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# Investigation of Quality Management Systems Implementation Trends Based on ISO 9001:2008 Standard: The Case of Construction Companies in Amhara Region, Ethiopia

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**BAHIR DAR UNIVERSITY**

**BAHIR DAR INSTITUTE OF TECHNOLOGY**

**SCHOOL OF RESEARCH AND POSTGRADUATE STUDIES**

**FACULTY OF CIVIL AND WATER RESOURCE ENGINEERING**

**Program: Construction Technology & Management MSc Regular program**

**MSc Thesis On:**

**Investigation of Quality Management Systems Implementation Trends Based  
on ISO 9001:2008 Standard:**

**The Case of Construction Companies in Amhara Region, Ethiopia**

By

Yibela Asres

March, 2014 E.C

Bahir Dar, Ethiopia



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**BAHIR DAR INSTITUTE OF TECHNOLOGY**  
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**MSc thesis on:**  
**Investigation of Quality Management Systems Implementation Trends Based**  
**on ISO 9001:2008 Standard:**  
**The Case of Construction Companies in Amhara Region, Ethiopia**

By:

Yibela Asres

A thesis submitted

In partial fulfillment of the requirements for the degree of Master of Science in  
Construction Technology and management

Advisor: Denamo Addissie (Ph.D.)

Co–advisor: Abel Fantahun

March, 2014 E.C

Bahir Dar, Ethiopia

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APPROVAL OF THESIS FOR DEFENSE RESULT

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## DECLARATION

This is to certify that the thesis entitled "Investigation of Quality Management Systems Implementation Trend Based on ISO 9001 Standard: The Case of Construction Companies in Amhara Region" submitted in partial fulfillment of the requirement for the degree of Master of Science in Construction Technology and Management under Faculty of Civil and Water Resource Engineering, Bahir Dar Institute of Technology, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Yibela Asres

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Name of the candidate

Signature

Date

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## LIST OF ABBREVIATIONS

AACCSA = Addis Ababa Chamber of Commerce & Sectorial Associations

ANOVA = Analysis of Variance

ANRS = Amhara National Regional State

DQS = Deployment Qualification System

EQA = Ethiopian Quality Award

ESA = Ethiopia Standard Agency

FIDIC = International Federation of Consulting Engineers

GDP = Gross Domestic Product

GIZ = Deutsche Gesellschaft für Internationale Zusammenarbeit

GTZ = Deutsche Gesellschaft für Technische Zusammenarbeit

ISO = International Standardization Organization

QA = Quality Assurance

QC = Quality Control

QMS = Quality Management System

RII = Relative Importance Index

SPSS = Statistical Package for Social Sciences

TQM = Total Quality Management

UCBP = University Capacity Building Program

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## ***ABSTRACT***

Quality is the one and the primary critical factors in the success of construction companies. Now a day Quality in construction is questioned and Projects were not performed as stated quality standard, agreement, design and technical specifications. So, in this competitive and challenging construction environment more researches on developing effective Quality Management Systems implementation approach in Construction Companies are needed. As a result, the main objective of this research is to investigate quality management systems implementation trends in Amhara Region and propose a suitable implementation intervention for construction companies in the Region. To carry out this study, several literatures were reviewed and briefly organized in to sub topics under the literature review part. A questionnaire was designed based on the literature review and 65 questionnaires were distributed to 19 selected construction companies and 56 (86.2%) questioners was returned. The data also collected by conducted unstructured interview and direct observations of company profile to get additional information which was not addressed by the questionnaire. The collected data was analyzed by using Statistical Package for Social Sciences Software, Analysis of variance, Relative importance index and Microsoft excel and the validity test is verified using Cronbach Alpha test and Pearson correlation method. The research both qualitative and quantitative and to analyze the qualitative data content analysis were conducted. Finally, this study result, the practices of ISO 9001:2008 based quality management system in construction companies in the region is not effective and lack of awareness is the major challenge to implement quality management systems. This research recommended that top managers in the construction companies take the lead to implement quality management systems in their company effectively.

**Key Words:** Quality management system, ISO 9001:2008 QMS principles, Construction Company, customer satisfaction, ISO certification and continuous improvement

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1. Background of the study

Construction industry makes significant contributions to the socio-economic development of a country. In the Ethiopian economy it has important contribution, as demonstrated by its share in the Gross Domestic Product. According to the 2017 edition of African economic Outlook, construction activities in Ethiopia accounted for 15.9% of GDP at current prices during the 2015/16 fiscal year and the market value of the construction sector is currently estimated at more than US\$7bn(Veitch, 2018).

The development of construction industry depends on the successful criteria of construction projects like deliver projects with high quality, on time, complete project with minimum expenses and satisfy customers. Quality of construction is one of the key successful components (Tigestu, 2018).

However, the construction sector has faced many challenges starting from its early stage up to now. There is a quality achievement problem, lack of favorable environment which promotes competitiveness and continuous improvement. In order to alleviate such challenges, transforming the sector is very important.

The management practice in Ethiopia is even far behind from other poor performing developing countries in Africa. The results revealed that the level of construction project management practice in terms of adapting general project management procedures, project management functions, tools & techniques to be unsatisfactory. Hence, the level of practice in terms of safety, risk and time management, planned costs and other variables such as quality, and resources utilization was found to be very low(Ayalaw, 2016)

Improvement of quality in Construction Company is linked with quality management in the project life cycle. that tells quality management at every stage of project life cycle is important especially quality management at the design and construction stage contributes significantly on final quality outcome of construction projects as well as companies. As a result, both consultants and contractors realize the importance of quality management in their companies and should get the feedback from their clients to evaluate their level of service(Mugheri, 2011).

Quality management refers to all activities of overall management functions, especially top management leadership, that determines quality policy objectives and responsibilities for all members of the organization (Ashokkumar, 2014).

QMS is a management technique used to communicate to employees what is required to produce the desired quality of products and services and to influence employee actions to complete tasks according to the quality specifications. It is the way the organization directs and controls those business activities which are associated with quality.

In order to implement quality management system, acknowledging the quality issues in construction, increasing demand for quality products and in order to attract customers, specific regulations have been framed and then ISO certification which is a part of ISO 9000 series became a trend.

However, the construction industry lags behind other industries in practicing standard quality management system and many construction companies are frustrated in their effort to improve quality through the use of Quality Management. All the company employers including top managers should perceive properly and act accordingly with the principles of quality management system to improve construction qualities in general. But the construction sector, flexible in nature, it is not understood easily and multiple parties are involved in the process which are not familiar to the concept of QMS principles and ISO certification and due to its unique characteristics. Now a days there are a very few construction companies in Ethiopia that implement quality management in their operational systems(Tigestu, 2018).

The guidance from Deutsche Gesellschaft für Internationale Zusammenarbeit GIZ International Services' as the project management and implementation agent for the UCBP program, under the capacity of the Ethiopian construction sector, the first companies in the Ethiopian construction sector received an ISO certificate on February 2008. During this period Total of 8 contractors were certified by German company (ZERT) through Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ-IS)(Tigestu, 2018).

These circumstances show that there is a gap in using QMS as a tool for better quality management in construction industry in Ethiopia and increased competition, customer demands, and higher quality requirements in the global environment have all forced the construction industry to pay much more attention to the concept of quality management system.



## **1.2. Problem Statement**

Quality as a key component of the success of construction businesses, the main goal of construction companies is to ensure that construction projects are successfully completed within the constraints of good quality, stated period, at minimum possible cost and satisfy customers through quality planning, quality assurance and quality control (Ashokkumar, 2014).

However, construction companies in Amhara Region are frustrated in their effort to improve quality through the use of Quality Management systems (Tigestu, 2018). Employees in the company perceived as principles of QMS are not much easy to implement due to multiple parties involved in the construction process, due to QMS unique characteristics and they are not familiar to the concept of QMS implementation principles.

According to the report of Urban Development Housing and Construction Bureau, Quality control in construction by using only International Federation of Consulting Engineers (FIDIC) now a day is challenged to achieve the goal of clients, contractors, consultants and customer satisfaction (UDHC, 2013). Currently there is design problem, poor management skill, lack of control and follow up, improper measurement during construction, unskilled workmanship, lack of resource management and conflict among involved parties.

These results, the construction projects are not performed based on stated quality standard. Some of the projects collapsed during construction or immediate after construction, others totally terminate due to quality problem. This affects the people of the region economically, socially, politically. It also has influence both current and future plan of government (UDHC, 2013).

There is not enough researches done on QMS implementation in construction companies which exaggerates the above problems. Therefore, conducting this research helps the Government as a starting point to enact specific regulations relating to the application and implementation of quality management systems (QMSs) which is an international standard that increasingly important to customers who have developed a growing aspiration to engage qualified and Professional construction companies capable of meeting their specification requirements and capable of giving better customer satisfaction.

### **1.3 Research Questions**

The research will be answering the following questions:

- What is the current practice of quality management system implementation trends in construction companies in Amhara region?
- What are the challenges that hinder to implement ISO 9001:2008 based quality management system in construction companies in the region?
- What are the benefits of implementing ISO 9001:2008 based quality management system in Construction Companies to enhance quality?
- What are quality management system implementation interventions that would enable construction companies to implement ISO 9001:2008 based QMS?
- What is the role of top management in QMS implementation?
- What is Efficiency and Effectiveness of implementing QMS in construction company?

### **1.4 Objectives of the study**

#### **1.4.1 Main Objective**

The main objective of this research is to investigate the implementation trends of ISO based quality management system and propose a suitable implementation intervention for construction companies in Amhara region.

#### **1.4.2 Specific Objectives**

In addition to main objective there are specific objectives that addressed by this study

- To assess the current practices of quality management system implementation trends in construction companies in Amhara Region.
- To identify the challenges that hinder to implement ISO 9001:2008 based quality management system in the Region.
- To study the benefits of implementing ISO 9001:2008 based quality management systems in Construction Companies to improve qualities.
- To study the role of top management in implementing quality management systems in construction companies.
- To identify suitable interventions to assist construction companies implement ISO based QMS in the Region.
- To study the Efficiency and Effectiveness of implementing quality management systems in the construction companies.

### **1.5. Significance of the Study**

This research has contributions to Construction companies as well as the government to improve quality management system practice, to identify the challenges that hinder implementation of the system, provide detail awareness about the role of implementing QMS and set the solution to overcome the challenge. It also helps the government as a device to develop a policy and/or a program for further improvement of quality management system in the country's construction industry and it positively contribute to the establishment of robust benchmarks.

The research outcome can also be used as a guideline and strategic tool for contractors and consultants to measure and understand their own corporate cultures, and to successfully prepare, develop and apply more effective QMSs, in order to adopt more efficient quality processes and practices.

It also provides awareness to construction company about the benefits of ISO 9001 certification, how to get ISO 9001:2008 certified and it also provide interventions like a framework to implement QMSs effectively.

### **1.6. Scope and Limitations of the Study**

According to Amhara National Regional State of Urban Development Housing and Construction Bureaus report there are 749 Grade-1 up to Grade-10 contractors and consultants registered in regulatory body and they work different construction projects in Amhara Region (UDHC, 2013).

This data does not include international and federal contractors and consultants that work construction projects in the region. However, as a result of time, budget constraint and geographical scatter it is broad to include all of them in this research. The study is limited to Grade 1, 2 and 3 construction contractors and category 1 to 3 consultants that work construction projects in Amhara Region. They may certify, under process to certify or not plan to implement the quality management system.

The researcher selects the sample size by using purposive and judgmental sampling method for grade 1 to 3 contractors and consultants. The selected contractor and consultant are high grade level construction companies that perform high value works and complex projects like hospitals, bridges, schools and roads in the region. They have high performance, working experience and working capital. So, they represent all contractors and consultants in the region in this research. The research questionnaire prepares incorporating required information to gather from the respondents. The participant professional experts or others in the companies are project manager,

technical team, site & office engineer, low, middle and high, level managements etc. within the company are part of the research.

There was also a limitation on acquiring sufficient data from the sample construction companies. This was due to the reason that the system is not fully practiced by the companies even on very few contractor offices that the system exists, withdrawal of top managers (QMS experts) replace by a new comer. and there was lock down due to COVID19. There was also lack of background data on previous QMS practice in Amhara region construction companies and due to the limited national research papers on the specific area to be referred.

## CHAPTER TWO

### 2. LITERATURE REVIEW

#### 2.1. Introduction

Quality is a subjective concept, like beauty, it is difficult to define it in a single way (word) because everyone has a different definition based on their personal experience. However, this research concerns quality with definition related to construction industry. Engineers define quality as, it is conformance to specifications, customer point of view Quality means fitness for use and meeting customer satisfaction. Process point of view: Quality means conformance with the process design, standards and specifications and Quality is all about reducing variations precision and accuracy of production(Kidanu, 2014).

Quality is also defined as Conformance to predetermined requirements. Conformance to established requirements conformance to contractual agreements(Bawane, 2017).

Quality of construction is more difficult to define because the product is usually not a repetitive unit but a unique piece of work with specific characteristics. However, contractor can judge the quality of his/her work by the degree of compliance with conditions in the contract, not only the technical specifications but also the contract sum and the contract period.

The client will be satisfied if the construction is executed as specified, within budget and on time. Therefore, a quality product of building construction is one that meets all contractual requirements (including statutory regulations) at optimum cost and time and also quality in general terms is fitness for purpose, but in building construction it is more appropriately interpreted as compliance with contractual requirements(Kidanu, 2014).

In the quality management field, quality has a more specific meaning, ISO 9000; defined quality as a degree to which a set of inherent characteristics fulfills requirements(Kidanu, 2014). If those inherent characteristics meet all requirements, high or excellent quality is achieved or if those characteristics do not meet all requirements, a low or poor level of quality is achieved. Therefore, the ISO definition goes further in that it may include related characteristics beyond product or service but goes deeper to the processes and systems within organization and a customer may specify some or all these characteristics. A problem or nonconformity in any of these

areas may lead to customer dissatisfaction. An organization must ensure that it has systems and controls to assure that it can consistently fulfill all these requirements and enhance customer satisfaction (Kidanu, 2014).

However, the needs of customers vary and change over time. Thought, companies should review quality requirements periodically this may come from regulatory, statutory, industry and other sources. An organization must be aware of and ensure that all these diverse requirements are defined and met. It could be stated that quality includes all of the characteristics of an organization's products, services, processes, support and management system that contribute to meeting requirements (Tigestu, 2018).

Quality is defined as the degree of excellence in a competitive sense, such as reliability, serviceability, maintainability or even individual characteristics (Ashokkumar,2014). quality can be defined in terms of an excellent product or service that fulfills or exceeds our expectations. These expectations are based on the intended use and its cost (Ashokkumar, 2014).

From the above definition, this research adopts quality with definition conformance to predetermined requirements, Conformance to established requirements and conformance to contractual agreements(Bawane, 2017).

## **2.2. Historical Development of Quality Management**

The concept of quality started as early as human existence and Quality management movement started in Japan during the 1950s. In the 1980s, it became increasingly popular in the United States and Europe most likely as a result of the success of Japanese firms in a number of global markets (Beshah, 2011).

Since the 1990s, quality management becoming one of the main issues in many organizations and was widely accepted. However, these organizations categorize the development of quality management into four stages as explained below (Beshah, 2011).

Quality inspection, Quality control, Quality assurance, and, Quality management.

In other source, there are four stages in evolution of quality management (Dey, 2016). These are Inspection, Quality Control Quality Assurance and Total Quality Management

### **2.2.1. Quality Inspection**

Quality management starts with simple inspection-based system. Under such a system, one or more characteristics of a product are examined, measured or tested, and

compared with specific requirements to assess its conformity. This system is used to appraise in coming products, manufactured components and assemblies at appropriate points in the production process. It is undertaken mainly by staff members employed specifically for this purpose (Beshah, 2011).

Products which do not conform to specification may be avoided, reworked or sold as lower quality items. In some cases, inspection is used to grade the finished products. The system is an after-the-fact screening process with no prevention content: but perhaps the identification of suppliers, operations, or workers manufacturing non-conforming products. Simple inspection-based systems are usually wholly in-house and do not directly involve suppliers or customers (Beshah, 2011).

#### 2.2.2. Quality Control

Under a system of quality control, product-testing and documentation control become the ways to ensure greater process control and reduce non-conformance. Typical characteristics of such systems were performance-data collection, feedback to earlier stages in the process, and self-inspection. While screening, inspection was again the main mechanism for preventing products which were outside the specification from being shipped to customers. Quality control measures led to greater process control and a lower incidence of nonconformance.

#### 2.2.3. Quality Assurance

The quality assurance stage came with the change away from product quality towards system quality. In this stage, an organization sets up a system for controlling what is being done and the system is audited to ensure that it is adequate both in design and use. A major part of this change is the use of both second-party and third-party audits to assess the efficiency of the system. The major characteristics of this stage are the use of quality manuals, procedures, work instructions, quality planning, quality audits, etc. The fundamental difference is that quality assurance is prevention-based while quality control is inspection-based.

#### 2.2.4. Quality Management

ISO 9000:2005 defines quality management as coordinated activities to direct and control an organization with regard to quality (Kidanu, 2014). The emphasis on QM arises from the demand of customers for ever-increasing standards of high quality and the need by suppliers to produce quality products consistently at a reasonable cost.

Quality management stage is the highest level involving the application of quality management principles to all aspects of the business. Typical of an organization going through a total quality process would be a clear and unambiguous vision, few interdepartmental barriers, time spent on training, excellent supplier and customer relations and the realization that quality is not just product quality but also the quality of the whole organization including sales, finance, personnel and other non-manufacturing functions.

Management of Quality (QM), as a new management model, changed the focus of the analysis of product or service to a quality system conception, and it influences the organizational culture as attitude and behavior changes are now required towards performance commitment, self-control and processes enhancement.

QM is defined as the application of a quality management system in managing a process to achieve maximum customer satisfaction at the lowest overall cost to the organization while continuing to improve the process.

#### 2.2.5. Total Quality Management

Total quality management (TQM) can be defined as a management approach to long term success through customer satisfaction. TQM is based on all members of an organization participating in improving processes, products, services and the culture in which they work (Adebabay, 2017).

Total Quality Management as integration of all the functions and process within an organization in order to achieve continuous improvement in goods and services. Total Quality Management also reduces wastes and invaluable activity while improving quality, efficiency and safety. TQM is an integrated management approach based on both quality management principles, tools and techniques that enable the organizations to accelerate and continuously providing products and services that surpass both the internal and external customers' expectations.

Total Quality Management (TQM) means that the organization's culture is defined by and supports the constant attainment of customer satisfaction through an integrated system of tools, techniques, and training. This involves the continuous improvement of organizational processes, resulting in high quality products and services (Dejene, 2018).

TQM as ,an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in an organization



so as to enable production and service at the most economical levels which allows for full customer satisfaction(Srpová, 2012).

### 2.2.6. Quality and Competitiveness

Higher product quality is required for a company to become more competitive, both locally and in international trade. Improved quality at the enterprise level lowers its cost of operations and increases its productivity. The Firm's ability to produce better products at a reduced (or even the same) price boosts its market share. The benefits that accrue from improved quality at individual firm level also augment national competitiveness. Hence, many world-class firms use quality as a powerful competitive tool as shown below figure 2.1 (Bete, 2003).

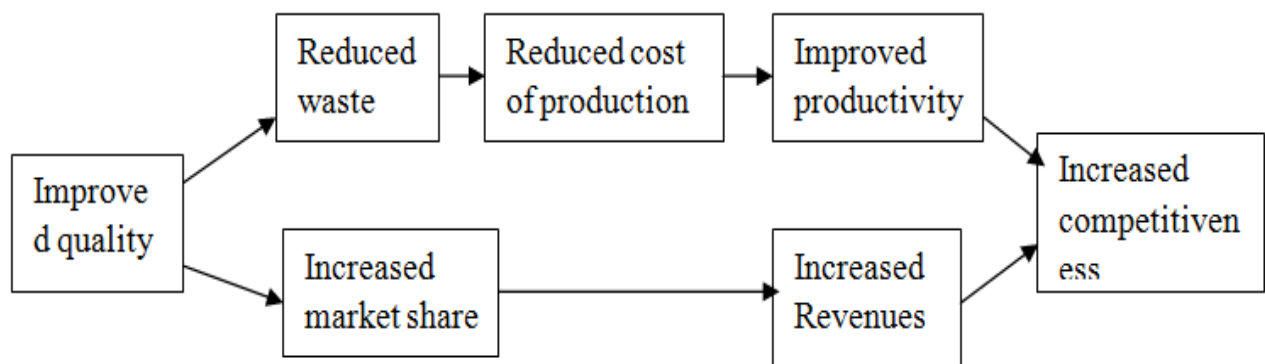


Figure 2.1: Quality and Competitiveness Sources

## 2.3. Quality Management Basics

### 2.3.1. Tenets of Quality Management:

Based on Deming, Juran, Crosby and other scholar's common ideas, there are four tenets of quality management: customers satisfaction, continuous improvement, process focus and management commitment explained as below (Kidanu, 2014).

a) **Customers' Satisfaction:** one of the most important quality management concepts is customers' satisfaction. External alignment with customers is achieved when the organization is capable of meeting the customer's requirements. On the other hand, internal alignment is attained when each department and each employee understand both the organization's vision and how the specific work, they accomplish fit into that vision.

b) **Continuous Improvement:** In the age of globalization, organizations feel heavy pressure from the rapid changes in their environment as to customer demands, product life-cycles, and competitions, autonomy needs of employees and government regulations and legislations. To be able to cope with this situation, constant development and learning will become mandatory. Continuous improvement can be defined as a culture of sustained improvement targeting the elimination of waste in all systems and processes of an organization.

c) **Process Focus:** At every supplier-customer interface, there is a transformation process and every task throughout an organization should be viewed as a process. Defining the scope of a process is vital since it will determine both the required inputs and the resultant outputs. The key to success is to align the employees of the business, their roles and responsibilities, with the organization and its processes. Many outstanding organizations have achieved and maintained their leadership through process improvement.

d) **Management Commitment:** In emphasizing management's responsibility, Deming noted that workers are responsible for 10% to 20% of the quality problems in a factory and the majority 80% to 90% is under management's control. Managers set policy & strategy that addresses internal culture, structure and operations in both short-term and long-term with regard to priorities, direction and needs of customers, resources, government initiatives and the community at large they are also responsible for the five major resources: people, material, equipment & machines, information & financial resources.

