. Do you have a well-established internal quality Audit procedure?

☐Yes
☐No

19. If yes, how often do you ensure that internal quality audits are carried out effectively?

☐Once a month
☐Quarterly
☐Once a year
☐Once every two years
☐Other (please specify) _____

20. Do you check for design conformance to standards /regulations?

☐Yes
☐No

21. If yes, how often do you check for design conformance to standards /regulations?

☐After every design
☐Before commencement of project
☐During construction
☐Other (please specify) _____

22. Do you carry out Peer review/project review after close out of every project?

☐Yes
☐No

Training

23. Is formal training in quality improvement given to employees?

☐No training is given (If No please go question to Q.26)
☐Some training is available
☐A formal training program is in effect
☐Other (please specify) _____

24. How do you train your employee for quality?

☐On-site/On the job training
☐Seminars /workshops on quality improvement
☐Short courses
☐Office library
☐Other (please specify) _____

25. How often does training organized for employees?

☐Once a year
☐Twice a year
☐Once every two years
☐Other (please specify) _____

Teamwork

26. How does your organization solve problems?

☐Assign individual to solve
☐Set up a multi-disciplinary team for each problem
☐A permanent team is available
☐Other (please specify) _____

Tools and techniques

27. What are the tools used in measuring improvement?

☐There are no tools implemented so far
☐Benchmarking
☐Value engineering /reengineering
☐Check sheets
☐Other (please specify) _____

Quality policy

28. Does the firm have quality manual or documents? (Policy, Standards, etc.)

☐Yes
☐No

29. What is the firm's mission statement in relation to quality?

☐Quality is captured in the mission statement
☐There is a standalone policy for quality
☐Mission statement does not capture quality
☐Other (please specify) _____

Problems affecting total quality management implementation

30. Does your company have total quality management system? If no, go to question 32

☐Yes

☐No

31. If yes, what were the difficulties occurred during quality management (QM) implementation in your firm? Not limited to one answer

☐Too much paper work
☐Lack of communication in organization
☐Low education level of field forces
☐Too much documents are required (Lack of documentation ability)
☐Lack of employees' commitment/understanding
☐Lack of expertise/resources in QMS
☐Unique nature of construction and too many uncontrollable factors
☐Difficulty in measuring results
☐Field employees considered TQM as irrelevant
☐Subcontractors and suppliers not interested

☐Transient work force
☐Others (please mention)_____

32. If no, what were the reasons and hindrances not to implement? Not limited to one answer

☐Never heard of it (TQM is a buzzword)
☐Unique nature of construction and too many uncontrollable factors
☐Field employees considered TQM as irrelevant
☐Subcontractors and suppliers not interested
☐Transient work force
☐Lack of time
☐ It's expensive to implement
☐Lack of expertise/resources in QMS
☐ Lack of top-management commitment/understanding
☐ Workers may be resistant to change
☐Others (please mention) _____

Section B

Below are a number of quality characteristics (constructs/critical success factors) which can have an impact on quality management in your firm. Please indicate the level of each quality characteristic in your organization *(Please mark just one appropriate box)*

1=Strongly disagree **3**=Somewhat agree **5**=Strongly agree

2=Generally disagree **4=**Generally agree

Total Quality Management Characteristics (Constructs/Critical success factors)	***1***	***2***	***3***	***4***	***5***
TOP MANAGEMENT COMMITMENT AND LEADERSHIP					
1. The management provides policies for promoting customer satisfaction	☐	☐	☐	☐	☐
2. The management establishes a vision, communicate that vision to those in the organization and provide the tools & knowledge necessary to accomplish the vision	☐	☐	☐	☐	☐
3. The management actively leads and directs quality management programs assuming responsibility for evaluating and improving Quality management system at pre-defined intervals	☐	☐	☐	☐	☐