### 2.3.2. Basic Concept of Quality Management Systems in Construction Industry

The quality management system is the main component to the ISO 9001 standard and it is a set of principles or guidelines for standard operating procedures that can use to measure the quality of various aspects of business. Think of it as a collection of policies, processes, and documented procedures that define the ideal way you want to be delivering your product or service to your customers. It's almost like a system for business process management, except with a focus on quality control(Peterson, 2019).

Each QMS will be different, designed to fit the needs and goals of the company using it. The ISO 9001 standard (and more generally, the ISO 9000 family) providing a set of guidelines to help design and implement a successful QMS. A management system of an organization includes different management systems, such as a quality management system, a financial management system or an environment management system. A QMS is the way the organization directs and controls those business activities, which are associated with quality (Peterson, 2019).

QMS is a formal statement of an organization's business policy, management responsibilities, processes and their controls that reflects the most effective and efficient ways to meet or exceed the expectations of those it serves whilst achieving its own prime business objectives (Kidanu, 2014).

QMS can be understood by breaking it down into four core elements or stages accordingly the following figure 2.2 (Tigestu, 2018) :

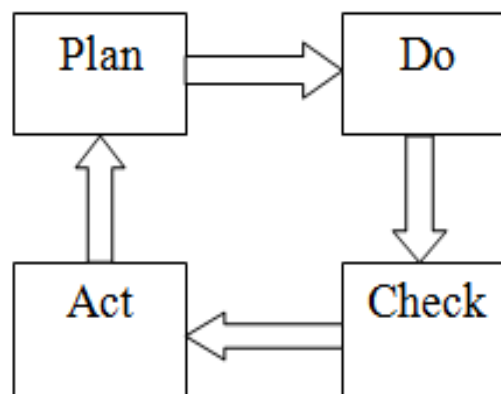


Figure 2.2: Key Elements of the Quality Management system.

Plan (establishes goals, standardize working procedures and train employees), Do (carry out the work according to plan i.e. implement the process), Check (verify compliance with plans), Act (in case of non-compliance; finding and removing its root causes).

The quality management system (QMS) in construction industry refers to quality planning, quality assurance and quality control. A QA/QC plan is a fundamental element of a QA/QC system and it is good practice to develop one. It is an internal document to organize, plan, and implement QA/QC activities. In developing and implementing the QA/QC plan; it may be useful to refer to the standards and guide lines published by the International Organization for Standardization (ISO), including the ISO 9000 series (P.P.Mane, 2015).

Quality Planning (QP) is identifying which quality standards are relevant to the project and determining how to satisfy quality standards. Quality Control (QC) is the monitoring of specific project results to determine if they comply with the relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance. Quality assurance (QA) is the planned and systematic activities implemented within quality system and demonstrated, as needed, to provide adequate confidence that an entity will fulfill requirements for quality (Ashokkumar, 2014).

The aim of implementing QMS is not to standardize the unique output of construction project but to standardize the process of carrying out an activity. If the process is standardized, the output is likely to meet quality requirements. The corporate procedures apply to all projects in varying degrees can be standardized with provision for preparation of a quality plan to cover the characteristics and specific requirements of a particular project. Typical examples are procurement, document control and record keeping (Kidanu, 2014).

Quality management in the construction industry is different from that in manufacturing or other service industries, as in the construction industry it encompasses not only the quality of products, but also the total management approach to meet a defined purpose provided by clients (Willar, 2012).

The eight quality management principles are the bases of ISO 9000:2008 QMS requirements. The quality management principles can be used by senior management as a framework to guide their organizations towards improved performance and see relations in figure 2.3 below (Kidanu, 2014).

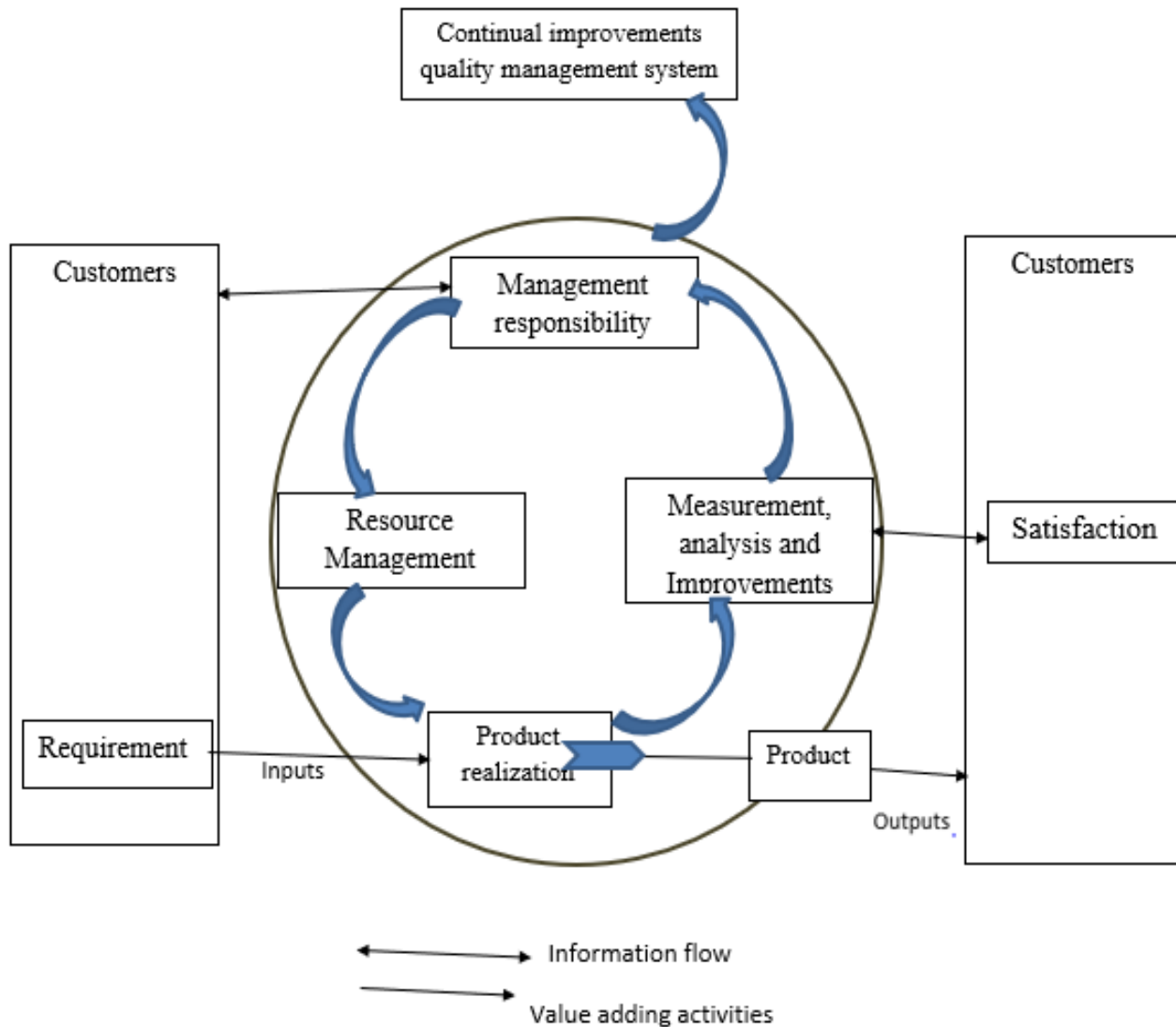


Figure 2.3 :Model of a process-based quality management system.

### 2.3.3. Current Status of Quality Management systems in Construction Industry

The construction industry in developing countries is often characterized with low productivity, lack of standards and poor quality (Bawane, 2017). It is also criticized for not taking the lead from the manufacturing industry that has successfully implemented the philosophy of quality in all spheres of its activities.

However, before making any attempt to draw parallel between the two industries it is important to examine the kind of environment under which they operate. Manufacturing industry operates under a closely monitored environment where it is possible to control all variables that have bearing on product quality. Construction on site is not an automated process and unlike engineering goods, it is the people rather than the machines and technology that influence the project outcome. Construction is a

very complex process that involves multiple parties and interests, ranging from owner, architect, consultants, contractors and vendors.

Several studies on construction industry conclude that its fragmented nature, lack of coordination and communication between parties, adversarial contractual relationships, and lack of customer focus inhibit the industry's performance. The quality management system needs to evolve around the specific characteristics of the project and its environment. Traditional quality management systems are often unrepresentative of workforce and, are usually preoccupied with instruments of control and its administration rather than the outputs that are important to the customers. However, the ISO based generic approaches to quality management are more bureaucratic in nature. These methods are generally abstract and more concern with the management system than with the control of the work process(Bawane, 2017).

#### **2.4. Instruments of Quality Management**

Quality awards and ISO 9001:2008 Quality Management System are the two major instruments or frameworks or models of quality management. The Ethiopian Quality Award (EQA) and ISO 9001:2008 Quality management system and some comparative analyses below(Beshah, 2011).

##### **2.4.1. Ethiopian Quality Award (EQA)**

A quality award is designed to support in the development of organizational excellence and to recognize organizations for their achievements in quality and performance. It is also aimed at raising awareness about the importance of quality and performance excellence as a global competitive edge.

##### **2.4.2. ISO 9001 Quality Management System**

Quality control systems were originally developed from United Kingdom (UK) nuclear and military standards and then rolled out as BS5750:1979 in the manufacturing industry. It was much later (in the 1980s and early 1990s) that the systems were adopted by UK construction companies to meet local and national government requirements for the construction industry when companies were required to have certified quality systems in order to take up offered bidding opportunities (Willar, 2012).

The ISO 9000 series has now become the QMS model recommended by the followers of the quality movement as a benchmark for implementation of good management and process control in a variety of industries and sectors. The first series of ISO 9000 developed by the International Organization for Standardization-Technical Committees

(ISO-TC 176) in 1987, was updated in 1994 and 2000, with the latest version of this standard being ISO 9001:2008 (Willar, 2012).

#### 2.4.3. Ethiopia Quality Award and Quality Management System

Both Quality management system and the Ethiopian Quality Award have common goal i.e. maximizing an organization's efficiency through a better system so that it can satisfy its customers and/or exceed customers' satisfaction. Since both conceptual models are derived from quality management basic principles, they start from customer requirements and end with customer satisfaction.

The basic difference between quality award and quality certification is that the latter is about fulfilling requirements set by the international organization for standardization and the former is excellence i.e. to become best in its class. However, a certified organization may or may not be best in its class.

There are numerous literatures on the outcomes of awards and QMS to promote quality in organizations. It is assumed that quality awards find out the best organization in its quality management practices and facilitates transfer of these practices to others. On the other hand, QMS sets minimum requirements in quality practices for the participation of organizations' in the trade and exchange of goods and services at international level (Beshah, 2011).

#### 2.4.4. ISO 9001:2008 Certification and Registration

ISO 9001:2008, certification refers to the issuing of written assurance (the certificate) by an independent, external body (the Certification Body) that has audited an organization's QMS and verified that it conforms to the requirements specified in the standard. Registration means that the auditing body then records the certification in its client register. The organization's QMS has therefore been both certified and registered. For practical purposes, the difference between the two terms is not significant and both are acceptable for general use. Certification is the term most widely used worldwide, although registration is more commonly used in North America. The two are also used interchangeably (Tigestu, 2018).

According to ISO, the certification process is expected to provide confidence that the organization has a quality management system that conforms to the applicable requirements. Many organizations successfully adopt a QMS without an ISO 9000 certification, relying on their internal review procedures to keep the whole process on track. ISO 9000 certification leads to formal review and approval of the QMS by an outside body and, more importantly, the certification body will review the QMS every

six months. Certification was never a requirement of any of the standards in the ISO 9000 family this came from customers (Tigestu, 2018).

Organizations that are ISO 9001 certified have successfully implemented a quality management system in accordance to all of the requirements detailed in the ISO 9001 standard. Part of the ISO 9001 certification is making sure areas for improvement are identified and acted on. As such, organizations with ISO 9001 certification can be assumed to provide products and/or services that meet strict quality management standards(Tigestu, 2018).

To get certified, companies basically have to implement a quality management system according to the most recent ISO 9001:2015 standard to set up a quality management system, and then proceed to have that QMS audited by a certified auditor. The result is a certification that typically lasts for three years, after which the organization will have to be recertified. Construction companies: It should be clearly stated, that ISO 9001 is not a group that organizations can just join up to rather it is a certification that must be achieved as part of a specific auditing process.

To get ISO 9001 certified, companies have to

1. Build and implement a quality management system in accordance with the principles of the latest ISO 9001 standard.
2. Have an audit performed by a Certified Body (CB or Registrar) to assess the performance of your QMS against the latest ISO 9001 standard.
3. If you are successful, the certificate will need to be recertified after three years (and every subsequent three years) to make sure you're still up to standard (as well as any new changes to the standard).

## **2.5. Benefits of Implementing QMS in the Construction Industry**

Actually, quality management system costs to implement and maintain significant investment in terms of money and staff time are needed to maintain quality assurance, especially for document preparation and staff training. Some people see this as another item of overhead for the company. However, they should not lose sight of the savings that will accrue later with much reduced incidents of rework or reject and the overall quality related costs decrease rapidly as quality awareness among the staff increases(Kidanu, 2014).



In other source, the implementation and certification of the Quality Management System (QMS) is nowadays indispensable to any institution because it is seen as a differentiating flag for the institutions of the sector and become competitive (Africano et al., 2019).

The implementation of a quality management system based on ISO 9000 should realize the following benefits: common language for communicating QA; increase in client confidence; avoidance of client assessment; increased competition for 'quality' products and services; increased client satisfaction; reduced quality and corrective costs; increased client base, and competitive edge for certified contractors(J. J. Smallwood).

There are a wide range of benefits that make ISO 9001 certification an important consideration for any organization (Africano et al., 2019).

#### 2.5.1. Benefits of QMS Implementation to Construction Company

The adoption of a QMS by organizations represents a strategic decision that can help improve their overall performance and provide a solid foundation for sustainable development initiatives and The companies can gain the benefits of their development from the training they have provided, and they will save money on training new employees when dissatisfied employees leave(Africano et al., 2019).

Successful implementation of quality management systems in a company can contribute to the following benefits (Peterson, 2019).

- Increased profit potential and market share, brand image and credibility improved
- Time saved from more efficient resource management
- Recurring problems and anomalies reduced or eliminated
- Manual work is reduced with process integration and process automation
- Organizational efficiency and effectiveness are improved by using data and evidence to inform decision making.

#### 2. 5.2. Benefits of QMS Implementation to Customers

One of the most important factors driving the implementation of quality management systems is the focus on improving customer (sublayers, client, renter, employees in the company) satisfaction by identifying their needs and goals. Improved customer

satisfaction then leads to ongoing business. When it's clear to a customer that companies have achieved the high standards of quality required by an ISO 9001 certification, they will more readily place their trust with increased consumer awareness and changing market expectation about product and service provision, companies now adopt and implement quality management systems for increased customers' satisfaction and competitiveness (Onojafe2, 2013,).

The implementation of a quality management system based on ISO 9001 standard realize the following benefits to customer: common language for communicating QA; increase in client confidence; avoidance of client assessment; increased competition for quality products and services; increased client satisfaction; reduced quality and corrective costs; increased client base, and competitive edge for certified contractors(J. J. Smallwood).

If the company has an adequate implementation of QMS ,the customers have the following benefits (Peterson, 2019).

- Provides assurance that they're a reliable, high quality vendor
- Customer satisfaction is a prime focus of ISO 9001
- Customer feedback can be quickly and efficiently acted upon
- Pre-emptive planning means issues are addressed before they have a chance to cause problems for your customers
  
- Consistency in quality of products and services
- Saves time and money by reducing the need for assessment of their suppliers
- Reduces incoming inspection costs
- Simplifies purchase decisions
- Creates confidence in their suppliers because of the approval by independent third party

### 2.5.3 Benefits of QMS Implementation to Construction Employees

Fostering a culture of continuous improvement of quality management system can help to improve worker morale (as well as general workplace happiness) by making workers feel like they're actively involved in, and responsible for, the development, implementation, and optimization of the processes they use on a daily basis (Peterson, 2019)

The employee benefits of a QMS are bonus for the company, happy employees will stay longer in the companies and they have training on new process improvement requirement (Onojaefe2, 2013,).

- Jobs are more secure thanks to improved business performance
- Employees report higher job satisfaction and workplace happiness due to their roles (what to do, and how to do it) being clearly defined and streamlined
- Training, on boarding, and educational resources are more readily available thanks to improved planning and organizational structuring
- Implementation of a QMS can foster a company culture of continuous improvement
- Employees become more engaged and feel more responsible for the processes they are using.
- Enhanced communication among employees
- Clarity in job specification

## **2.6. Core Elements of a Quality Management System**

The following core elements are contained within both the ISO 9001 and are applicable to construction projects. There are other additional elements that should be considered, but the elements described below are considered core. By incorporating these elements into a QMS it ensures the key and supporting processes and the interaction between processes will function as intended(Foundation, 2013).

### **2.6.1. Management Commitment**

All levels of managements are involved and contributed to achieving an organization's goals and objectives. Top down management is important to foster a culture that understands the value of a QMS and it ensure proper infrastructure and resources are available to support the QMS. They also review the QMS on a regular basis to ensure its functioning properly and conformance to requirements.

### **2.6.2. Resource Management**

Determine the necessary resources and information to implement and monitor the key processes of a QMS. This also includes the people to manage the resources.

Qualified and competent people are available to support the QMS and the key processes within. These people require appropriate experience and training to achieve the desired

level of qualification. People operating within the QMS are evaluated for performance and continued competency.

Training programs including core and job specific requirements are established. Core training is included within the QMS. In addition to job-specific training, each quality critical position will have a written job description that describes the necessary educational and work-related experience to adequately perform the required tasks.

### 2.6.3. Plan and Develop Processes

Process Control: Identify and implement the processes and determine the interaction between them. Establish the roles and responsibilities for controlling the processes and records. Written procedures are established for all significant construction activities. The field inspectors have written instructions on what is expected of them.

### 2.6.4. Measurement, Analysis and Improvement

- Monitor, Measurement, and Analysis

Monitoring and measuring activities are conducted to ensure that key processes are effective. For pipeline construction projects this would include the various inspection activities.

Determine criteria and methods needed to ensure that both the operation and control of the processes are effective. Monitor, measure, and analyze these processes.

- Audits (Process Assessments)

Audits, sometimes called Assessments, are conducted to ensure the integrity and continual improvement of work processes.

Audits may be performed on planned intervals or on an as needed basis.

Through audits, non-conformances are identified and immediate actions are taken to remedy these situations.

The following types of audits can occur within the operation of the QMS:

Internal Audits: Internal audit programs typically are established by the project owners to ensure the integrity and continuous improvement of the work processes, including the QMS.

Stakeholder Audits: Quality audits by various stakeholders are permitted and typically require adequate notification to conduct.

- Regulatory Audits

The business or project offers full cooperation to all regulatory audits to confirm compliance with applicable regulatory requirements.

- Continual Improvement

Non-conformances are identified and immediate actions are taken to remedy these situations. Corrective actions identified prevent the reoccurrence of similar non-conformances by addressing and eliminating the root causes. Lessons learned are shared with other project teams.

#### 2.6. 5. Documentation and Records

Establish the core documentation requirements and controls for the overall QMS, key and supporting processes and procedures includes documenting industry specifications and standards, inspection testing plans and determining records that need to be maintained for the project.

All documents used on the project must be current and approved, and available for the users.

- Documentation Control

QMS policies and procedures are maintained under document control, as are quality-critical Documents such as construction drawings and specifications, work processes, process maps and procedures.

Documents required by the QMS are controlled. Written procedures are in place for Controlling document approval, revision of documents and document retention.

- Records Control

Records are generated to confirm conformance and compliance with project requirements and applicable regulations and codes. These are maintained in a secure environment for the project. In the case of projects, records are part of the final turn-over to the owner for operations.

Records are established and maintained to provide evidence of conformity and compliance to demonstrate the effective operation of the QMS.

### **2.7. Steps for Implementing ISO 9000 Quality Management System**

ISO 9000 is primarily concerned with quality management and there are 14 essential steps, briefly described below, are to be followed through in order to implement ISO 9000 quality management system successfully (Woldelul, 2004).

Step 1 Top management commitment

Step 2 Establish implementation team

Step 3 Start ISO 9000 awareness programs

Step 4 Provide training

Step 5 Conduct initial status survey

- Step 6 Create a documented implementation plan
- Step 7 Develop quality management system documentation
- Step 8 Document control
- Step 9 Implementation
- Step 10 Internal quality audits
- Step 11 Management review
- Step 12 Pre-assessment audit
- Step 13 Certification and registration
- Step 14 Continual improvement

## **2.8. ISO 9001 QMS in Ethiopian Construction Companies**

The research made by Teklebrhan Kidanu on the impact of ISO 9001 on certified Ethiopian construction companies, it is assessed that whether Ethiopian ISO 9001 certified construction companies have benefited from obtaining the certification and investigate the main reasons if they have not (Kidanu, 2014).

In this research, the researcher determined that the ISO 9001 certified construction companies have not got tangible benefit. The main reason for failure is that construction companies do not give much emphasis to internal benefits of the standard such as process efficiency and effectiveness, inadequate training, inadequate motivation etc. In addition to this, the support and encouragement of governmental bodies to certified companies lacks continuity.

According to this study ensuring higher productivity and Expecting that ISO 9001 QMS certification will be a requirement for tender internationally and locally in Ethiopia were among the driving forces to implement ISO 9001 by the contractors. The contractors had expected that ISO 9001 is adopted in line with legal requirements so, it can be used as a means of fulfilling legal requirements (Kidanu, 2014).

The university capacity building program (UCBP) and GTZ IS has pushed construction companies to get ISO 9001 certification. The participants stated that the UCBP and GTZ IS were promising that uncertified construction companies will not be allowed to participate especially in construction projects owned by ministry of education. So, this has partly contributed for participants to get certified.

However, they have not achieved tangible and quantifiable benefit that shows continual improvement satisfactorily as their expectation and also in almost all national tenders, except for some international tender, being ISO certified is not considered as a

requirement or as additional value by customers. The extent of achieved benefits of QMS compared to the expected plan was as low as 65% (Kidanu, 2014).

Main challenges faced during implementation of QMS in Ethiopian Construction Companies are Resistance of changes by staff i.e. unwillingness of the staff to implement QMS, Convincing the workers to follow the procedures to implement the system at project site level was difficult. This challenge has happened due to the reason that some employees were not willing to divert from their previous tradition. Especially Engineers are more change resistant than other professionals. The QMS is not implemented as per the manual i.e. the company staff are not using formats and work instructions properly and not following determined process as per QMS requirement (Gebregergs, 2019).

## **2. 9. Standardization and Certification in Ethiopia**

Ethiopian Standards Agency (ESA), DQS a German based standardization company and ISO handled the work of assuring standards in Ethiopia. These companies do their job in cooperation with companies they are working for (their clients). All companies hold the responsibility of issuing and certifying companies based on the ISO 9001:2008 standard. Addis Ababa Chamber of Commerce & Sectorial Associations (AACCSA) then awards and certifies the accomplishment to International Organization for Standardization (ISO) (Tigestu, 2018).

The evaluation and/or certification of the Client's management system(s) shall be performed in accordance with the applicable standards; the industry related requirements (if applicable) and the Assessment and Certification Agreement. The certification body must comply with ISO/IEC 17021. The Certified Quality Auditor is a professional who understands the standards and principles of auditing and the auditing techniques of examining, questioning, evaluating and reporting to determine a quality system's adequacy and deficiencies. The Certified Quality Auditor analyzes all elements of a quality system and judges its degree of adherence to the criteria of quality management system. These auditors shall meet or exceed the qualification guidelines for management system auditors described in ISO 19011:2011 and ISO 9001:2008/2015 and are assessed as competent to perform quality management system audits (Tigestu, 2018).

## **2.10 Characteristics of Effective Quality Management Systems**

Verification of Process Quality management systems can become cumbersome and bureaucratic if not properly developed, implemented and maintained. Effective quality

management systems have common characteristics. These common denominators of quality management, when properly implemented, can improve organization's ability to satisfy customer and manage your processes and products more effectively. These common characteristics of effective quality management systems are listed below (Tigestu, 2018).

1. **Quality manual:** - a quality is including scope, justifications for any exclusion, documented procedures and process interaction descriptions. This will specify how a QMS will be observed and emphasize the company's commitments to both continuous improvement and quality. The quality policy and quality objectives are defined, deployed throughout the organization and understood by employees at all levels.

2. **Process base:** - a process is in place and clearly defined to ensure the needs and expectations of customers and other interested parties.

3. **Documented processes:** - Processes are documented in simple to use procedures that are up to date.

4. **Monitoring Processes:** - Metrics are established and monitored for each process. When a process is not monitored and measured, leaders couldn't know if it is producing the desired outcomes. Inefficiencies will be extensive and it is very difficult to implement corrective actions that really work.

5. **Management commitment:** - Management is committed to use the metrics for process improvements and for communications within the organization as well as for holding people accountable for their performance. The leader follow-up to insure people do what is expected.

The management is also involved in the system and reviews the entire system at appropriate intervals to insure the system is functioning as planned, is effective for the business and is being maintained.

6. **Process to prevent non-conforming product or services:** - a process is in place for preventing non-conforming product or services and in the event non-conforming the situation is documented and corrective actions taken. In the case of non-conforming product, the process provides for identification and segregation to prevent it from getting to a customer.

7. **Framework for verification of processes:** - a framework for verification of processes and products is in place and functioning as planned. This includes internal audits of the processes as well as product quality verification at various stages of production. When



you have good customer issue (feedback) or audit data, and are trending an issue, the most common reaction is to start a CAR (Corrective Action Report).

8. Documents and document procedures: - Any documents needed to ensure the effective operation, planning and control of company processes and any document procedures required by the compliance standard is identified.

9. Records: - records such as evidence of conformity to requirements and of effective QMS operation will be required by the compliance standard.

10. Resources: - to meet objectives are identified and provided. Resources include people, processes, equipment and infrastructure.

11. Continual improvement: - this is a priority action and simple approaches are implemented to involve people throughout the organization in identifying continual improvement opportunities.

### **2.11. Summary of review and Research Gaps**

According to the researcher effort in literature review above, the researcher assessed different literatures, summarize the findings and identify the research gap. The researcher found that few researches done on ISO 9001 based QMS only on ISO certified construction companies in Ethiopia.

According to the study of Quality Management in construction industry by Ashokkumar Quality Management has increasingly been adopted by construction companies as an initiative to solve quality problems and meet the needs of the final customer (Ashokkumar, 2014).

According to Selamawit Tigestu research (2018) results the involvement of construction consultants in the country on QMS is negligible. The reason that: -

- QMS benefits are not clearly understood by the consultants.
- lack of adequate knowledge on activities to make the system effective.
- The difficulty to interpret the standard requirement.
- lack of top management commitment and engagement of employees
- lack of technical expertise to establish and control the implementation of the system

This research studies only on Grade1-5 ISO certified construction consultants.

The findings by Teklebrhan Kidanu (2014) argue that the ISO 9001 certified construction companies have not got tangible benefit. The reasons that: -

- They do not give much emphasis to internal benefits of the standard
- Inadequate training and motivation to employees.
- Lack of continual support and encouragement from governmental bodies.

It also concerned only ISO 9001 certified construction companies.

Fikreab Markos (2018) These two real estate construction companies ISO certified in 2007. This research also studies only ISO certified construction companies but not included uncertified construction companies that adapt quality management systems applied in traditionally.

These researches were study only ISO 9001:2008 certified construction companies in Ethiopia. However, from the above research findings the researcher understood that ISO certified construction companies to implement ISO 9001:2008 based QMS in Ethiopia almost none. So, the gap of these research is study of QMS on these small sample size not represent effective result. So, this research studies both certified and uncertified construction companies to fill the gap by study the challenges that uncertified construction companies unable to implement ISO 9001:2008 based QMS.

## CHAPTER THREE

### 3. RESEARCH METHODOLOGY

#### 3.1. Introduction

There are three important components of a research approach namely philosophical world view, research design, and research methods. Research approaches are classified into the categories of post Positivism, constructivism, transformative and pragmatism (Grover, 2015).

These world views are merged to form three approaches namely-quantitative, qualitative and mixed methods. Among of this research approaches, in this study mixed method approach is used.

#### 3.2. Research Design

A research design is a procedural plan that is adopted by researchers to answer questions objectively, accurately, economically and with validity. Moreover, research design should provide the overall structure and orientation of an investigation as well as a framework within which data can be collected and analyzed (Markos, 2018).

Therefore, in this study a detailed description of the essential considerations in designing the research project which encompass the research design, population and sample design, sampling techniques, instruments of data gathering, validity and reliability of data, and methods of data analysis.

This study follows mixed type approach both qualitative and quantitative methods (Markos, 2018). It is qualitative because the study focused to identify the status of QMS implementation, challenges and role of QMS implement. Qualitative approach is employed as the major methodology as this best suited the research objectives and associated research gaps. The study is also quantitative, because it focused on measurements of the variables that identified from the literatures to get answers for the formulated questions.

The process in research design part available documentary sources relevant to the research would be reviewed, based on the data and information sources the research instruments have been decided that is Questionery and interviews.

Finally, after an in-depth review of different literature from books, journals and websites, questionnaires designed and distributed to the respondents such as

contractors, consultants and certain information and data also collected from governmental bureau and offices. Upon obtaining the desired data, checking and sorting of data done (either qualitative or quantitative).

The data also then analyzed by using both qualitative and quantitative approaches for cross checking the conformity of the information through the overall research work. This would follow through discussions to draw a conclusion and to forward recommendations to the construction stakeholders based on the findings of the study.

The research design was a comprehensive design, that is both descriptive and explanatory research design. the purpose of an explorative study is to explore an area which is new or unknown. An explorative survey can be carried out to generate interesting problems for future research, as well as an introduction to a survey can be made to test some chosen hypotheses and to collect as much information as possible within a certain problem area to gain an understanding.

The techniques most useful in explorative studies are interviews and observations. it is especially appropriate in new topic areas, the implementation of quality systems in the construction process is such an area.

### **3.3. Questionnaire Design**

To ensure that meaningful data was collected, the questionnaire in this study was carefully developed and tested, followed by minor revisions in order to have a well-validated survey instrument. All statements were primarily based on information derived from the literature review and preliminary studies (Willar, 2012).

The researcher has developed questionnaires based on the literature review to meet the objective of the research by using mixed method research approach. The researcher in the questionnaire used open response-option questions which is used to the respondents to save their time and to depend less on memory in answering a question.

The number of questions, the ranking scale and various optional points are provided to the respondents. The researcher was given a ranking scale from 0 to 4 ,0 Not Applicable,1 Never,2 Rarely,3 Sometimes,4 Always for the 1<sup>st</sup> four questions ,0 to 2 chooses to the respondents with 0 Not applicable, 1 No, 2 yes for the second one question and finally 0 to 4 ,0 Not Applicable,1Strongly Disagree,2 Disagree,3 Agree ,4 Strongly agree for the last two questions See in Annex A.

### 3.4. Questionnaire Format

The 1<sup>st</sup> part of questionnaire focused on assessment of a construction company's organizational culture profile and respondents experience the 2<sup>nd</sup> part is focused the benefits gained from QMS implementation, challenges that hinder QMS implementation, the motivation to implement QMS and Effectiveness and efficiency of QMS.

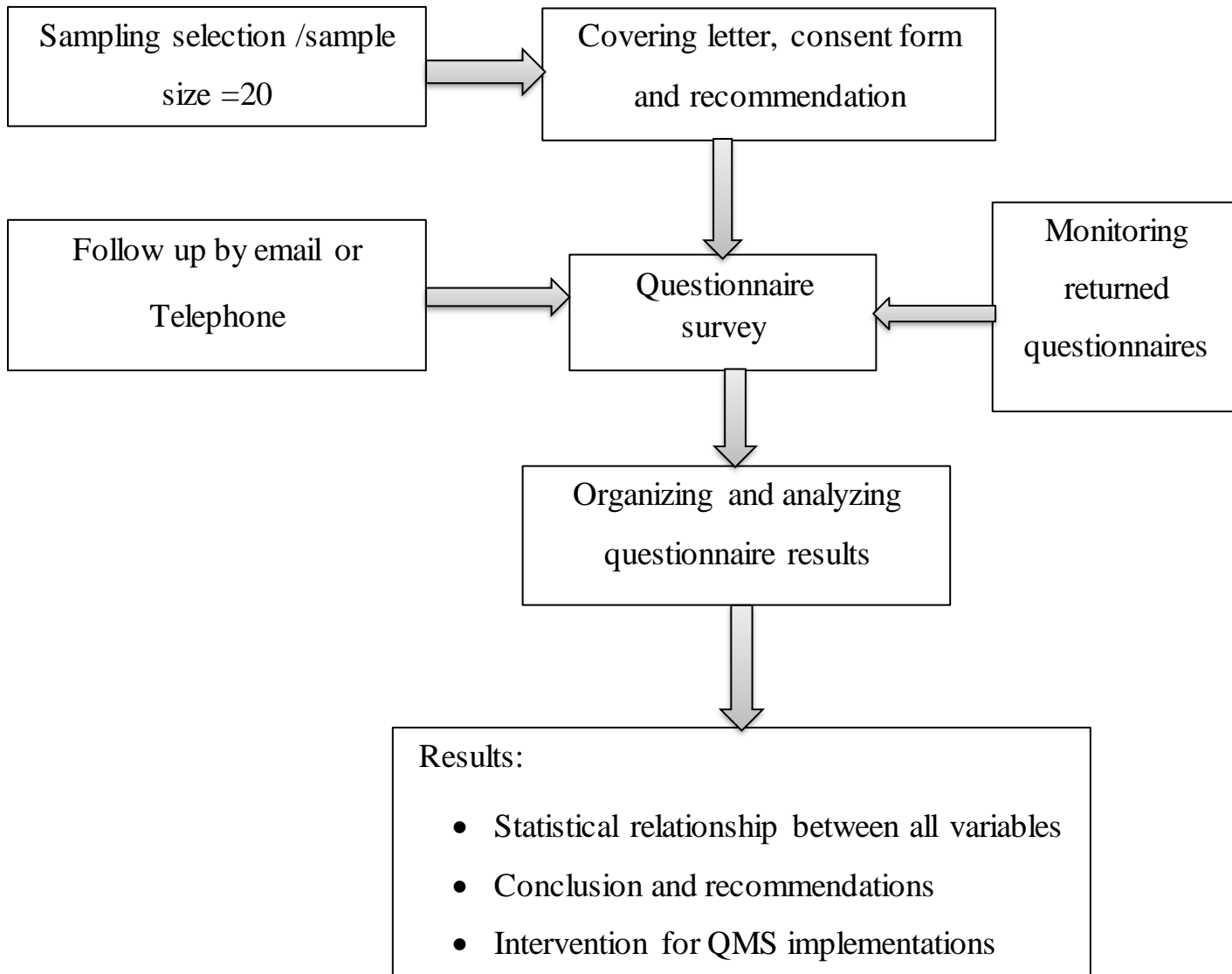


Figure 3.1: Approach of Questionnaire survey

### 3.5. Population and sampling frame

#### 3.5.1. Target Population

The first step in sampling process is to clearly define the target population. Population is commonly related to the number of people living in a particular country (Taherdoost, 2017). Population is considered as a total collection of elements about which we wish to make some inferences (Markos, 2018).

According to ANRS Urban Development Housing and Construction report, there are a 759 grade 1 to 10 contractors and consultants registered and work construction projects in Amhara region (UDHC, 2013). In this study the researcher selects a target population of Grade 1-3 contractors and category 1-3 consultants by using purposive or Judgmental sampling technique from the total population which are 20 in number that registered and work construction projects in Amhara region. Purposive or judgmental sampling is a strategy in which particular settings persons or events were have selected deliberately to provide important information that cannot be obtained from other choices (Taherdoost, 2017).

As a result, the researcher has a total target population of 20 construction companies that is Grade-1-3 contractors and consultants. Among of these 15 of them are contractors and 5 of them are consultants. These data are not include contractors and consultants that have federal licenses even they work construction projects in the region.

### 3.5.2. Sample Size Determination

Designing a suitable sample for data collection is an obvious necessity, since it is rarely possible to investigate an entire population due to source restrictions in most research studies. The objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out whilst ensuring that the sample provides a good representation of the population (Willar, 2012).

In general, there are two types of sampling techniques. Probability or random sampling and Non- probability or non- random sampling (Bhardwaj, 2019). According to the scope and limitation, the sampling technique the researcher used in this study is a non-random sampling technique. Because the population was known and the number of populations is less than 50.

### 3.5.3. Sampling Technique

Sample size refers to the number of items to be select from the universe to constitute a sample. It was a major issue before a researcher headed to the collection of data. The size of the sample should be optimum, and this optimum sample is one, which would fulfill the requirements of efficiency, representativeness, reliability, and flexibility. In deciding the size of the sample, it was necessary to determine the desired precision as also an acceptable confidence level for the estimate and hence 95% confidence level used to calculate the sample size (Taherdoost, 2017). However, for very small

populations (50 or less), the researcher needs almost the entire population to achieve accuracy. For this research the target population is less than 50 which is 20 the researcher takes the whole target population for this study.

### **3.6. Data Collection**

To achieve the intended objective and to answer the research questions of the study, data was collected from multiple sources.

#### **3.6.1. Source of data**

Source of data in this study were categorized into primary sources, and secondary sources. Prime sources provide original data for this research which are questionnaires and interviews the secondary sources were from journals, books, articles, and journals published, to identify data about the research topic.

### **3.7. Data Collection Instruments**

In collecting the necessary data, the researcher used self-administered questionnaires and interviews. Primary data were collected through questionnaires and interviews, while those of secondary data would be collected through Observation of archival documents/literature (reports, websites, researches and textbooks).

For data collection in this study, contractors, consultants and regulatory bodies participated. Then the researcher takes the sample of 19 construction companies and distributed 65 questionnaires to the respondents by using phone and call to know the address and go to the office by taxes, Bajaj. One company was not found the address and data was not collected from it among 20 companies. So, this study distributed questionnaires' for 19 construction companies.

#### **3.7.1. Questionnaires**

A questionnaire is a set of questions that are asked of people in order to gather statistically relevant information on a specific subject. When properly constructed and responsibly administered, questionnaires become a vital instrument by which statements can have made about specific groups of people or entire populations. It is used as the primary tool for collecting data and it can help the researcher/s to collect data faster and cheaper than any other instrument.

As a result, in this research data was collected mainly in the form of questionnaires. The questionnaires were delivered to the respondent's face-to face at their company to motivate the respondents to participate, improving the response rate for the study and

to give clarification to the questions which may not be understood by the respondents. The respondents in the company were managers in different levels, Office and Site Engineers, technical experts on QMS, and specialists that have direct involvement to Quality management within the construction companies.

### 3.7.2. Interviews

Unstructured interviews in this study conducted on the same questions as questionnaires to support and justify the reliability of the data collected through questionnaire focusing on the responses that the researcher thought it needs clarification and to help the respondents to express their response in detail by giving examples.

The interview was also held during the survey to understand the content of questionnaires and to avoid the discrepancies among the respondents. It takes place in a casual setting, such as over coffee or lunch to get additional information that do not include in the Questionnaire such as the current status of ISO 9001 certification validity (expired or renewed) are collected during interview. The interviewees would be any concerned body available at the construction company during the study.

### 3.7.3. Observations

In this research direct observation of the existing facilities of the company like reviewed important documents such as company strategic documents, QMS development and implementation documents, annual reports, procedure manuals and inspection data. The findings from observation was discussed in the analysis and discussion part of the research.