4. The management communicates management policies and plans to employees	☐	☐	☐	☐	☐
5.Quality issues are frequently reviewed in the top management meetings	☐	☐	☐	☐	☐
6 Top management supports long -term quality improvement process	☐	☐	☐	☐	☐
7. The management promotes and acknowledges innovation in the organization	☐	☐	☐	☐	☐
EMPLOYEE INVOLVEMENT &HUMAN RESOURCE MANAGEMENT	***1***	***2***	***3***	***4***	***5***
1 Human resource management policies aligned with site quality /operational and business performance plans	☐	☐	☐	☐	☐
2. Safeguarding, occupational health and safety and security of employees at sites and offices	☐	☐	☐	☐	☐
3. Organization -wide training and development process, including carrier path planning for all employees	☐	☐	☐	☐	☐
4. Supervisors, unit heads and divisional managers assuming active roles as facilitators of continuous improvement, coaches of new methods and leaders of empowering employees	☐	☐	☐	☐	☐
5. Training organized for employees in problem identification and solving skills, quality improvement skills, teamwork and other technical skills	☐	☐	☐	☐	☐
6. Every employee's thought has been taken into consideration to make any quality decision	☐	☐	☐	☐	☐
7. Management developing an environment helping towards on-the-job-training	☐	☐	☐	☐	☐
8. Constant employee awareness and feedback on status are provided and a reward/recognition process is established	☐	☐	☐	☐	☐
9. Employees understanding the basic processes used in designing and construction works	☐	☐	☐	☐	☐

10. Availability/provision of resources for employee training in the company/division or firm	☐	☐	☐	☐	☐
11. Training for management and employees in quality principles, tools and techniques is given regularly	☐	☐	☐	☐	☐
12. Technical and managerial training is provided to subcontractors to enhance their projects management	☐	☐	☐	☐	☐
CUSTOMER FOCUS & SATISFACTION	***1***	***2***	***3***	***4***	***5***
1. Customers' requirements are used as the basis for quality in the organization	☐	☐	☐	☐	☐
2. Responding effectively to clients'/customers' enquiries and complaints	☐	☐	☐	☐	☐
3.Employees know which attributes of the process in construction the organization's customers value	☐	☐	☐	☐	☐
4. Follow -ups with customer or client on products/service and transactions to receive prompt and actionable feedback	☐	☐	☐	☐	☐
5. The employees are encouraging to promptly resolve customers complaints and to satisfy customers	☐	☐	☐	☐	☐
6. Preventive and corrective actions undertaken to delight customers	☐	☐	☐	☐	☐
7. The use of customer surveys and feedback process, and tracking of other key measures to assess customer satisfaction	☐	☐	☐	☐	☐
8. The company emphasizes on assessing current and future customers' needs & expectations	☐	☐	☐	☐	☐
9. Customers' complaints are studied to identify patterns and prevent the same problem from recurring.	☐	☐	☐	☐	☐
10. The company uses data on customer expectations and/or satisfaction when starting new processes or projects.	☐	☐	☐	☐	☐
STRATEGIC QUALITY PLANNING	***1***	***2***	***3***	***4***	***5***

1. Comprehensiveness of quality improvement plan within the organization	☐	☐	☐	☐	☐
2. Development and implementation of strategies and plans based on data concerning customers' requirements and the company's capabilities	☐	☐	☐	☐	☐
3. The management sets quality objectives for both managers and employees	☐	☐	☐	☐	☐
4. The management communicates its strategy and objectives to the whole staff	☐	☐	☐	☐	☐
5. Well defined responsibilities of personnel who manages performs and verifies work that affects quality	☐	☐	☐	☐	☐
6. Evaluation of results by comparing them to planned results, in order to make improvements	☐	☐	☐	☐	☐
7. Management involving the employees in the setting of its objectives and plans	☐	☐	☐	☐	☐
8. Assessments of subcontractors for their ability to meet the subcontract requirement including commercial, statutory and technical aspect prior to selection and award of contract	☐	☐	☐	☐	☐
9. Proper planning is utilized during mobilization, project undertaking & demobilization stage	☐	☐	☐	☐	☐
10. The company has proper machinery, equipment & manpower management manual.	☐	☐	☐	☐	☐
11. The company employees are given adequate time to plan for and test improvements.	☐	☐	☐	☐	☐
12. Each department and work group within the company maintains specific goals to improve quality	☐	☐	☐	☐	☐
13. Middle managers (e.g. department heads, directors, supervisors & project managers) are playing a key role in setting priorities for quality planning.	☐	☐	☐	☐	☐
14. Non-managerial employees are playing a key role in setting priorities for quality planning.	☐	☐	☐	☐	☐
PROCESS MANAGEMENT	***1***	***2***	***3***	***4***	***5***