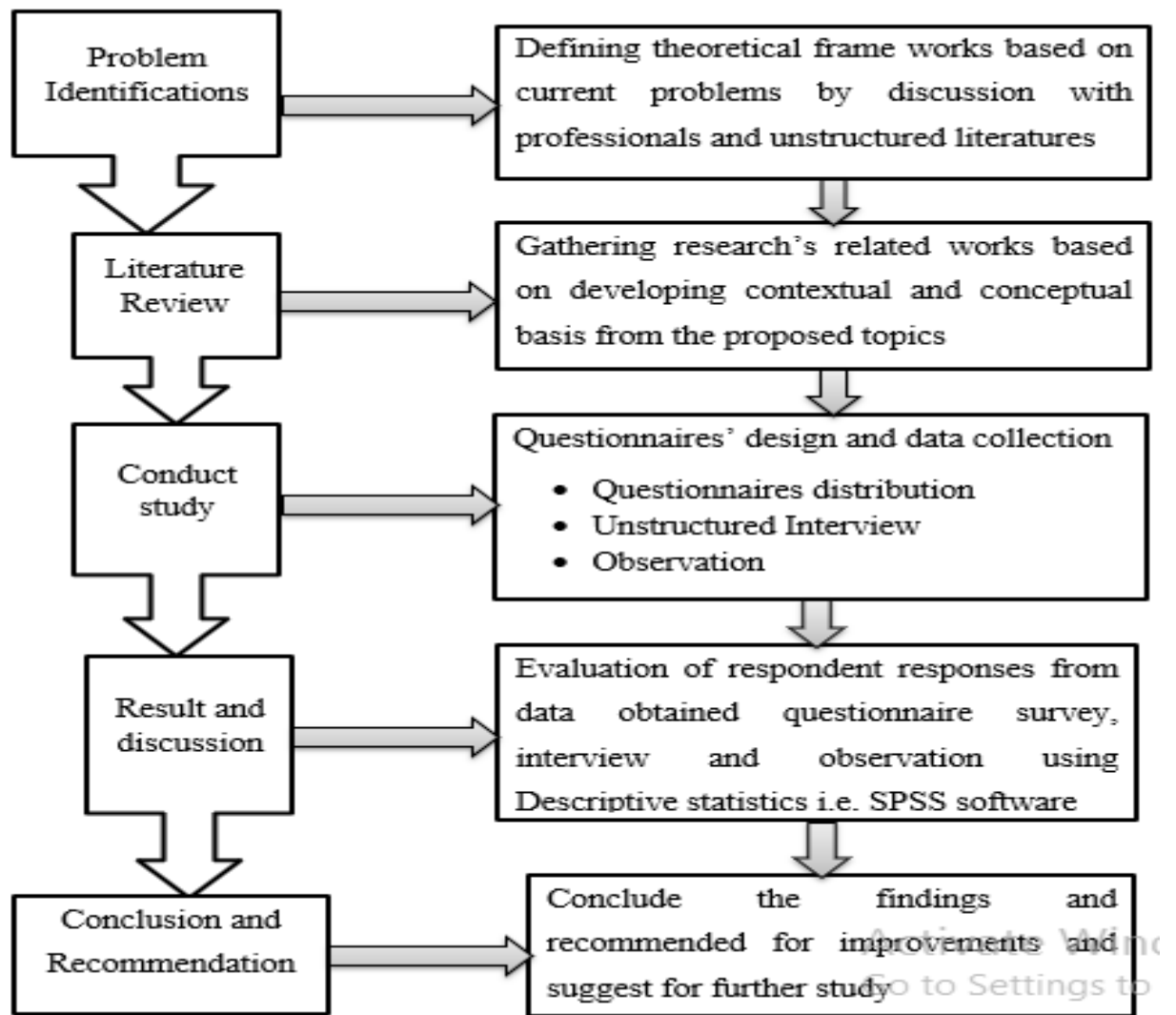


Figure 3.2: Flow chart for research Methodology

### 3.8. Methods of Data Analysis

The research was conducted using a questionnaire survey and unstructured interview to validate the findings of the study. The questionnaire was compiled for quantitative study. The quantitative study was conducted to measure the variables identified from the literatures. The interviews were conducted for qualitative study to increase the reliability of the data. The quantitative data first was organized and put into tables to suit for analysis.

The collected raw data was analyzed and discussed based on descriptive and inferential statistics, the designed questionnaire could let the respondents give their responses corresponding their personal experiences and opinions, to the different variables by Likert scale point which are proper and widely used in opinion measurement with scale ranging. The results of the questionnaires were analyzed in this study by using the Microsoft Excel software package, SPSS (Statistical Package for the Social Sciences) Version 23 software and Relative Importance Index (RII).

### 3.8.1 Quantitative Data Analysis

As noted above, data collected from the questionnaires was both qualitative and quantitative data, which was the output, required from the survey. This data was then processed, analyzed and interpreted by using statistical techniques, to provide the information needed. Quantitative data analysis involves both looking at the general trends in the data and fitting statistical models to the data. The Statistical Package for Social Sciences (SPSS) version 23 was used for the statistical analysis of quantitative data from the Questionnaires.

A descriptive statistical analysis of frequency distribution (numbers and percentages) was first undertaken to provide an overview of the development phase of contractors and consultants QMSs quantitatively. Continuing the descriptive(qualitative) analysis, the results depicted the current status of the QMSs implementation including the levels of the existing QMS implementation, the levels of barriers that affect QMSs implementation, and the levels of company's key performance during QMSs implementation (Willar, 2012).

Relative Importance Index (RII) is a non-parametric technique widely used by construction and facilities management researchers for analyzing structured questionnaire responses for data involving ordinal measurement of attitudes (Sakhare1, 2019 ). Relative index analysis was selected in this study to rank the criteria according to their relative importance and ranking of the variables based on their degree of influence (Rooshdia, 2018).

The relative importance index method (RII) for each case computed using the following expressions (Ljevo, 2017).

$$RII = \frac{\sum W}{A * N} \dots\dots\dots [3.1]$$

Where:

RII is relative importance index

W is the weight given to each factor by the respondents

A = the highest weight

N = the total number of respondents

The second category of analyses undertaken was the conduct of parametric tests using:

- Pearson's Correlation in order to statistically assess the relationships among the QMS variables.
- Analysis of Variance (ANOVA) was conducted to statistically test whether different profiles of construction companies' variables have different influence on the QMS variable.

### **3.8.2 Qualitative Data Analysis**

Qualitative data analysis After the data was collected from the unstructured interview, it was subject to analysis. However, prior to analysis, some preliminary data processing was undertaken. The evaluations of the interviewees of the frameworks were telephone, video and tape-recorded, and then transcribed into text document files. Subsequently, the transcribed data was edited, coded, and then arranged in an order by categories of participants. The classic analysis approach was used to allow the results and analysis to be category( data can be selected, sorted, listed or manipulated with a series of commands and functions)based on the substance of the key questions (Willar, 2012).

### **3.9. Validity and Reliability of the Data Collection Instrument**

#### **3.9.1. Validity**

Validity is defined as how much any measuring instrument measures what it is intended to measure. Validity is the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure (Markos, 2018).

The researcher may not have any connection with the Questionnaire respondents, which provided an unbiased perspective for the participants. However, the researcher as stated in the confidentiality agreement, respondents were encouraged to express their idea openly and honestly with the knowledge about their company and protect their identity in the published results and ensure that the data used only for academic purpose. This condition increases the validity of the data from questionnaire.

In addition to this there are three types of validity check for data (Taherdoost, 2016). (i) Content validity (ii) Criterion-related validity and (iii) Construct validity. In this study content validity of data was checked by the researcher conducted the validity of questions and answers based on Pearson's correlation coefficient. It indicates between 0 and 1 it shows a positive correlation and if correlation between the variables was less than 0 the relation was bad or negative relation.

#### **3.9.2. Reliability**

For a questionnaire to be valid, it must be reliable. When responding to a questionnaire, respondents can consistently interpret a question in one way when it actually means something else. As a result, even though the question is accurate, it is irrelevant because it lacks internal validity and therefore would not allow the research question to be answered. Therefore, Reliability is concerned with the strength of the questionnaire and

was checked using Cronbach's alpha values. The descriptive statistics helped to determine uni-dimensionality and construct validity of the measures, and the Cronbach's alpha values of the factors helped to show the reliability of data that would explain the practice of quality management within the construction activities. The Cronbach's alpha measures the internal consistency of a group of items by measuring the homogeneity of the group of items. It is an indication of how well the different items complement each other in their measurement of different aspects of the same variable or quality. To test the reliability of the questionnaire as a research instrument, a pilot study would be carried out and a Cronbach Alpha Moment Co-efficient would have been used in this case.

### 3.9.3. ANOVA test

The Analysis of Variance is used to test if there are differences in the measured characteristics between two groups of cases (contractors and consultants). The objective is to test if there is a difference in means between the K populations.

The hypothesis of this type of test methods is:  $H_0: \mu_1 = \mu_2 \dots = \mu_k$  versus  $H_a: \mu_i \neq \mu_j$  for at least one pair of  $i, j$ . A large F-value, indicated by a small P-value ( $< 0.05$ ), implies that at least one pair of means differ significantly. A small F-value, indicated by a large P-value ( $> 0.05$ ), implies the means do not differ significantly (Mustafar, 2019).

### 3.10. Ethical consideration

Regarding the ethical considerations, the following issues were considered: the researcher protected the confidentiality of all participants by ensuring that none of them would write the name in the data. The purpose of the study has pre-informed the participants and participants of the study were informed as filling the questionnaire was based on voluntariness; they can withdraw if they cannot participate in the study at any time. Informed participants, as their responses were used only for research purposes rather than other issues, their confidentiality has prevailed, and the research would be reported honestly and hopefully. In addition, all the sources the researcher has used are acknowledged and referenced.

## **CHAPTER FOUR**

### **4. RESULTS AND DISCUSSION**

#### **4.1 Introduction**

This chapter analyses and discuss the data that collected by using questionnaires and unstructured interviews. The collected data from the questionnaires were tabulated and analyzed using Microsoft excel, Relative importance index and SPSS software. The data from the questionnaires have been presented and the findings have been discussed and draw up various conclusions to the problem statement and the objectives.

In this study from the 65 distributed questionnaires 56 questionnaires have been responded. This shows that questionnaire response rate was found 86.15% which is good to continue the study. Results and discussions are divided in five parts in line with the objectives of the research. The first part tries to present the demographic characteristics of the respondents, then the second part shows motivations to implement QMS. The third part of the results and discussion contains the benefits gained from QMS implementation the 4<sup>th</sup> part is present the findings towards identifying and understanding the level of top management responsibility in their company to implement QMS. The fifth part is focused to the challenges that hinder implementation of QMS.

#### **4.2. Validity Test**

Validity refers to how accurately a method measures what it is intended to measure. If research has high validity that means it produces results that correspond to real properties, characteristics, and variations in the physical or social world. High reliability is one indicator that a measurement is valid. There are different categories of correlation coefficient relationship between the required data; mostly the following relations and interpretation used for test the validity of the collected data. The correlation coefficient between 0.00 to 0.10 negligible correlations, 0.10 to 0.39 weak correlations, 0.40 to 0.69 moderate correlations, 0.70 to 0.89 strong correlations and the remaining 0.90 to 1.00 is very strong correlation (Boer, 2018).

For this thesis the validity of the collected data is checked with correlation – bivariate analysis using SPSS software. The SPSS software analysis for collected data result is shown below in table 4.1.

Table 4.1: Data validity Test with Correlation Analysis

Correlations			
Description		Total respondent	Company type
Total respondent	Pearson's Correlation	1	.687**
	Sig. (2-tailed)		.000
	N	56	56
**. Correlation is significant at the 0.01 level (2-tailed).			

The total sample size or respondents are 56 and the degree of freedom of the data calculated as  $N-2 = 54$ , the data is characterized with level of significance of 0.01 with two tailed. The data is valid if the level of significance is lower than 0.01 or the calculated value of the Pearson correlation should greater than the critical standard table valued obtained in the Pearson correlation table.

As shown in table 4.1 above the calculated level of significance of the total value of Pearson correlation is 0.000, so the data is valid. Alternatively, using degree of freedom = 54 and level of significances 0.01 for two tailed, the critical Pearson correlation in the standard table is equal to 0.3424 using tabulated method. So, this indicates that the table obtained value is less than the calculated value i.e. 0.687 and shows highly significant so it is a valid question in moderate correlation accordingly Boer study in 2018.

### 4.3. Reliability Test

Before going to the main analysis of the study, a reliability test was administered to check whether the questionnaire is reliable or not by Cronbach alpha test. The Cronbach's alpha measures the internal consistency of a group of items by measuring the homogeneity of the group of items. It is an indication of how well the different items complement each other

in their measurement of different aspects of the same variable or quality. To test the reliability of the questionnaire as a research instrument, a pilot study would be carried out and in this case a Cronbach Alpha Moment Co-efficient would have used.

Based on Cronbach's alpha test value of this study the researcher found 0.761 for company that implement QMS, 0.922 for companies that plan to implement QMS and 0.718 for companies that did not plan to implement QMS. All results found in this study was above the minimum acceptable threshold  $r = .671$  and the category of reliabilities levels are: - Excellent reliability 0.90 and above, strong reliability 0.70-0.90, moderate reliability 0.50-0.70, and poor reliability 0.50 and below (Taherdoost, 2017). This paper has strong reliability except one which have excellent (0.922) as shown below in table 4.3.

Table 4.2: Cronbach's Alpha Test Summary for QMS Implemented Company

Reliability Statistics			Case Processing Summary			
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items			N	%
0.761	0.789	47	Cases	Valid	12	100
				Excluded <sup>a</sup>	0	0
				Total	12	100
			a. List wise deletion based on all variables in the procedure.			

Table 4.3: Cronbach's Alpha test Summary for Plan Companies to Implement QMS

Reliability Statistics			Case Processing Summary			
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items			N	%
0.922	0.92	27	Cases	Valid	16	100.0
				Excluded <sup>a</sup>	0	0.0
				Total	16	100.0
a. List wise deletion based on all variables in the procedure.						

Table 4.4: Cronbach's alpha test summary for companies not practicing QMS

Reliability Statistics			Case Processing Summary			
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items		N	%	
0.718	0.707	22	Cases	Valid	28	100
				Excluded	0	0
				Total	28	100
a. List wise deletion based on all variables in the procedure.						

#### 4.4. ANOVA Test

The ANOVA analyzes the relationship between the groups and within the groups of the collected data. The software analysis considers two-way assumptions i.e. Null hypothesis or alternative hypothesis. The relationship between the groups are evaluated accordingly the relation mentioned in the methodology parts. This software evaluates the data accordingly the null hypothesis or alternative hypothesis principles based on the analysis of output and the result shows in the following tables 4.5,4.6 & 4.7.

Table 4.5: Respondents Descriptive Data Based on 95% Confidence Interval

Descriptive								
Descriptions	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Contractor	44	.48	.698	.105	.26	.69	0	2
Consultant	12	1.92	.289	.083	1.73	2.10	1	2
Total	56	.79	.868	.116	.55	1.02	0	2

Table 4.6: Test of Homogeneity of Variances

Test of Homogeneity of Variances			
Levene Statistic	df1	df2	Sig.
19.568	1	54	.000



Table 4.7: ANOVA Test Summary

ANOVA					
Descriptions	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	19.535	1	19.535	48.181	.000
Within Groups	21.894	54	.405		
Total	41.429	55			

The findings of the P-value for the Levene's test of equality of variance is 0. The output P-value is less than 0.05 levels of significance. The degree of freedom for between groups and within groups are 1 and 54 as shown in the above table 4.7 respectively. Therefore, there is no need of another test method requires justifying this result accordingly. In this case a non-parametric test does not performed to solve these values to identify whether the test retain null hypothesis or not accordingly mentioned in methodology sections.

The non-parametric independent test of study is performed using Kruskal Wall test method (Girish, 2010) result if it requires justifications based on the result. This indicates that the null hypothesis test assumed is rejected. Accordingly, the ANOVA test, the two groups are different i.e. the assumptions at least one means of the groups are different from each other. So, the study shows that alternative hypothesis is accepted whereas null hypothesis rejected.

#### 4.5. Demographic Analysis

This section mainly concerns with the presentation of the results of the study based on the collected data-using questionnaire. To make it clear, the presentation of the results was organized in line with the basic research questions.

#### 4.5.1 Rate of Response

The respondents were grouped into two major groups namely, consultant and contractor. The questionnaire return rate from the two groups are tabulated in figure 4.1 below. From the 65 questionnaires that were distributed to 19 construction companies (the sample size is 20 but the address of one company is not found). Out of 65 questionnaires, 56 of them completed and responded from 17 construction companies. However, two construction companies totally didn't return the questionnaires that were 1 consultant and the other 1 was contractor. Then, rate of response is 86.15%.

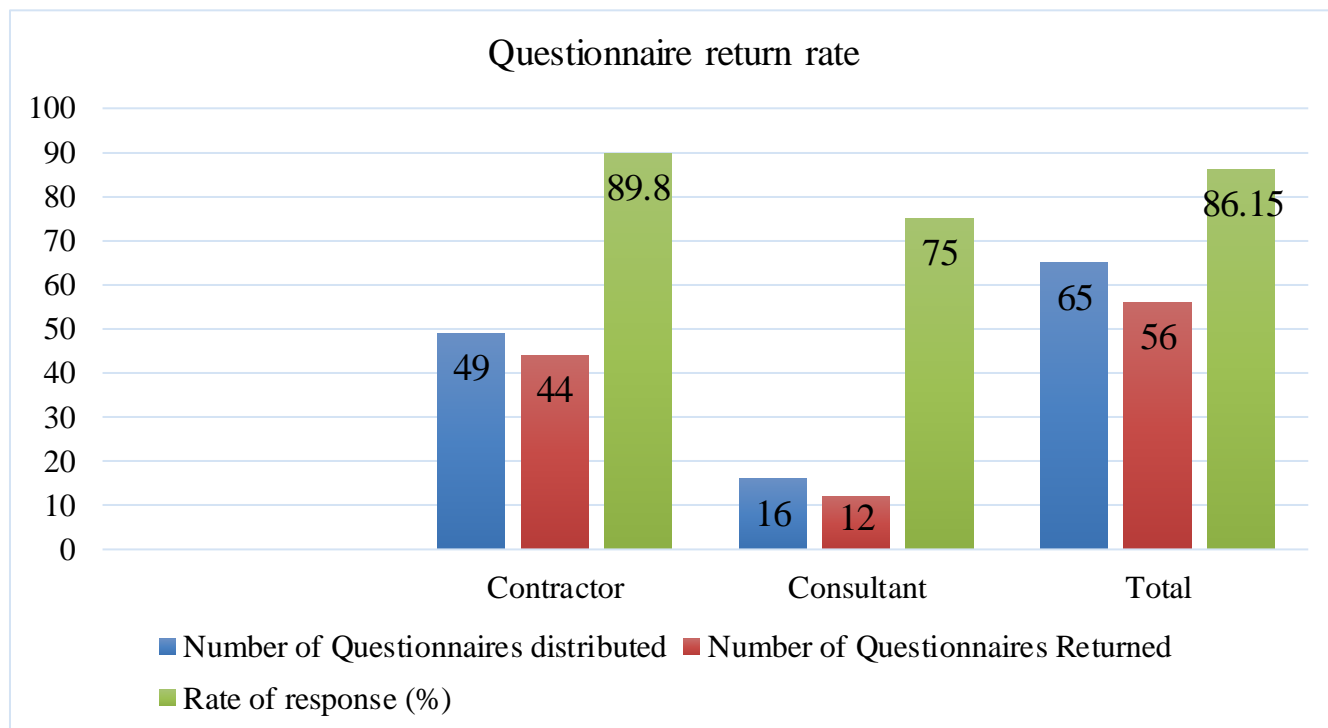


Figure 4.1: Questionnaires Return Rate

Table 4.8 : Companies Grade Level

Company grade status		
Company grade	Respondents	Percent
Grade 1	40	71.4
Grade 2	3	5.4
Grade 3	13	23.2
Total	56	100.0

Among the respondents, 71.4% respondents are grade- 1,5.4% respondents are grade-2 and 23.2% are grade - 3 for both contractor and consultant.

#### 4.5.2 Respondents' Background

Among the fifty-six respondents 23% of them were project managers ,34% of the respondents were office engineers, 12% were technical team leader, 11% were contract administration team leader and 20% were site engineer. The findings from the analysis show that 34% of the respondents were office engineers who are directly concerns to quality management systems implementation by preparing of quality manual, document preparation of quality training. Next to office engineer 23% of the respondents were project managers who takes the lead of initiation of quality management implementation by take and provide training about QMS to the employees in the company. So, the researcher believe that they are skilled and the information filled by the respondents are more valid and reliable.

**Respondents Background**

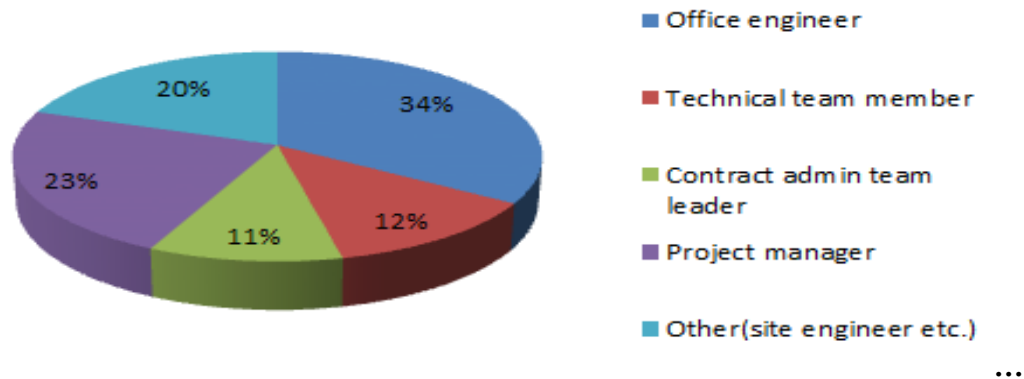


Figure 4.2: Composition of Respondents by their Position in their Organization.

#### 4.5.3. Respondent's Experience

All the respondents have different levels of work experience in selected companies. The majority of the respondents in the companies have between 5 to 10 years experiences (71.43%). The others were ranges below 5 years were (21.43%) and respondents above 10 years' experience were less (7.14%). The composition of younger staff and senior management experts have an adequate experience in their assigned position to practice and

implement QMS, which could further help them to transform their institutional activities in a better way and to a higher level of achievements.