1 There is process flow chart and inspection and test plan for activities that directly affect quality.	☐	☐	☐	☐	☐
2. There are inspection and test plans, including checklist on completion of the construction project or a pre -determined stage of the work.	☐	☐	☐	☐	☐
3. There is testing, reviewing and inspection of incoming products or work for specification compliance	☐	☐	☐	☐	☐
4. Value engineering technique is employed before commencement of construction in order to highlight potential cost time saving proposals	☐	☐	☐	☐	☐
5. Clarity of work or process instruction is given to employees, artisans and site staffs (these includes both employees of subcontractors & project staff)	☐	☐	☐	☐	☐
6. There is a system to ensure clarity, conciseness and uniformity of drawings and specification	☐	☐	☐	☐	☐
SUPPLIER MANAGEMENT & INVOLVEMENT	***1***	***2***	***3***	***4***	***5***
1. Suppliers are involved during design reviews, tendering & construction stage.	☐	☐	☐	☐	☐
2. Reliance on reasonably few dependable suppliers who are evaluated and selected based on their capability and commitment to product and service quality, and value for money	☐	☐	☐	☐	☐
3. The company offers closer and long term working relationship to suppliers	☐	☐	☐	☐	☐
4. The management encourages the usage of few suppliers, emphasizing quality rather than price or schedule	☐	☐	☐	☐	☐
5. Education(Technical Assistance) is provided for suppliers by the company	☐	☐	☐	☐	☐
6. Clear specifications are provided to suppliers	☐	☐	☐	☐	☐
7. The purchasing department assumes responsibility for the quality of incoming products / services	☐	☐	☐	☐	☐
8. The suppliers have programs to assure quality of their products / services	☐	☐	☐	☐	☐

CONTINUOUS IMPROVEMENT	***1***	***2***	***3***	***4***	***5***
1. Cost of quality process (rework, waste, rejects) is tracked for continuous improvement	☐	☐	☐	☐	☐
2. The company ensures that design and construction use quality tools(check sheet) for improvement activities	☐	☐	☐	☐	☐
3. The causes of all the possible faults are identified and informed to all the employees	☐	☐	☐	☐	☐
4. There is research & development department in the organization and identification of areas for continuous improvement are assessed.	☐	☐	☐	☐	☐
5. There is a practice of continual review on the construction safety, work plans and workplace environment with a view for improvement	☐	☐	☐	☐	☐
6. There is a practice of continual review on process completion time with a view of improvement	☐	☐	☐	☐	☐
7. There are practices to encourage project quality improvement discussions at subcontractor site meetings	☐	☐	☐	☐	☐
8. There is a practice of Bench marking process in order to improve activities in the firm with subsequent improvement to delight customers	☐	☐	☐	☐	☐
TEAMWORK	***1***	***2***	***3***	***4***	***5***
1. There is the use of specific organizational structures (quality committee, work teams) to support quality improvement	☐	☐	☐	☐	☐
2. The company establishes peer review teams after project completion	☐	☐	☐	☐	☐
3. There is effective coordination & communication between various department of the firm	☐	☐	☐	☐	☐
4. The company encourages teamwork	☐	☐	☐	☐	☐
5. There are activities to encourage frequent contact between parties involved in projects delivery and other functions.	☐	☐	☐	☐	☐

6. Employees regularly participate in making decisions on their work areas, including suggestions for improvement, planning, goal setting & monitoring performance.	☐	☐	☐	☐	☐
INFORMATION ANALYSIS AND EVALUATION	***1***	***2***	***3***	***4***	***5***
1. There is continual use of internal or external Quality Audit system in the company to ensure delivery of quality works, products and service.	☐	☐	☐	☐	☐
2. Review of drawings and specification prior to authorization for construction works is performed.	☐	☐	☐	☐	☐
3. There is documented procedure for reviewing disposition of nonconforming works & products.	☐	☐	☐	☐	☐
4. There is documented procedure for implementing corrective and preventive actions in construction sites.	☐	☐	☐	☐	☐
5. The company disseminates proper data and information to all the employees.	☐	☐	☐	☐	☐
6. Project related documents are documented properly.	☐	☐	☐	☐	☐

THE END!!!

APPENDIX B

Importance index

Critical success factors (Constructs)	Items	Imp. Index (I.I)	Response categories (Likert Scale)					
		59.84	1	2	3	4	5	Total
Top management commitment and leadership	1	69.06	0	6	23	18	6	53
	2	60.75	0	15	23	13	2	53
	3	60.38	0	14	25	13	1	53
	4	58.87	0	18	23	9	9	53
	5	58.11	1	19	21	8	4	53
	6	60.00	0	18	20	12	3	53
	7	51.70	6	22	15	8	2	53
Employee involvement & human resource management		**62.55**						
	1	75.09	0	1	19	25	8	53
	2	79.25	0	1	13	26	13	53
	3	58.49	0	18	23	10	2	53
	4	66.42	0	4	30	17	2	53
	5	58.11	1	22	16	9	5	53
	6	53.21	1	22	25	4	1	53
	7	62.26	0	12	27	10	4	53
	8	56.98	1	21	18	11	2	53
	9	72.45	0	1	20	30	2	53
	10	60.00	0	22	13	14	4	53
	11	54.72	1	24	18	8	2	53
	12	53.58	1	27	16	6	3	53
Customer Focus & Satisfaction		**65.02**						
	1	70.19	0	3	24	22	4	53
	2	73.96	0	3	18	24	8	53
	3	70.19	0	1	25	26	1	53
	4	66.79	0	3	31	17	2	53
	5	67.92	0	5	24	22	2	53
	6	79.62	0	1	7	37	8	53
	7	60.38	0	18	19	13	3	53

	8	60.75	0	19	18	11	5	53
	9	51.32	5	22	17	9	0	53
	10	49.06	12	16	14	11	0	53
Strategic quality planning		**66.25**						
	1	55.85	3	24	12	9	5	53
	2	65.66	0	7	27	16	3	53
	3	59.62	0	15	26	10	2	53
	4	56.98	0	19	25	7	2	53
	5	69.43	0	6	21	21	5	53
	6	72.08	0	5	18	23	7	53
	7	63.02	0	10	29	10	4	53
	8	65.66	0	6	32	9	6	53
	9	81.51	0	0	9	31	13	53
	10	84.53	0	2	5	25	21	53
	11	64.53	0	1	40	11	1	53
	12	63.02	0	9	29	13	2	53
	13	67.92	0	6	24	19	4	53
	14	57.74	0	16	28	8	1	53
Process management		**62.39**						
	1	61.89	1	16	17	15	4	53
	2	78.11	0	0	16	26	11	53
	3	80.00	0	0	13	27	13	53
	4	34.72	35	7	1	10	0	53
	5	63.77	0	3	38	11	1	53
	6	55.85	1	25	14	10	3	53
Supplier management & involvement		**63.07**						
	1	52.08	2	27	15	8	1	53
	2	64.91	0	9	24	18	2	53
	3	66.04	1	6	28	12	6	53
	4	61.89	1	11	26	12	3	53
	5	50.19	3	29	12	9	0	53
	6	63.02	0	8	31	12	2	53
	7	76.98	0	0	14	33	6	53

	8	69.43	0	4	21	27	1	53
Continuous improvement		**57.08**						
	1	35.47	30	10	9	3	1	53
	2	69.43	0	2	28	19	4	53
	3	49.43	5	25	17	5	1	53
	4	44.15	24	7	11	9	2	53
	5	70.57	0	4	22	22	5	53
	6	72.45	0	1	23	24	5	53
	7	80.00	0	0	10	33	10	53
	8	35.09	29	13	6	5	0	53
Teamwork		**66.04**						
	1	63.02	0	14	20	16	3	53
	2	52.83	2	26	15	9	1	53
	3	63.77	0	4	37	10	2	53
	4	76.98	0	3	14	24	12	53
	5	75.47	0	1	16	30	6	53
	6	64.15	0	4	36	11	2	53
Information analysis and evaluation		**60.06**						
	1	58.11	3	21	12	12	5	53
	2	71.70	0	1	27	18	7	53
	3	44.53	16	20	7	9	1	53
	4	41.89	21	17	5	9	1	53
	5	62.26	1	5	34	13	0	53
	6	81.89	0	0	11	26	16	53