71.43% of the respondents have above five-year and below 10-year experience in the company and the researcher expected that they have enough experience to have a detail information about their company to fill the questionnaires. The validity of the questioner increases as the respondent's experience increases in the company. Proportions of the respondents in terms of number of years they work in companies are tabulated in Table 4.9 below.

Table 4.9: Respondent Experiences

Respondent experience ranges	Total respondents	Respondent rate (%)
Less than 5 years	12	21.43
5 to 10 years	40	71.43
Above 10	4	7.14
Total	56	100

#### 4.6. Analysis

In the structured part of the questionnaire, the respondents were asked to rate the degree of contribution of the variables drawn from the literature review. The responses were analyzed using the Microsoft Excel software package and the reliability of the content were checked by SPSS software and the rank of influence of variables were determined by using relative importance index. The questionnaires are categorized in three ways based on the company status i.e. QMS implement (ISO certified), planned to QMS implement and didn't implement QMS. Both companies' contractors as well as consultants grouped based on the above and analyzed considering for these categories. The following table shows the percentage analysis of the respondents about basic information on the implementation of QMS based on respondent's data using SPSS software.

Table 4.10: Category of QMS Implementation Level of the Companies

Quality Management system analysis result		
Categories	No. of respondents	Percent
Not implement QMS	28	50.0
Implement QMS	12	21.4
Planned to implement QMS	16	28.6
Total	56	100.0

Source: Data from Questionaries,2013 E.C

As shown above table 4.10, from the total respondents 21.4% of the respondents are ISO certified that implement QMS, 28.6% of the respondents were planned to implement QMS in the future and 50% of the respondents still not planned to implement QMS.

From the above analysis, half of the companies' respondents have not implemented QMS and only 21.4% respondents have implemented QMS in their company from 100%. These data were as respondent level from questioners. However, from informal interview findings there are three construction companies are ISO certified in the region. These companies all are Grade-1 contractors. These show that ISO certification in construction companies are not give attention to practice the system and not planned to practice in the future.

A) QMS Implemented Company's Analysis

Table 4.11 : QMS Implementation Driving Force and Analysis

S.No	Description of driving forces to implement QMS ISO 9001:2008	Response	frequency	Percent	RII= $\sum W/A*N$	Rank
1	Dissatisfaction with the previous/present working(I)	Rarely	4	33.3	0.7083	9
		Sometimes	6	50.0		
		Always	2	16.7		
		Total	12	100		
2	Minimization of poor construction/service quality(B)	Sometimes	3	25	0.9375	2
		Always	9	75		
		Total	12	100		
3	Business and process improvement (C)	Sometimes	4	33.33	0.9166	3
		Always	8	66.67		
		Total	12	100		
4	For marketing purposes and to enhance the reputation of your company (L)	NA	2	16.7	0.6666	12
		Rarely	1	8.3		
		Sometimes	6	50		
		Always	3	25		
		Total	12	100		
5	There is strong competition and your company needs to be more competitive (F)	Sometimes	5	41.7	0.8958	6
		Always	7	58.3		
		Total	12	100		
6	To increase employee motivation and participation (J)	NA	2	16.67	0.6875	10
		Never	1	8.33		
		Sometimes	3	25		
		Always	6	50		
		Total	12	100		

S.No	Description of driving forces to implement QMS ISO 9001:2008	Response	frequency	Percent	RII= $\sum W/A*N$	Rank
7	To ensure higher productivity(A)	Sometimes	1	8.33	0.9791	1
		Always	11	91.67		
		Total	12	100		
8	To fulfill legal requirements (H)	Rarely	4	33.33	0.75	8
		Sometimes	4	33.33		
		Always	4	33.33		
		Total	12	100		
9	To improve Efficiency and Effectiveness(D)	Sometimes	4	33.33	0.9166	4
		Always	8	66.67		
		Total	12	100		
10	For Paper work reduction(M)	NA	1	8.33	0.625	13
		Never	3	25		
		Sometimes	5	41.67		
		Always	3	25		
		Total	12	100		
11	For Bidding requirements(K)	Rarely	5	41.67	0.6666	11
		Sometimes	6	50		
		Always	1	8.33		
		Total	12	100		
12	For Short- and long-term training programs(N)	NA	4	33.33	0.4791	14
		Never	1	8.33		
		Rarely	1	8.33		
		Sometimes	4	33.33		
		Always	2	16.67		
		Total	12	100		
13		Rarely	2	16.67		

S.No	Description of driving forces to implement QMS ISO 9001:2008	Response	frequency	Percent	RII= $\sum W/A*N$	Rank
	For Reduction mistakes and rework(E)	Always	10	83.33	0.9166	5
		Total	12	100		
14	Only for marketing purpose(O)	NA	3	25	0.375	15
		Never	4	33.33		
		Rarely	3	25		
		Sometimes	2	16.67		
		Total	12	100		
15	Company prestige/image(G)	NA	1	8.33	0.7708	7
		Rarely	1	8.33		
		Sometimes	5	41.67		
		Always	5	41.67		
		Total	12	100		

Source: Data from Questionnaire 2013.E.c

From the literatures of different researches, the most driving force to implement QMS in construction companies are:

To effectively and efficiently control project activities; it was also as the most prevalent motive selected. For the betterment of the company's overall management system, to fulfil client's requests as part of the bidding process, to improve business performance and to minimize poor quality of construction processes and products. Respondents chose as a requirement from the Ministry of Public Works, to improve the company's prestige (e.g. image, reputation) and to enter the international construction market, as their less important motive (Willar, 2012).

In parallel to this, the findings from this research as shown from table 4.11 analysis result the Respondents rated the most driving force to implement QMS are: 6(50%) of respondents agreed that dissatisfaction with the previous/present working sometimes forces to implement QMS, 9(75%)of the respondents believed that minimization of poor construction/service quality always influence to implement QMS, 8(66.67%) of the



respondents said that business and process improvement always influence to implement QMS, 6(50%) of the respondents said that marketing purposes and to enhance the reputation of company sometimes influence to implement QMS, 7(58.7%) of the respondents said that strong competition and the company needs to be more competitive always influence to implement QMS, 11(91.67%) of respondents shows that to ensure higher productivity always influence to implement QMS,8(66.67%) of the respondents said that improve efficiency and effectiveness always influences to implement QMS , 6(50%)of the respondents said that bidding requirements sometimes pushed to implement QMS, 10(83.33%) of the respondents said that for reduction mistakes and rework always influences QMS implementation.

The critical Analysis of six selected top deriving force to implement QMS based on RII value are shown in figure 4.3 below.

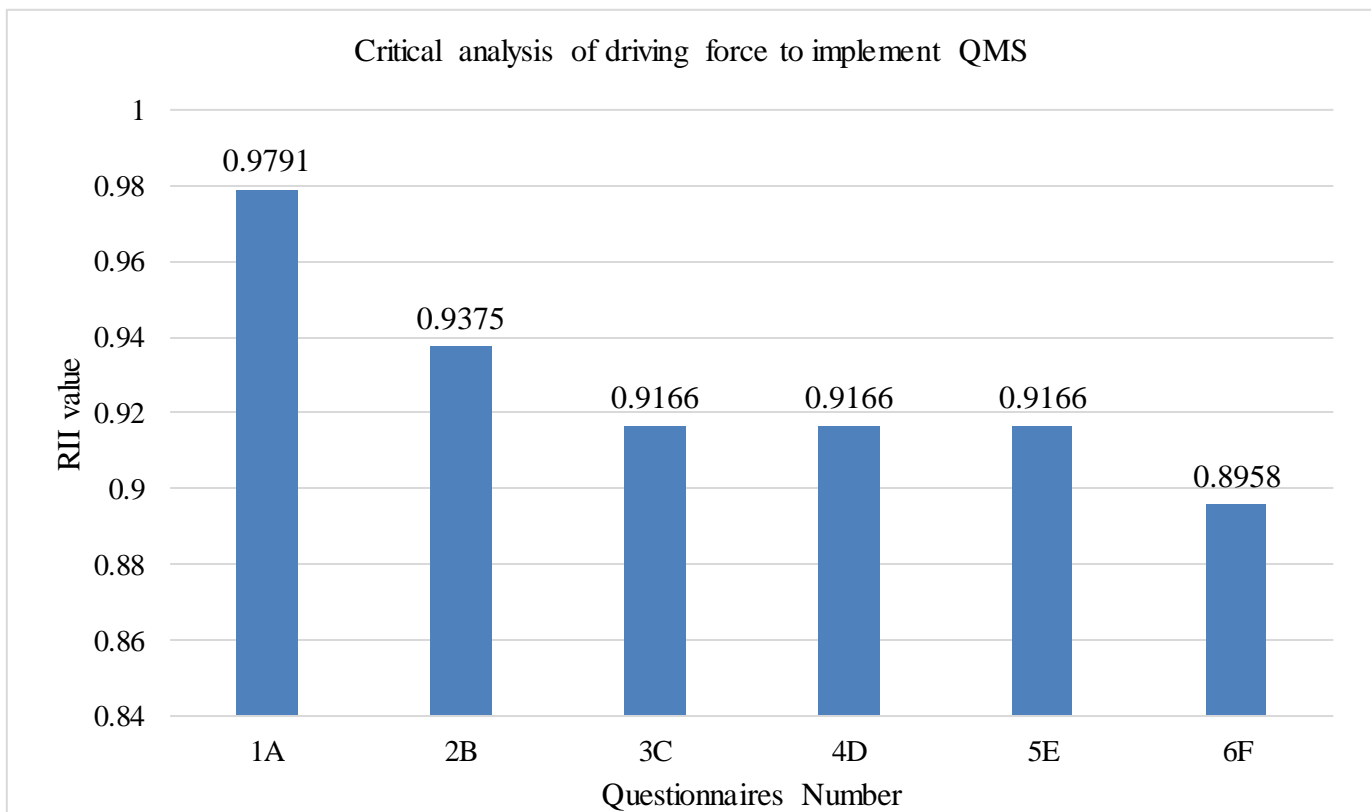


Figure 4.3: Critical Driving Forces to Implement QMS

Based on this study findings, the most critical influential reasons to implement QMS in the company level is identified as shown in figure 4.3 above. The RII method ranks the level

of criticality to consider for implementing QMS from 0.9791 to 0.8958 as described in table 4.11. so, this indicates that other related companies take lessons from these companies for the initiation to implement QMS for those did not practice/implement QMS until now.

Table 4.12:Role of implementing QMS and Analysis

S.no	Benefits of QMS implementation	Respondent outputs			RII= $\sum W/A*N$	Rank
		Response	Frequency	Percent%		
1	Improved management confidence(F)	Sometimes	2	16.67	0.9583	6
		Always	10	83.33		
		Total	12	100		
2	Improved communications(K)	Sometimes	4	33.33	0.9166	12
		Always	8	66.67		
		Total	12	100		
3	Better defined responsibilities and authorities(L)	Sometimes	5	41.67	0.8958	13
		Always	7	58.33		
		Total	12	100		
4	Improved awareness of company objectives(O)	Sometimes	7	58.33	0.8541	16
		Always	5	41.67		
		Total	12	100		
5	Improved utilization of resource(E)	Sometimes	2	16.67	0.9583	5
		Always	10	83.33		
		Total	12	100		
6	Minimization of construction waste, defects and rework(R)	Rarely	1	8.33	0.9375	9
		Sometimes	1	8.33		
		Always	10	83.33		
		Total	10	100.00		
7	Improved productivity(D)	Sometimes	2	16.67	0.9583	4
		Always	10	83.33		
		Total	12	100		

S.no	Benefits of QMS implementation	Respondent outputs			RII= $\sum W/A*N$	Rank
		Response	Frequency	Percent%		
8	Improved profit and company growth(G)	Sometimes	3	25	0.9375	7
		Always	9	75		
		Total	12	100		
9	Improved customer satisfaction(C)	Sometimes	2	16.67	0.9583	3
		Always	10	83.33		
		Total	12	100		
10	Improved focus on customer requirement(Q)	Rarely	2	16.67	0.8125	18
		Sometimes	5	41.67		
		Always	5	41.67		
		Total	12	100		
11	Improved monitoring and control(J)	Sometimes	4	33.33	0.9166	11
		Always	8	66.67		
		Total	12	100		
12	Improved employee awareness about quality(B)	Sometimes	2	16.67	0.9583	2
		Always	10	83.33		
		Total	12	100		
13	Improved company reputation(T)	NA	2	16.67	0.6666	20
		Rarely	1	8.33		
		Sometimes	6	50		
		Always	3	25		
		Total	12	100		
14	Improved risk management(M)	Rarely	1	8.33	0.875	14
		Sometimes	4	33.33		
		Always	7	58.33		
		Total	12	100		
		NA	1	8.33	0.7292	19

S.no	Benefits of QMS implementation	Respondent outputs			RII= $\sum W/A*N$	Rank
		Response	Frequency	Percent%		
15	Reduced paper work, and improved documentation(S)	Never	2	16.67		
		Rarely	1	8.33		
		Sometimes	1	8.33		
		Always	7	58.33		
		Total	12	100		
16	Improved completion time and cost of project(A)	Sometimes	1	8.33	0.9792	1
		Always	11	91.67		
		Total	12	100		
17	Improved identification of root causes of problems(N)	Rarely	1	8.33	0.8541	15
		Sometimes	5	41.67		
		Always	6	50		
		Total	12	100		
18	Better record handling / Documentation(H)	Rarely	1	8.33	0.9375	8
		Sometimes	1	8.33		
		Always	10	83.33		
		Total	12	100		
19	Increased Your tender winning(P)	Sometimes	8	66.67	0.8333	17
		Always	4	33.33		
		Total	12	100		
20	Increased motivation and involvement of all employees (I)	Sometimes	4	33.33	0.9166	10
		Always	8	66.67		
		Total	12	100		

Source: Data from Questionnaire, 2013 E.C

From literatures the researches done by J. J. Smallwood, the implementation of a quality management system based on ISO 9000 should realize the following benefits: common language for communicating QA, increase in client confidence, avoidance of client assessment, increased competition for quality products and services, increased client

satisfaction, reduced quality and corrective costs, increased client base and competitive edge for certified contractors.

In other way the findings from this research analysis as shown in table 4.12 The analysis result of the actual benefits gained from QMS implementation are:11(91.67%) of the respondents always confirmed that improved completion time and cost of project,10(83.33%) of the respondents always assured that improved utilization of resource assured that improved customer satisfaction, and improved productivity,9(75%) of the respondent always assured that Improved profit and company growth, 10(83.33%) of the respondents always improved employee awareness about quality, better record handling / documentation are the highest benefits that always gained from QMS implementation. 7(58.33%) of the respondents confirmed that improved awareness of company objectives, 8(66.67%) sometimes increased tender winning and always improved communications, 10(83.33%) of the respondent always said that minimization of construction waste, defects and rework,5(41.67%) of the respondents conclude that sometimes & always improved focus on customer requirement,6(50%) of the respondents assured that improved company reputation, are the benefits that sometimes gained from QMS implementation. However,2(16.67%) of the respondents disagree that implementing of QMS Reduced paper work, and improved documentation.

The critical analysis of twelve top selected benefits of QMS implementation based on RII value shown in figure 4.4 below.

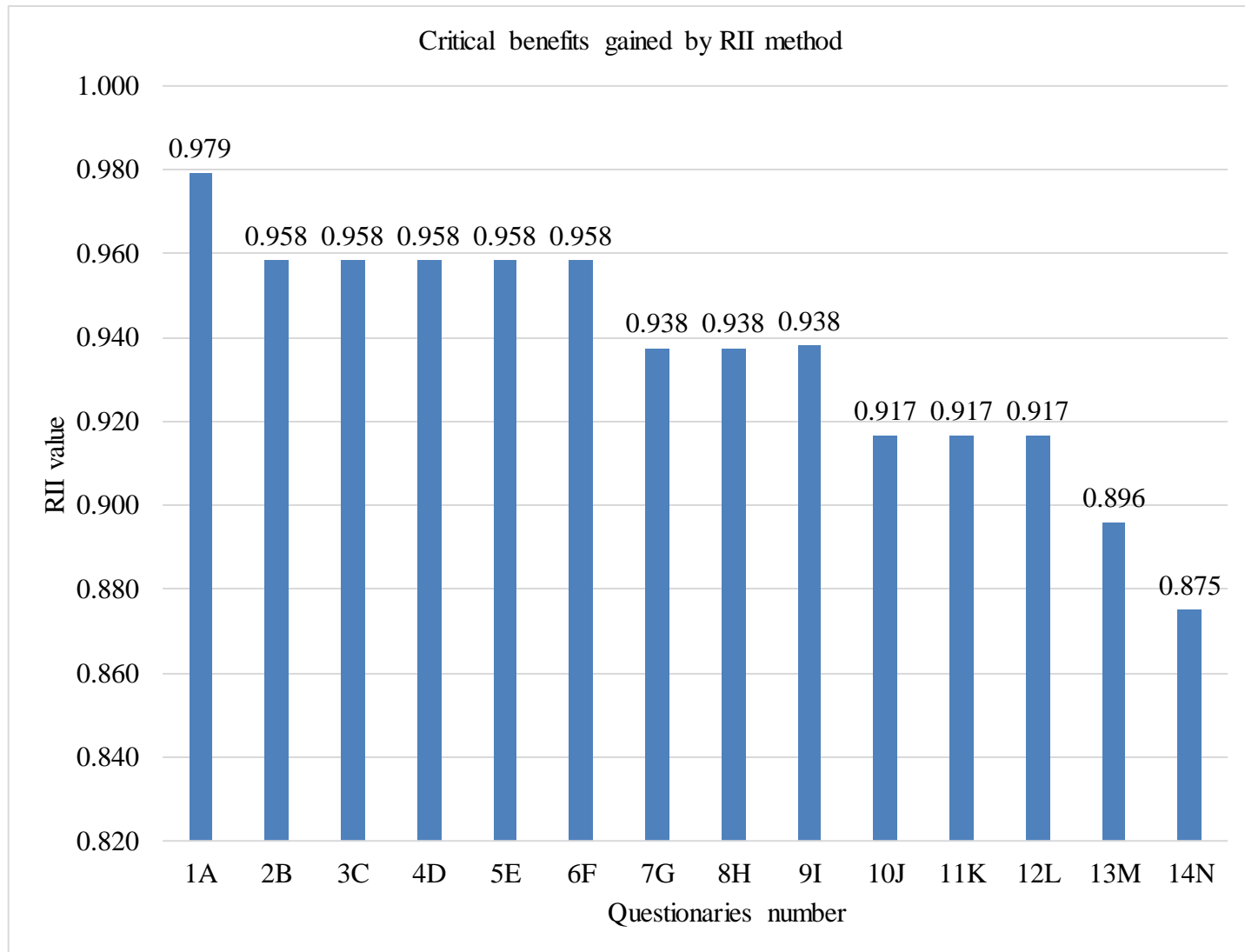


Figure 4.4:Benefits of Implementing QMS

This research finds the top 14 best benefits gained by implementing QMS are mentioned in figure 4.4 as shown above by analyzing using RII methods accordingly table 4.12 analysis result. The study used RII method for identifying the benefits of QMS implementation and ranks from 0.979 to 0.875 that found higher contributions in the company. This indicates that implementing QMS is essential for the company to gain many advantages. So, others better to implement QMS to be effective and efficient for their company in sustainable way.

Table 4.13 :Top Management Role in QMS Implementation

S.no	Role of top management	Respondent outputs			RII	Ranks
		Responses	Frequency	Percent (%)		
1	They take lead on QMS initiatives(D)	sometimes	8	66.67	0.8333	4
		Always	4	33.33		
		Total	12	100		
2	They are involved for improved QMS planning and monitoring(C)	sometimes	7	58.33	0.8542	3
		Always	5	41.67		
		Total	12	100		
3	They are involved and committed in QMS implementation(E)	Rarely	3	25	0.8125	5
		sometimes	3	25		
		Always	6	50		
		Total	12	100		
4	They provide sufficient support to staff for QMS implementation(F)	Rarely	1	8.33	0.8125	6
		sometimes	7	58.33		
		Always	4	33.33		
		Total	12	100		
5	Organize staffs (team) and provide budget(B)	sometimes	6	50	0.875	2
		Always	6	50		
		Total	12	100		
6	Provide continuous training to employees(G)	Never	2	16.67	0.6458	7
		Rarely	1	8.33		
		sometimes	9	75		
		Total	12	100		
7	Have good awareness about QMS(A)	sometimes	4	33.33	0.9167	1
		Always	8	66.67		
		Total	12	100		

Source: Data from Questionery,2013 E.C

From table 4.10 analysis result of role of top managements in implementing QMS, 8(66.67%) of the respondents confirmed that top managements always have good awareness about QMS, 6(50%) of the respondents said that they are always involved and committed in QMS implementation. 9(75%) of the participant assured that they sometimes Provide continuous training to employees, 7(58.33%) of the respondent assured that they

sometimes provide sufficient support to staff for QMS implementation and They are involved for improved QMS planning and monitoring.

The critical analysis of six major role of top managers in implementing QMS in the company by RII methods.

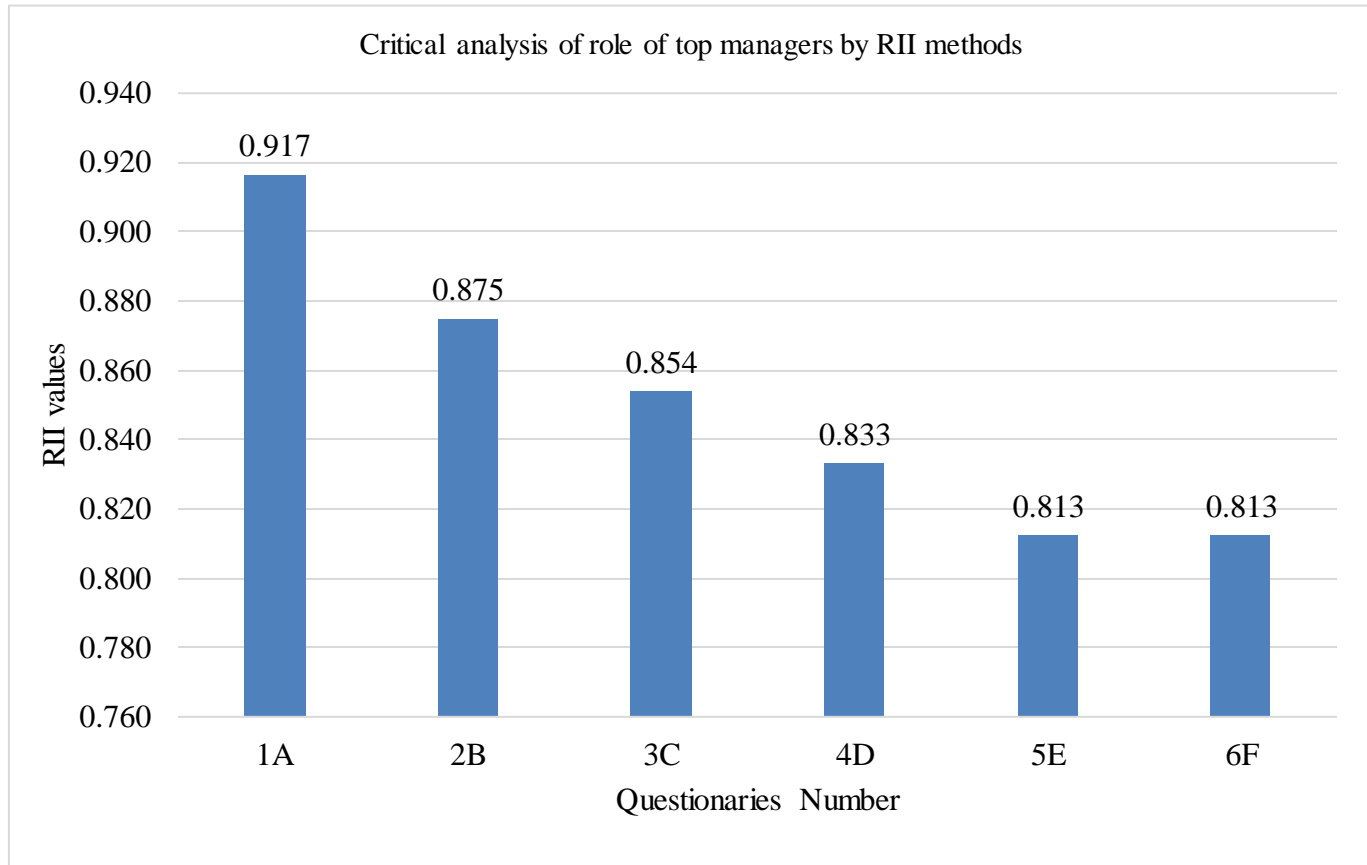


Figure 4.5: Critical Roles of Top Management in QMS Implementation

Based on this research findings, the top management are highly influential for implementing QMS in the company level. As shown in figure 4.5 based on table 4.13 result analysis, the top managements had high role within the company to initiate for implementing QMS. The study used RII method for identifying the role of top managements and ranks from 0.917 to 0.813 that found higher contributions in the company.



Table 4.14: Rank Level of Effectiveness and Efficiency

S.no	Levels of effectiveness and efficiency	Respondent outputs			RII= $\frac{\sum W}{A*N}$	Rank
		Responses	Frequency	Percent (%)		
1	QMS satisfies customer needs and meets his/her full requirement	Sometimes	6	50	0.875	5
		Always	6	50		
		Total	12	100		
2	QMS considers the staff needs like health and safety	Sometimes	4	33.33	0.9167	3
		Always	8	66.67		
		Total	12	100		
3	QMS has improved work efficiency	Sometimes	4	33.33	0.9167	2
		Always	8	66.67		
		Total	12	100		
4	QMS has improved construction process effectively	Rarely	1	8.33	0.8958	4
		Sometimes	3	25		
		Always	8	66.67		
		Total	12	100		
5	QMS has reduced wastes, and controls defects	Sometimes	2	16.67	0.9583	1
		Always	10	83.33		
		Total	12	100		

Source: Data from Questionery,2013 E.C

From the literature's, researches done by Teklebrhan Kidanu (2014) "Assessment of the Impact of ISO 9001 Certification on Ethiopian Construction Companies" states that the measures of effectiveness and efficiency of QMS of a company are customer satisfaction, internal audits, process performance and product conformance, in order to demonstrate conformity of the product, to ensure conformity of the QMS and to continually improve the effectiveness of the QMS (Kidanu, 2014).

From table 4.14 analysis result of this research the measures of effectiveness and efficiency, 8(66.67%) of the respondents assured that QMS always considers the staff needs like health and safety, always has improved work efficiency and has improved

construction process effectively, 10(83.33%) of the respondent confirmed that QMS has always reduced wastes, and controls defects, 6(50%) of the respondents assured that QMS sometimes satisfies customer needs and meets his/her full requirement.

From the results of RII value the measures that have high rank and show high level of effectiveness and efficiency are: QMS has reduced wastes, and controls defects, QMS considers the staff needs like health and safety, QMS has improved work efficiency and QMS has improved construction process effectively.

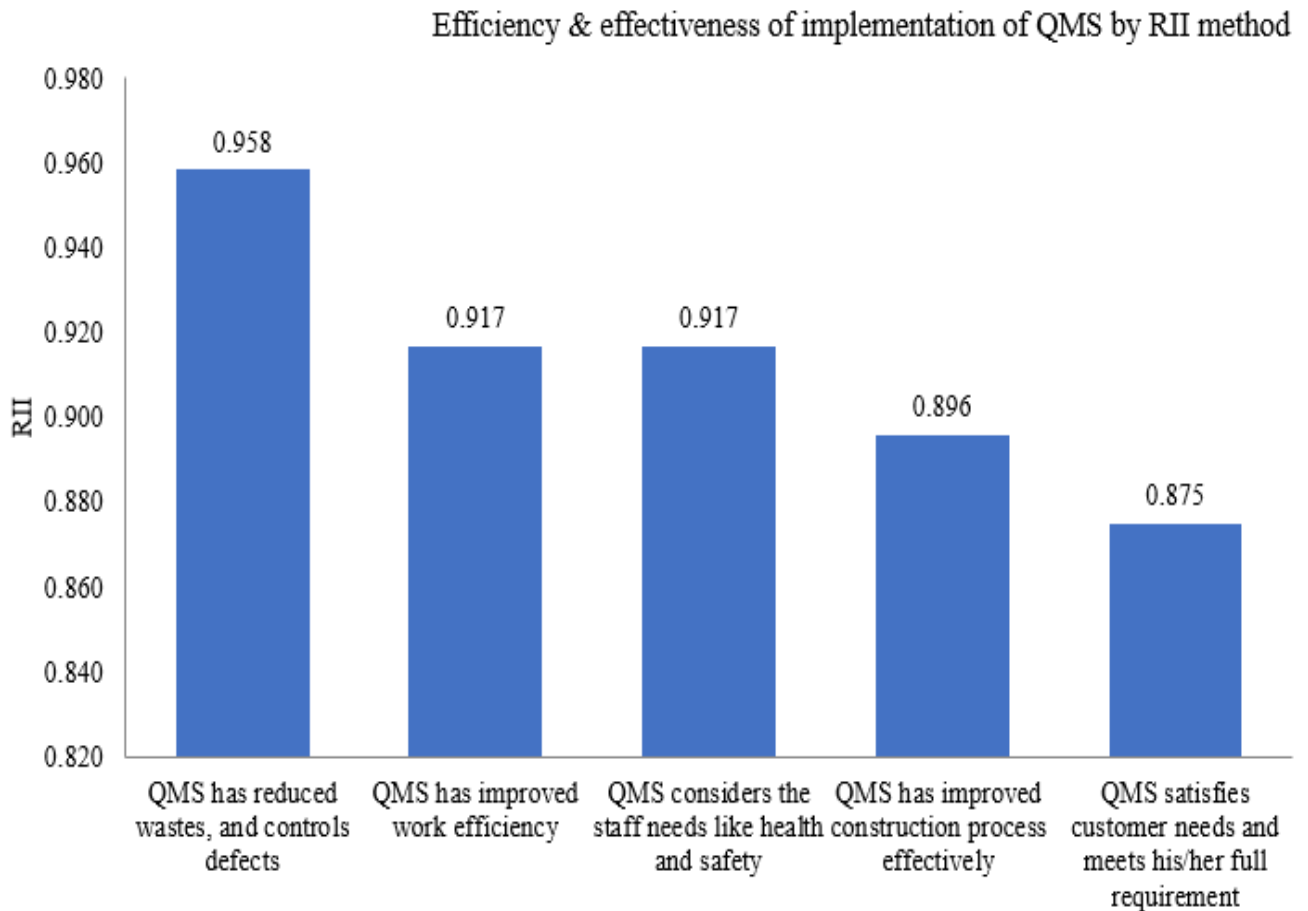


Figure 4.6: Critical Efficient and Effectiveness of Implementing QMS

The efficient and effectiveness of implementing QMS based on this research findings were good status conditions. As shown figure 4.6 the companies were efficient and effective by implementing QMS accordingly RII method ranking system. So, the company had good results and competitive by practicing and implementing QMS within the company. The top five ranks ranges from 0.958 to 0.875 which are best performance status of the company

and recommended for all construction companies to implement QMS for company as well as country level benefits.

B) Plan to Practice QMS Analysis

Table 4.15: Plan to Implement QMS Analysis Result

S.no	Query type	Respondent analysis outputs			RII	Ranks
		Responses	Frequency	Percent (%)		
1	Do you follow the traditional QA/QC practices? (A)	No	1	6.25	0.9688	1
		Yes	15	93.75		
		Total	16	100		
2	Do you have published quality manual? (N)	NA	1	6.25	0.375	14
		No	11	68.75		
		Yes	4	25		
		Total	16	100		
3	Do you have a specific unit/cell/for QA/QC? (L)	NA	1	6.25	0.5313	12
		No	13	81.25		
		Yes	2	12.5		
		Total	16	100		
4	Do have written inspection and testing procedures? (C)	NA	1	6.25	0.8438	3
		No	3	18.75		
		Yes	12	75		
		Total	16	100		
5	Does material supply is inspected to assure technical conformance? (B)	No	2	12.5	0.9375	2
		Yes	14	87.5		
		Total	16	100		
6	Do you procure the materials from approved sources/ suppliers? (F)	NA	1	6.25	0.75	6
		No	6	37.5		
		Yes	9	56.25		
		Total	16	100		
7		NA	1	6.25	0.6875	8

S.no	Query type	Respondent analysis outputs			RII	Ranks
		Responses	Frequency	Percent (%)		
	Do you provide adequate training for testing and inspection staff? (H)	No	8	50		
		Yes	7	43.75		
		Total	16	100		
8	Do you follow the statistical quality control methods? (K)	NA	1	6.25	0.5625	11
		No	12	75		
		Yes	3	18.75		
		Total	16	100		
9	Do you segregate non-conformed products from production? (J)	NA	2	12.5	0.625	10
		No	8	50		
		Yes	6	37.5		
		Total	16	100		
10	Do you investigate the origin and extent of deficiencies? (M)	NA	3	18.75	0.5313	13
		No	9	56.25		
		Yes	4	25		
		Total	16	100		
11	Do you monitor the corrective action? (D)	NA	1	6.25	0.8438	4
		No	3	18.75		
		Yes	12	75		
		Total	16	100		
12	Do you follow standard calibration procedures? (I)	NA	1	6.25	0.65625	9
		No	9	56.25		
		Yes	6	37.5		
		Total	16	100		
13	Do you store equipment /materials to prevent from damage/loss? (E)	NA	1	6.25	0.8125	5
		No	4	25		
		Yes	11	68.75		
		Total	16	100		
14		NA	1	6.25	0.75	7

S.no	Query type	Respondent analysis outputs			RII	Ranks
		Responses	Frequency	Percent (%)		
	Do you consider workers health and safety as a part of quality(G)	No	6	37.5		
		Yes	9	56.25		
		Total	16	100		

Source: Data from Questionery,2013 E.C

From table 4.15 analysis result 15(93.75%) of the respondents give positive response that they follow the traditional QA/QC practices, 12(75%) of the respondents responded positively that they have written inspection and testing procedures and they monitor corrective actions 14(87.5%) of the respondents assured that material supply is inspected to assure technical conformance, .11(68.75%) of the respondents responded negatively that they have not published quality manual,13(81.25%) of the respondents assured that they havent a specific unit/cell/for QA/QC.

The critical findings of planning to implement QMS for the company's responses are shown below in figure 4.7.

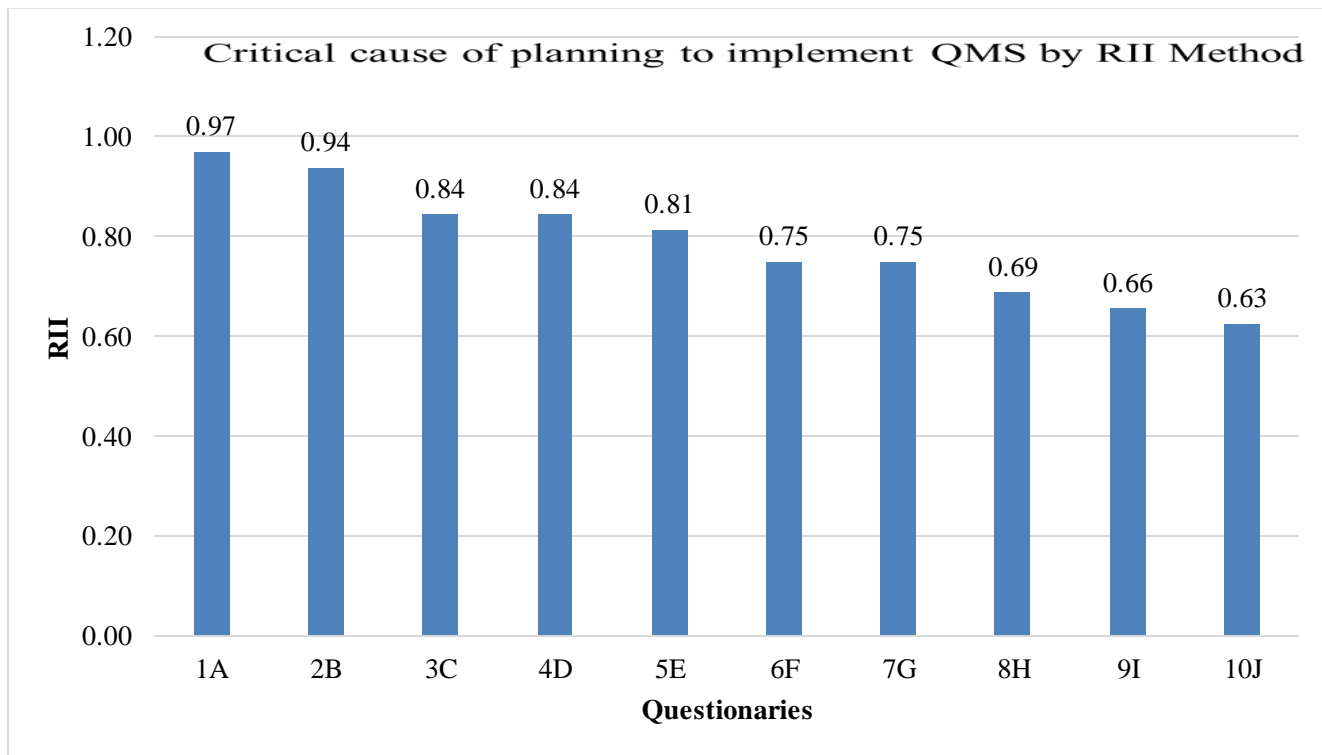


Figure 4.7: Critical Cause of Planning for Implementing QMS in the Company

Different companies had different status to implement QMS for their companies. In this section the research investigated the critical cause of planned to implement QMS as shown in figure 4.7. The result was evaluated using RII method based on the respondent responses. The top ten RII rank shows that causes ranges from 0.97 to 0.63 which major factors that found to plan for implementing QMS in the companies.

Table 4.16: Driving Forces to Plan for QMS Implement

S.No.	Description of driving forces to plan to implement QMS ISO 9001:2015	Respondent analysis outputs			RII= $\frac{\sum W}{A*N}$	Ranks
		Responses	Frequency	Percent (%)		
1	Dissatisfaction with the previous/present working(J)	Never	1	6.25	0.7344	10
		Rarely	2	12.5		
		sometimes	10	62.5		
		always	3	18.75		
		Total	16	100		
2	Minimization of poor construction/service quality(E)	Never	1	6.25	0.84375	5
		sometimes	7	43.75		
		always	8	50		
		Total	16	100		
3	Business and process improvement(L)	NA	1	6.25	0.71875	12
		Rarely	4	25		
		sometimes	6	37.5		
		always	5	31.25		
		Total	16	100		
4	For marketing purposes and to enhance the reputation of your company (I)	Rarely	3	18.75	0.7969	9
		sometimes	7	43.75		
		always	6	37.5		
		Total	16	100		
5		Rarely	2	12.5	0.875	3

S.No.	Description of driving forces to plan to implement QMS ISO 9001:2015	Respondent analysis outputs			RII= $\frac{\sum W}{(A*N)}$	Ranks
		Responses	Frequency	Percent (%)		
	There is strong competition and your company needs to be more competitive (C)	sometimes	4	25		
		always	10	62.5		
		Total	16	100		
6	To increase employee motivation and participation (D)	Rarely	2	12.5	0.8594	4
		sometimes	5	31.25		
		always	9	56.25		
		Total	16	100		
7	To ensure higher productivity(A)	Rarely	1	6.25	0.8906	1
		sometimes	5	31.25		
		always	10	62.5		
		Total	16	100		
8	To fulfill legal requirements (M)	Rarely	2	12.5	0.78125	13
		sometimes	10	62.5		
		always	4	25		
		Total	16	100		
9	Efficiency and Effectiveness(B)	Rarely	1	6.25	0.8906	2
		sometimes	5	31.25		
		always	10	62.5		
		Total	16	100		
10	Paper work reduction(H)	Rarely	2	12.5	0.7969	8
		sometimes	9	56.25		
		always	5	31.25		
		Total	16	100		
11	Bidding requirements(G)	Rarely	2	12.5	0.7969	7
		sometimes	9	56.25		

S.No.	Description of driving forces to plan to implement QMS ISO 9001:2015	Respondent analysis outputs			RII= $\frac{\sum W}{(A*N)}$	Ranks		
		Responses	Frequency	Percent (%)				
		always	5	31.25				
		Total	16	100				
		Rarely	3	18.75			0.71875	11
		sometimes	12	75				
always	1	6.25						
Total	16	100						
13	Reduction mistakes and rework(F)	Rarely	1	6.25	0.8281	6		
		sometimes	9	56.25				
		always	6	37.5				
		Total	16	100				

Source: Data from Questionery,2013 E.C

From table 4.16 analysis result 10(62.5%) of the respondents always ensured higher productivity, Efficiency and Effectiveness, strong competition and need to be more competitive are the main driving forces to plan QMS implement. 10(62.5%) of the respondents confirmed that they dissatisfied with the previous/present working, to fulfill legal requirements, Short- and long-term training programs are sometimes driving force to plan QMS implementation.

The critical driving forces to plan for implementing QMS are shown in figure 4.8 below accordingly RII method ranking system.



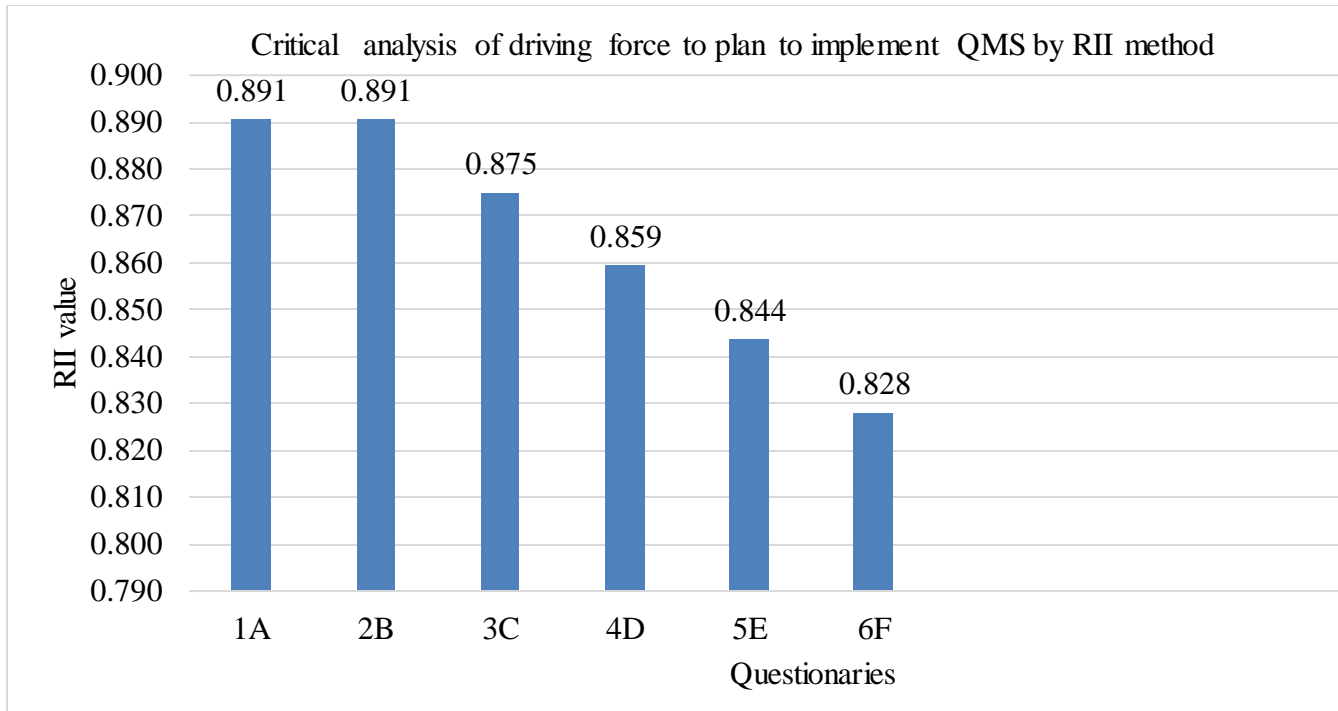


Figure 4.8: Critical Cause of Driving Forces to Plan for Implementing QMS

In this research, the critical driving forces are found based on RII methods as shown in figure 4.8 above accordingly table 4.16 analysis result. The top determinant critical cause of driving forces to plan for implementing QMS are ranked by using RII methods ranging from 0.891 to 0.828 which major factors in the company.

**Remarks:**

All legends shown with 1A, 2B,3C,4D....in the above or below figures are indicated to show the horizontal axis represents the questionnaire in the table corresponding RII value results.

B) Companies not plan to implementing QMS

Table 4.17: Reasons that Do Not Practice QMS

S.No	Reasons not to plan to implement for future	Respondent analysis outputs for not practicing QMS			RII= $\sum W / (A*N)$	Rank
		Responses	Frequency	Percent (%)		
1	We are satisfied with our present traditional QA/QC practice(C)	Strongly disagree	2	7.14	0.607	3
		Disagree	12	42.86		
		Agree	14	50		
		Total	28	100		
2	QMS is not useful for marketing and company prestige (J)	NA	1	3.57	0.411	10
		Strongly disagree	11	39.29		
		Disagree	13	46.43		
		Agree	3	10.71		
		Total	28	100		
3	QMS is not efficient and effective in monitoring and control(I)	Strongly disagree	7	25	0.482	9
		Disagree	18	64.29		
		Agree	1	3.57		
		Strongly agree	2	7.14		
		Total	28	100		
4	QMS is not a customer /client/bidding requirement(G)	NA	2	7.14	0.518	7
		Strongly disagree	1	3.57		
		Disagree	18	64.29		
		Agree	7	25		
		Total	28	100		
5	QMS is not legal/ministry requirement(D)	NA	1	3.57	0.545	4
		Strongly disagree	4	14.29		
		Disagree	14	50		
		Agree	7	25		

S.No	Reasons not to plan to implement for future	Respondent analysis outputs for not practicing QMS			RII= $\sum W / (A*N)$	Rank		
		Responses	Frequency	Percent (%)				
		Strongly agree	2	7.14				
		Total	28	100				
		NA	1	3.57			0.616	2
		Strongly disagree	3	10.71				
Disagree	9	32.14						
Agree	12	42.86						
Strongly agree	3	10.71						
Total	28	100						
6	QMS certification and QMS implementation is very costly(B)	NA	1	3.57	0.491	8		
		Strongly disagree	7	25				
		Disagree	12	42.86				
		Agree	8	28.57				
		Total	28	100				
7	Our company is in lack of fund for QMS implementation(H)	NA	1	3.57	0.670	1		
		Strongly disagree	1	3.57				
		Disagree	8	28.57				
		Agree	14	50				
		Strongly agree	4	14.29				
		Total	28	100				
8	QMS implementation increases the cost and time(A)	NA	1	3.57	0.536	5		
		Strongly disagree	3	10.71				
		Disagree	16	57.14				
		Agree	7	25				
		Strongly agree	1	3.57				
		Total	28	100				
9	QMS is difficult to understand, document and practices(E)	NA	1	3.57	0.518	6		
		Strongly disagree	3	10.71				
10		NA	1	3.57	0.518	6		
		Strongly disagree	3	10.71				

S.No	Reasons not to plan to implement for future	Respondent analysis outputs for not practicing QMS			RII= $\sum W / (A*N)$	Rank
		Responses	Frequency	Percent (%)		
.	Our company staff is unwilling for QMS implementation(F)	Disagree	18	64.29		
		Agree	5	17.86		
		Strongly agree	1	3.57		
		Total	28	100		

Source: Data from questionery,2013 E.C

From table 4.17 analysis result 14(50%) of respondents agreed that they are satisfied with their present traditional QA/QC practice and QMS implementation increases the cost and time are the main reason for unable to implement QMS but 18(64.29%) of the respondents disagree that the staff unwilling for QMS implementation and QMS is not efficient and effective in monitoring and control and QMS is not a customer /client/bidding requirement,16(57.14%) of the respondents disagree that QMS is difficult to understand, document and practices.

The critical cause of not to plan for implementing QMS are shown in figure 4.9 below accordingly RII method ranking system.

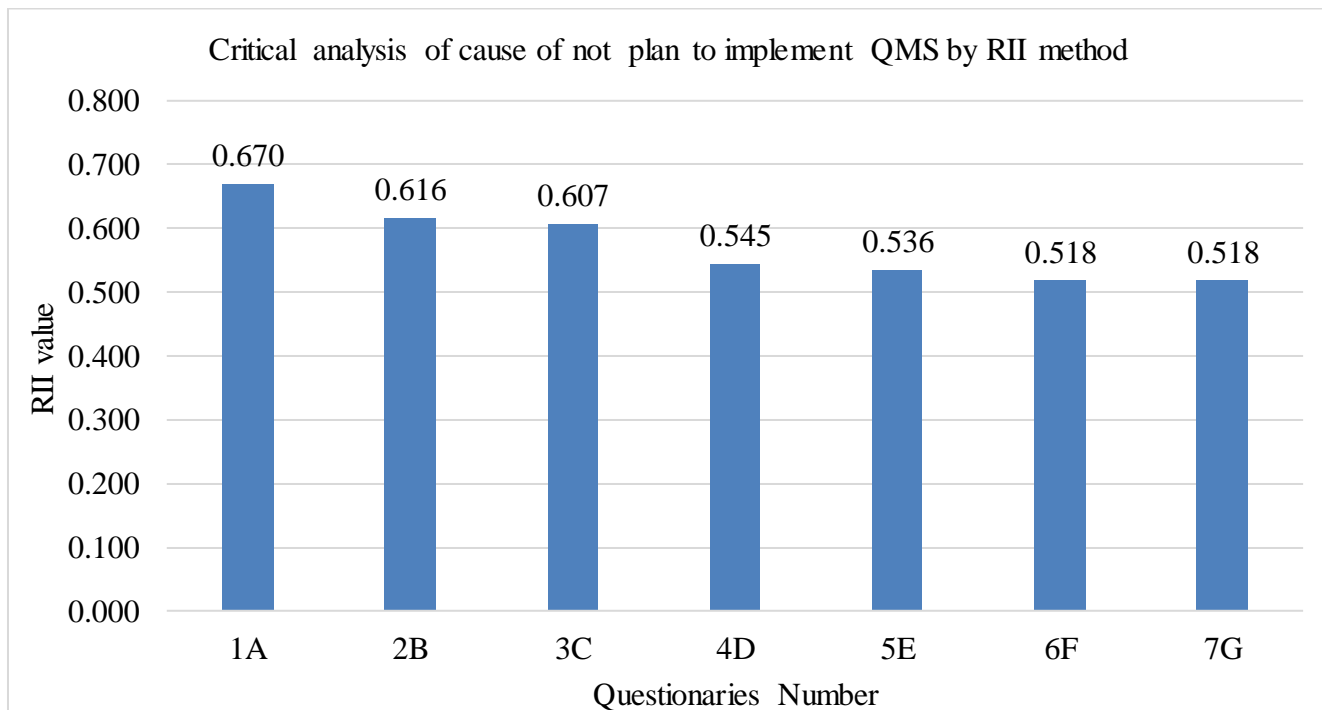


Figure 4.9: Critical Cause of Not Plan to Implement QMS

In this research, the critical causes of not to plan were found based on RII methods as shown in figure 4.9 above accordingly table 4.17 analysis result. The top determinant critical cause of not to plan for implementing QMS are ranked by using RII methods ranging from 0.67 to 0.52 which are major factors in the company. These factors should give attentions and take actions to shift the company plan to implementing QMS for good performance and effectiveness by sharing experiences those companies that implement QMS and benefits gained.

Table 4.18: Challenges and Analysis to Not Implementing QMS

S. No	Description /challenges for not implement QMS	Respondent analysis outputs for not practicing QMS			RII= $\sum W / (A*N)$	Ranks
		Responses	frequency	percent (%)		
1	Management focus only on marketing/customer requirements as a result QMS lacks internally driven improvement(A)	disagree	10	35.71	0.6875	1
		Agree	15	53.57		
		strongly agree	3	10.71		
		Total	28	100		
2	Difficulty in understanding QMS terminology, and how to integrate fully in to company's operating procedures(I)	disagree	19	67.86	0.5893	9
		Agree	8	28.57		
		strongly agree	1	3.57		
		Total	28	100		
3	Management and staff are engaged in other operational activities thus QMS is perceived as a matter of fulfilling requirements(B)	strongly disagree	2	7.14	0.6875	2
		disagree	7	25		
		Agree	15	53.57		
		strongly agree	4	14.29		
		Total	28	100		
4	Lack of commitment, strategic planning, action and timely decision-making(J)	NA	5	17.86	0.5536	10
		strongly disagree	3	10.71		
		disagree	7	25		
		Agree	7	25		
		strongly agree	6	21.43		
		Total	28	100		

S. No	Description /challenges for not implement QMS	Respondent analysis outputs for not practicing QMS			RII= $\sum W / (A*N)$	Ranks
		Responses	frequency	percent (%)		
5	Quality manager is appointed in compliance to documentation requirement without authority to make any real change and decisions(L)	NA	8	28.57	0.4911	12
		strongly disagree	1	3.6		
		disagree	5	17.9		
		Agree	12	42.9		
		strongly agree	2	7.1		
		Total	28	100		
6	Lack of effective grievance handling mechanism(D)	strongly disagree	3	10.71	0.6339	4
		disagree	9	32.14		
		Agree	14	50		
		strongly agree	2	7.14		
		Total	28	100		
7	Lack of a well- designed employees, reward and punishment system to espouse the QMS values(C)	strongly disagree	1	3.57	0.6696	3
		disagree	8	28.57		
		Agree	18	64.29		
		strongly agree	1	3.57		
		Total	28	100		
8	Internal communication process between management and staff, amongst staff, are not always defined(E)	disagree	15	53.57	0.6339	5
		Agree	11	39.29		
		strongly agree	2	7.14		
		Total	28	100		
9	Poor external communication exists (for example with sub-contractors and clients) and contributes to poor quality outcomes(H)	disagree	18	64.29	0.5982	8
		Agree	9	32.14		
		strongly agree	1	3.57		
		Total	28	100		
10	Resistance and unwillingness to implementation of QMS amongst staff(K)	strongly disagree	1	3.57	0.5357	11
		disagree	22	78.57		
		Agree	5	17.86		

S. No	Description /challenges for not implement QMS	Respondent analysis outputs for not practicing QMS			RII= $\sum W / (A*N)$	Ranks
		Responses	frequency	percent (%)		
		Total	28	100		
11	Lack of identified funding in the company for implementing QMS(G)	NA	2	7.14	0.6071	7
		strongly disagree	2	7.14		
		disagree	8	28.57		
		Agree	14	50		
		strongly agree	2	7.14		
		Total	28	100		
12	Increase of cost and time attributes to QMS implementation(F)	NA	1	3.57	0.6339	6
		strongly disagree	3	10.71		
		disagree	10	35.71		
		Agree	8	28.57		
		strongly agree	6	21.43		
		Total	28	100		

Source: Data from Questionery,2013 E.C

From literatures reviews, researches done by Debby Willar (2012) "Improving Quality Management System Implementation In Indonesian Construction Companies", the barriers to Implementing Quality Management Systems are Management Attitude and Purpose, Implementation by Consultants, ISO 9001 Management Representative without Power, Insufficient Resources, Lack of Improvement and Making it Complicated are the main deterrents to the effective implementation of the ISO 9001 in many organizations (Willar, 2012).

However, from this research the analysis and result from table 4.18 the researcher finds 15(53.57%) of the respondents agree that Management focus only on marketing/customer requirements as a result QMS lacks internally driven improvement, focused on operational activities thus QMS is perceived as a matter of fulfilling requirements, 18(64.29%) of the respondents agree that Lack of a well- designed employees, reward and punishment system to espouse the QMS values are the most challenges.

The results from relative importance index, Management focus only on marketing/customer requirements as a result QMS lacks internally driven improvement (0.6875), Management and staff are engaged in other operational activities thus QMS is perceived as a matter of fulfilling (0.6875), Lack of a well- designed employees, reward and punishment system to espouse the QMS values (0.6669), Internal communication process between management and staff, amongst staff (0.6339), are not always defined and Increase of cost and time attributes to QMS implementation (0.6339) are the main challenges that unable to implement QMS.

Critical analysis of seven major challenges that hinder to implement QMS by RII method as shown in figure 4.10 below.

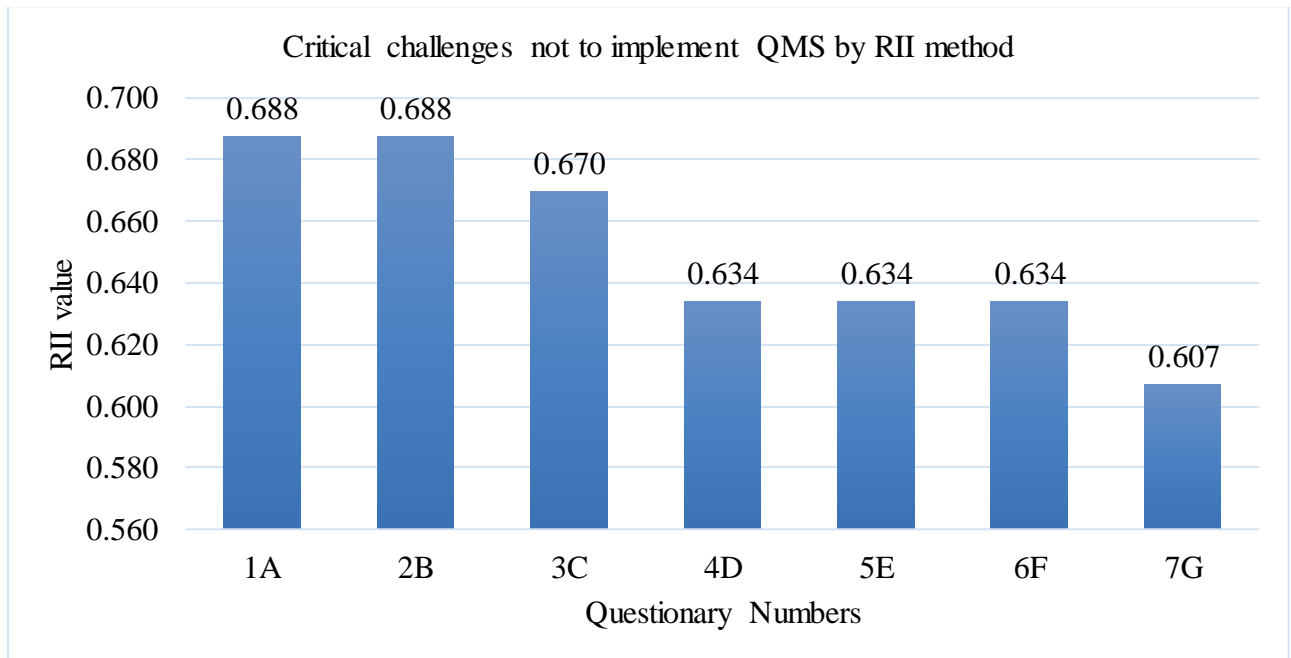


Figure 4.10: Critical Challenges Not to Implement QMS

In this research, the critical challenges not to plan for implementing QMS were found based on RII methods as shown in figure 4.10 above accordingly table 4.18 analysis result. The top determinant critical cause of challenges not to plan for implementing QMS are ranked by using RII methods ranging from 0.688 to 0.607 which major factors in the company.

The companies should discuss these challenges which hinders to implement QMS and share experiences other related companies that implement QMS for good performing for



their companies. The top management take commitments to improve the company performance and competitiveness by applying QMS principles in effective ways. Without improving the company performance with quality and future there is gap and danger for sustaining the company living as usual. So, competitiveness is the major factors that sustain the company with profit as business companies.

In case of drawing suitable interventions to assist for construction companies, construction companies consider the following points to implement QMS.

- A. Organize quality control department and assign skilled technical experts to the Quality department Position.
- B. Use of the ISO 9004:2009 standard manual as a guidance to interpret the requirements in the ISO 9001 2008 manual.
- C. Develop the system and maintain its sustainability.
- D. Strengthening internal audit through experienced auditors.
- E. Proper analysis for the non-conformities and take corrective actions.
- F. Continuous measurement of the system by the top management.
- G. Surveillance audits better made by auditors with relevant background or experience.
- H. Intensive training on QMS through the assistance of qualified company in the field to increase the knowledge of employees and make them familiar with the system.
- I. Motivation or guidance for the employees to increase their effort on QMS activities.
- J. Arranged meeting or any other communication methods to involve employees for their valuable technical contribution.
- K. Clear communication way should apply between the construction company and regulatory body/concerned government bodies.
- L. The government bodies should follow regularly to evaluate the companies and give comments and follow correction actions accordingly.

#### **4.7. Interview Analysis Result**

The researcher collects the data from informal interview and discuss the results as follow:

From the sample of 20 construction companies, there are three construction companies were ISO certified (implement QMS based on ISO standard) and these all are grade-1 contractors. However, QMS implementation in this companies were not continuing, effective and renewed after the validity is expired. because the certification is not initiated by themselves of the companies rather by the government opportunity and encouragement. The company once certified, there is no continuity follow up by the government to implement and renewed the system. They expect the order from the government to continuous and stay in the system. As a result, the interviewees of ISO certified construction companies assured that the validity of ISO certification of all company is expired but not renewed.

The interviewee also approved that there is lack of QMS awareness among employees in the uncertified company starting from top managers to daily laborer. They perceive, it is difficult to understand the term of QMS, there was not enough skilled human resource to assigned and there was financial resource constraint for implementation of QMS. In addition, there were resistance from some managers and lack of follow up on the implementation of QMS.

Public clients like Ethiopian roads authority, Education and Health beaure and private clients not certified themselves and take a lead in promoting construction companies to implement and maintain ISO 9001 QMS and they are not giving priority to certified construction companies when especially tendering large and complex projects.

Uncertified companies have no information about ISO certification (QMS implementation), how to certified, who gives certification and the advantages of QMS implementation system in their companies. They practice quality management system informally(traditionally) to control quality of construction.

#### **4.8. Observation Analysis result**

Based on direct observation, the researcher observed that documentation system of ISO certified construction company was poor and not done in good manner, process are not

identified in all the process, quality policy are prepared but not functional, reviewed mechanisms are also established, responsibilities and authority are defined, quality objectives, requirements for products also prepared, but quality control department was not established to lead the quality management system development implement. The implementation is not covering all the departments rather and quality department even the quality departments start implementation are not effective.

Withdrawal of the skilled employees specially company managers and quality management system department experts and replace a new comer who are unskilled to QMS implementation is a great problem in ISO certified companies. They have no full information about their company even it is ISO certified or not, when it certified, when it renewed and where is the certification document.

In uncertified companies, responsibilities and authority are not well defined, most of the time follow oral reviewed mechanisms and they give priority to cost and time rather quality objectives and customer satisfaction. They take most time for tendering, inspection, order and test of materials and communication system.

## CHAPTER FIVE

### 5. Conclusions and Recommendations

The results of the questionnaire survey, unstructured interview and direct observation and discussion of the findings in line with the literature review were presented in section four of this paper. In this section the summary, conclusions and recommendation were derived from research findings.

#### 5.1. Summary of findings

According to the demographic characteristics, the researcher found that 71.43% of the respondents have an adequate experience of above 5 years in their assigned position, 34% of the respondents are office engineers who are direct contact to practice and implementation of QMS and most of the respondents are project managers. These all help them to transform their company activities in a better way and to a higher level of achievements.

Major findings in line with objectives:

1. The findings related to the current status of QMS implementation trend in construction company in Amhara Region.
  - a) From the findings as the respondent level 21.4% of the respondents assured that their company is ISO certified to implement QMS, 50% of the respondents also assured that their company not implement QMS at all and 28% of the respondents confirmed that their company plan to implement QMS in the future.
  - b) The findings from the interview the interviewees stated that as company level among 20 sample construction companies in this research, three of them are ISO certified to implement QMS in their company those are Grade-1 contractors; the other five companies are planned to implement QMS and the remaining nine are neither implement nor plan to implement the system.
  - c) The interviewee also stated that certified construction companies were certified through the opportunity and facilitation of GTZ-IS under UCBP they were not

initiated by themselves by analyzing the internal and external benefits of the system.

- d) The interviewee stated that there is no forceful condition to practices the system (remain in to the system) to the construction companies in the region.
  - e) The findings from observation, certified companies assumed that getting ISO certified once is enough and less effort has been made on the continual improvement. As a result, the number of Construction Company which certified and remained active on the system are negligible (15%).
2. The findings related to challenges that affect QMS implementation:
- a) Most of the respondents agree that, Lack of a well- designed employees reward and punishment system to espouse the QMS values and management, staff are engaged in other operational activities thus QMS is perceived as a matter of fulfilling requirements are the major challenges to practices QMS system in the companies.
  - b) On other side most of the respondents agree that difficulty in understanding QMS terminology, how to integrate fully in to company's operating procedures, Poor external communication exists (for example with sub-contractors and clients), Resistance and unwillingness to implement QMS amongst staff and contributes to poor quality outcomes are minor challenges that affect QMS implementation.
  - c) Some of the respondents replied that Quality manager is appointed in compliance to documentation requirement without authority to make any real change and decisions has not tangible effect to implement QMS.
3. The Major findings related to the benefits of implementing QMS in the construction companies are:
- a) Most of the respondents agreed that Improved employee awareness about quality, Improved customer satisfaction, Improved productivity, Improved utilization of resource, Better record handling / Documentation and Improved completion time and cost of project are rated as the main benefits that always gained from QMS implementation in the company.

- b) Some of the respondents said that improved awareness of company objectives, increased tender winning are benefits that sometimes gained from QMS implementation.
  - c) Few of the respondents agreed that improved focus on customer requirement, improved company reputation, improved risk management reduced paper work, and improved documentation are benefits that rarely gained from QMS implementation.
4. Major findings from analysis and discussion related to the role of top managers are:
- a) Some of the respondents approved that top managers of the company sometimes take lead on QMS initiatives, involved for improved QMS planning and monitoring, involved and committed in QMS implementation and provide sufficient support to staff for QMS implementation.
  - b) Most of the respondents replied that top managers always have good awareness about QMS.
  - c) Few of the respondents agreed that top managers never Organize staffs (team) and provide budget and Provide continuous training to employees.
5. From the analysis result there are criteria to evaluate the effectiveness and efficiency of QMS implementation in the company.
- a) Some of the respondents agreed that QMS always considers the staff needs like health and safety, always has improved work efficiency and has improved construction process effectively,
  - b) Most of the respondents agreed that QMS has always reduced wastes and controls defects,
  - c) A few respondents agreed that QMS sometimes satisfies customer needs and meets his/her full requirement.

## **5.2. Conclusions**

The following conclusions are drawn from the above findings: -

1. Conclusions related to the current status of QMS implementation:
  - a) From the findings of this study, there are a few construction companies were ISO certified and plan to certified in the future to implement QMS. This indicates that

implementation of QMS is almost negligible in construction companies in Amhara region.

- b) Construction companies were not taking the lead of initiation by themselves to implement QMS by analyzing internal and external benefits of the system rather they wait the government opportunity and facilitation.
  - c) There were no established forceful mechanisms to push construction companies to get ISO 9001 certified quality management system.
  - d) ISO certified companies are better in quality police preparation, reviewed mechanisms, responsibilities and authority are defined, quality objectives and preparation of requirements for products as compared to uncertified companies.
  - e) ISO certified construction companies have better in quality control system and give priority to quality of construction and they have better awareness about QMS, communication way between employees and with customers and they are effective in their performances than un certified companies.
2. Conclusions related to the main challenges that the construction company faced to implement QMS are:
- a) Management and staff are engaged in other operational activities thus QMS is perceived as a matter of fulfilling requirements.
  - b) There is a challenge in understanding QMS terminology by employees and how to integrate fully in to company's operating procedures.
  - c) There is a resistance and unwillingness amongst staff of the company to implement QMS.
  - d) There is lack of top management commitment and lack of technical expertise to establish and control the implementation of the system.
3. Conclusions related to the major benefits of implementing QMS in the construction companies are: Implement of QMS in construction company has the following benefits
- a) Improved employee awareness about quality and customer satisfaction.

- b) Improved productivity, utilization of resource and better record handling / documentation.
  - c) Improved completion time and cost of project, awareness of company objectives, increased company reputation and tender winning.
4. Conclusions related to the role of top managers are:
- a) Top managers some time take the lead on QMS initiatives and involved for improved QMS planning and monitoring.
  - b) They sometimes involved and committed in QMS implementation and rarely provide sufficient support to staff by provide budget for QMS implementation.
  - c) Top managers have better awareness than employees about QMS and they sometimes provide continuous training to employees.
5. Conclusions related to efficiency and effectiveness of QMS in the company
- a) There are standard requirements which specific to Construction Company and need to be satisfied in order to apply QMS in a company.
  - b) Requirement from the ISO 9001 2008 standard quality manual was the base to evaluate QMS practices whether effective or not in the company.
  - c) Implementation of QMS as an ISO 9001:2008 to construction company in Amhara Region is not effective.
6. From the analysis and results according to research objectives the researcher proposes the intervention to implement effective QMS as ISO 9001:2008 standard and achieve better result in the companies.

The construction company implement the following flow chart diagrams to apply quality management system.



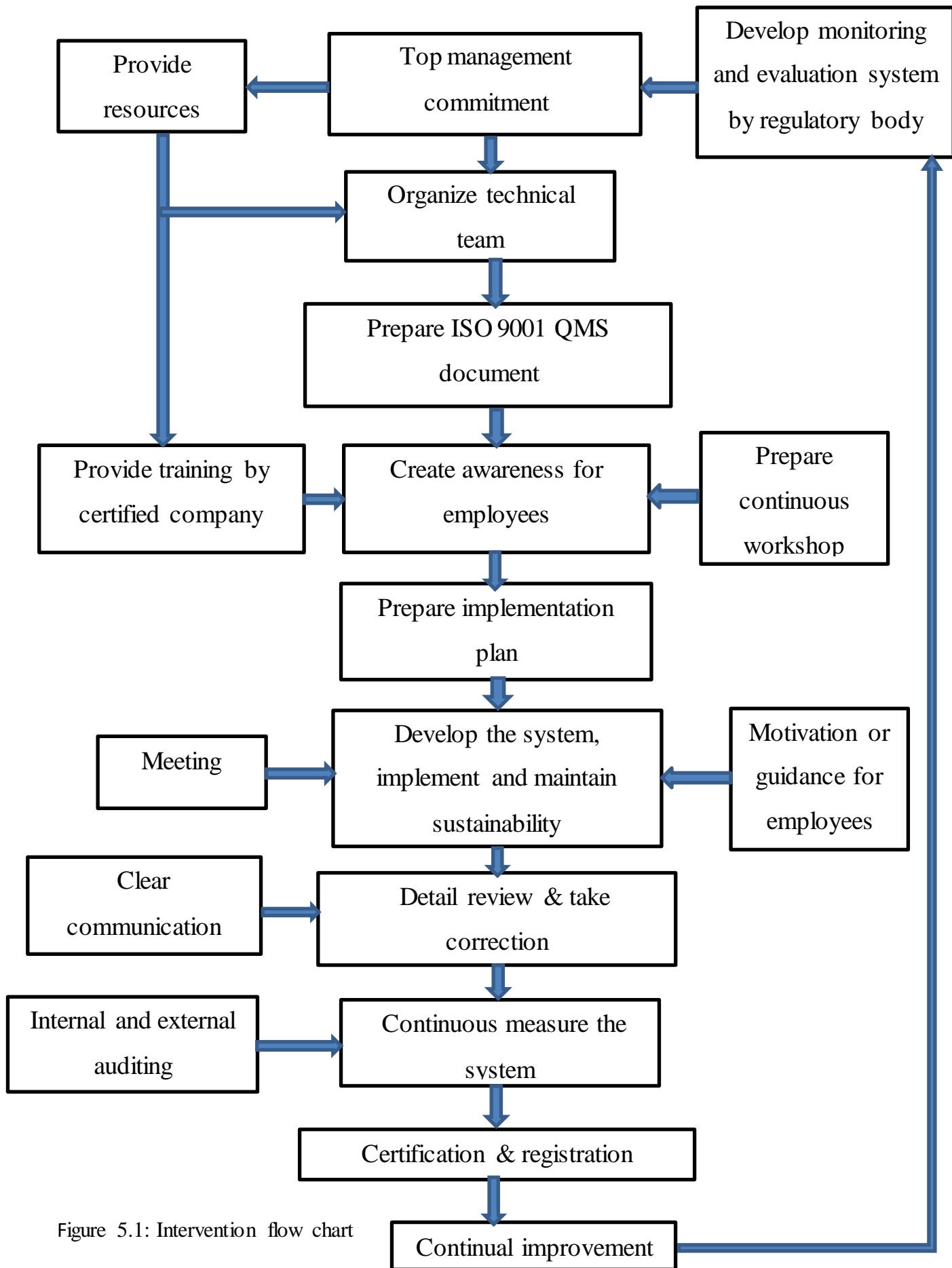


Figure 5.1: Intervention flow chart

### **5.3.Recommendations**

The following recommendations are forwarded for concerned bodies.

- a) The construction companies give priority to awareness creation about QMS to their employees by showing internal benefits of having QMS and QMS implementation is better a culture of the companies to improve performance and competitiveness.
- b) The construction companies should take the lead of initiation by itself to implement QMS rather they wait the government opportunity and facilitation.
- c) The construction companies continuously motivate and provide enough training to employees to avoid resistance to change and increase awareness during & after implementation of QMS. For example, new employees have training before they start the work and evaluate their awareness level.
- d) The company should aware their staff and laborers on the company's quality objectives and give commitments with clear agreements for concerned employers to specific jobs accordingly.
- e) Top management in the construction company always be committed to initiate maintain and lead the QMS and continuously show that the QMS is a main instrument to win competitions in construction business by having good knowledge on the concept of QMS.
- f) Managers in company must realize that competitive advantage will be generated only if top management is fully committed to effective implementation of QMS by identified barriers and should be reduced or eliminated and Sufficient resources should be assigned to accomplish the remedial activities.
- g) Establish measurable objectives related to reworks reduction, waste reduction, increase in productivity and also keep records to measure the company's efficiency and achieve continual improvement based on established objectives seated before.
- h) Governmental institutions do more on awareness creation by considering ISO 9001 certification, arranging continual workshops on quality management to create awareness and build the capacity of companies.
- i) The government establishes mechanisms to encourage construction companies to get ISO 9001 certification. For example, inclusion of ISO 9001 certification as bid evaluation criteria with a certain amount of mark

- j) Government should have created competition and evaluation methods for all construction companies based on ISO 9001 certification quality control methods and encourages for each year those are good performers.
- k) Public clients like Ethiopian roads authority, Education and Health beaure and private clients should be certified themselves and take a lead in promoting construction companies to implement and maintain ISO 9001 QMS by consider ISO 9001: 2008 as one of the technical requirements of tendering and give priority to certified construction companies when especially tendering large and complex projects tendering.

#### **5.4.Recommendations for Further Research**

This study in literature reviews indicates that there is a research gap on ISO based QMS implementation in construction companies in Amhara Region. As a result, conducting this research is one of the solutions to alleviate this research gap and it should be followed by a number of researches to investigate scopes which were not considered in this research. Thus, this study recommends the following for further research and investigation:

- a) A detail research should require on uncertified construction companies to determine which method they used to control quality of construction until now, the most critical challenges that unable to certify ISO 9001 QMS and the levels of perception of employees about ISO 9001 QMS in their company.
- b) During this research the researcher found that use of questionnaire to collect data is difficult to get reliable information. Because, most respondents haven't awareness about the concept of QMS, ISO 9001 certification to fill the information in the questionnaires. Therefore, in the future research on QMS it is better to conduct study with panel discussion to construction companies by inviting QMS experts.
- c) In this research as a result of time and budget constraint the researcher cannot include to create awareness about the concept of QMS which are the main problems of employees in construction company in the scope of the study. However, in the future research awareness creation about the concept of QMS to construction industry players should the first objectives to implement ISO based QMS in the construction companies.

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## **ANNEX A:**



### **Questionnaires**

I am presently engaged in both descriptive and explanatory research to find out Quality management system implementation trend in Construction Companies in Amhara Region.

The objective of this research is:

- Investigate the construction companies in Amhara Region have implemented quality management system as an ISO 9001 standard or not.
- Identify the challenges that affect the implementation of quality management system in Amhara Region.
- Identify the role of implementing quality management system in construction companies.

Data and information collected through this questionnaire shall be confidential and will be used only for academic purpose to analyze this research that entitled investigate of quality management system implementation trend in construction companies in Amhara Region without reporting the person or company bio-data.

This research work is possible only through your kind support and cooperation, therefore we request you to kindly respond to this questionnaire.

If you have any questions/queries please do not hesitate to contact me any time on 0918132356.

Thank you in anticipation.

**Part I: Back ground of the company and Respondents**

Company type please Tick (√) as many if Applicable or specify.

Company	GC	BC	Grade-1	Grade-2	Grade-3
Contractor					
Consultant					

Respondent's 1. Work experiences in the company.....

2. Work position in the company.....

**Part II: Are you practicing quality management system (QMS) in your company?**

**Please choose your response from the following.**

2. If you say Yes, practicing QMS (certified ISO 9001:2008) in your company please fill the following details.

Year of certification.....

Year of renewal/up grading every.....

Year of validity.....

Internal audit of QMS every.....

External audit of QMS every.....



2.1. Why you were interested/motivated/ in implementing QMS (ISO 9001 certification) in your organization? (please Tick (√) the Likert point for the following scale)

Level of Motivation	Never	Rarely	Sometimes	Always	Not Applicable
Likert point	1	2	3	4	0

S.No.	Description of driving forces to implement QMS ISO 9001:2008	Likert point				
		1	2	3	4	0
1	Dissatisfaction with the previous/present working					
2	Minimization of poor construction/service quality					
3	Business and process improvement					
4	For marketing purposes and to enhance the reputation of your company					
5	There is strong competition and your company needs to be more competitive					
6	To increase employee motivation and participation					
7	To ensure higher productivity					
8	To fulfill legal requirements					
9	To improve Efficiency and Effectiveness					
10	For Paper work reduction					
11	For Bidding requirements					
12	For Short- and long-term training programs					
13	For Reduction mistakes and rework					
14	Only for marketing purpose					
15	Company prestige/image					

2.2. The role of implementing QMS/Certified ISO 9001:2008 please Tick (√) under for the following queries respectively.

Level of role	Never	Rarely	Some times	Always	Not Applicable
Likert point	1	2	3	4	0

S.no	Role type					
		1	2	3	4	0
1	Improved management confidence					
2	Improved communications					
3	Better defined responsibilities and authorities					
4	Improved awareness of company objectives					
5	Improved utilization of resource					
6	Minimization of construction waste, defects and rework					
7	Improved productivity					
8	Improved profit and company growth					
9	Improved customer satisfaction					
10	Improved focus on customer requirement					
11	Improved monitoring and control					
12	Improved employee awareness about quality					
13	Improved company reputation					
14	Improved risk management					
15	Reduced paper work and improved documentation					
16	Improved completion time and cost of project					
17	Improved identification of root causes of problems					
18	Better record handling / Documentation					
19	Increased Your tender winning					
20	Increased motivation and involvement of all employees					

**2.3. Rank the level of top management involvement with your QMS implementation to the following Likert scale.**

Rank level	Never	Rarely	Sometimes	Always	Not applicable
Likert point	1	2	3	4	0

S. No	Involvement type	Likert point				
		1	2	3	4	0
1	They take lead on QMS initiatives					
2	They are involved for improved QMS planning and monitoring					
3	They are involved and committed in QMS implementation					
4	They provide sufficient support to staff for QMS implementation					
5	Organize staffs (team) and provide budget					
6	Provide continuous training to employees					
7	Have good awareness about QMS					

**2.4. Rank the level of effectiveness and efficiency of your QMS to the following Likert scale**

Rank Level	Never	Rarely	Some times	Always	Not applicable
Likert point	1	2	3	4	0

S. No	Concern type	Likert point				
		1	2	3	4	0
1	QMS satisfies customer needs and meets his/her full requirement					
2	QMS considers the staff needs like health and safety					
3	QMS has improved work efficiency					
4	QMS has improved construction process effectively					
5	QMS has reduced wastes, and controls defects					

**3. If you say not practicing QMS...but we are planning/under the process for certification**

**3.1. Please write 2,1, or 0 corresponding to your choice for yes, No, or Not applicable for the following queries respectively.**

S.No.	Query Type	0	1	2
1	Do you follow the traditional QA/QC practices?			
2	Do you have published quality manual?			
3	Do you have a specific unit/cell/for QA/QC?			
4	Do have written inspection and testing procedures?			
5	Does material supply is inspected to assure technical conformance?			
6	Do you procure the materials from approved sources/ suppliers?			
7	Do you provide adequate training for testing and inspection staff?			
8	Do you follow the statistical quality control methods?			
9	Do you segregate non-conformed products from production?			
10	Do you investigate the origin and extent of deficiencies?			
11	Do you monitor the corrective action?			
12	Do you follow standard calibration procedures?			
13	Do you store equipment /materials to prevent from damage/loss?			
14	Do you consider workers health and safety as a part of quality			

**3.2. Driving forces to plan/under process to implement QMS (ISO 9001:2008 certification)**

Rank level	Never	Rarely	Sometimes	Always	Not applicable
Likert point	1	2	3	4	0

S.No.	Description of driving forces to plan to implement QMS ISO 9001:2008	Likert point				
		1	2	3	4	0
1	Dissatisfaction with the previous/present working					
2	Minimization of poor construction/service quality					
3	Business and process improvement					
4	For marketing purposes and to enhance the reputation of your company					
5	There is strong competition and your company needs to be more competitive					
6	To increase employee motivation and participation					
7	To ensure higher productivity					
8	To fulfill legal requirements					
9	Efficiency and Effectiveness					
10	Paper work reduction					
11	Bidding requirements					
12	Short- and long-term training programs					
13	Reduction mistakes and rework					

4. If you say Not practicing at all.....and not plan to implement in the future.

4.1 (Please rank your reasons using the following tabulated reasons and Likert scale for not practicing by (Tick (√)).

Agreement Level	Strongly Disagree	Disagree	Agree	Strongly agree	Not Applicable
Likert point	1	2	3	4	0

S.No.	Reason type	Likert point				
		1	2	3	4	0
1	We are satisfied with our present traditional QA/QC practice					
2	QMS is not useful for marketing and company prestige					
3	QMS is not efficient and effective in monitoring and control					
4	QMS is not a customer /client/bidding requirement					
5	QMS is not legal/ministry requirement					
6	QMS certification and QMS implementation is very costly					
7	Our company is in lack of fund for QMS implementation					
8	QMS implementation increases the cost and time					
9	QMS is difficult to understand, document and practices					
10	Our company staff is unwilling for QMS implementation					

4.2. Rank the challenges that unable to implement QMS in your company by using the following Likert scale by Tick (√).

Agreement Level	Strongly Disagree	Disagree	Agree	Strongly agree	Not Applicable
Likert point	1	2	3	4	0

S. No	challenge Type	Likert point				
		1	2	3	4	0
1	Management focus only on marketing/customer requirements as a result QMS lacks internally driven improvement					
2	Difficulty in understanding QMS terminology, and how to integrate fully in to company's operating procedures					
3	Management and staff are engaged in other operational activities thus QMS is perceived as a matter of fulfilling requirements					
4	Lack of commitment, strategic planning, action and timely decision- making					
5	Quality manager is appointed in compliance to documentation requirement without authority to make any real change and decisions					
6	Lack of effective grievance handling mechanism					
7	Lack of a well- designed employees, reward and punishment system to espouse the QMS values					
8	Internal communication process between management and staff, amongst staff, are not always defined					
9	Poor external communication exists (for example with sub-contractors and clients) and contributes to poor quality outcomes					
10	Resistance and unwillingness to implementation of QMS amongst staff					
11	Lack of identified funding in the company for implementing QMS					
12	Increase of cost and time attributes to QMS implementation					