

**ASSESSING TOTAL QUALITY MANAGEMENT (TQM) IN THE
GHANAIAN CONSTRUCTION INDUSTRY: AN EXPLORATORY
STUDY IN KUMASI.**

KNUST

A Dissertation Submitted To

The Department Of Building Technology, Faculty Of Architecture And Building Technology

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In Partial Fulfilment Of The Requirements for
Master of Science Degree in the Construction Management Programme



By

NANA YAA ADUSA-POKU

NOVEMBER, 2014

DECLARATION

This work or any part thereof has not previously been submitted in any form to the University or to any other body whether for the purpose of assessment, publication or for any other purpose. Aside any expression, acknowledgements, reference and/or bibliographies cited in the work, I confirm that the intellectual content of this work is the result of my own efforts and no other person.

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Nana Yaa Adusa-Poku

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Student

Signature

Date

Rev. Prof. F. D. K. Fugar

.....

Supervisor

Signature

Date

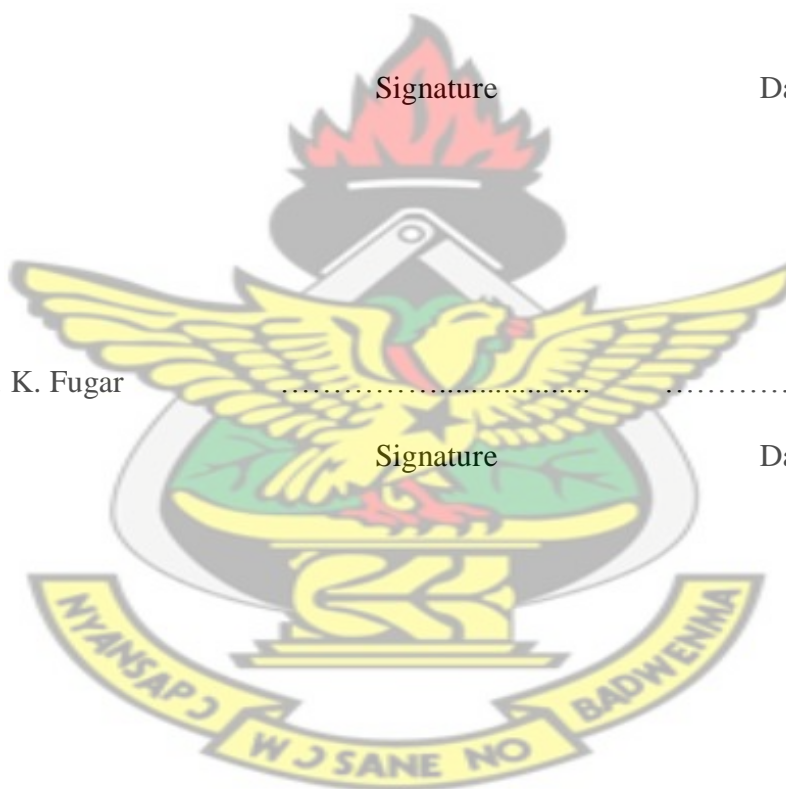
Prof. J. Ayarkwa

.....

Head of Department

Signature

Date



ABSTRACT

Competition among Contractors in the Construction Industry has increased as Ghana maintains her middle-income status. To have a sustained competitive edge, successful industries know that quality management is the key to competing successfully. Recognizing that quality is the key to competition, Total Quality Management (TQM) was introduced in the construction industry in developed countries as a philosophy and a culture to improve productivity and quality.

However, developing countries such as Ghana are slow in adopting TQM in the Construction Industry. Therefore, the level of quality in local Ghanaian construction firms is low as compared to international construction firms operating in Ghana.

This research assessed the Construction Quality management practices in the country and compared with the principles of TQM. In addition a framework was proposed to guide construction firms in adopting TQM.

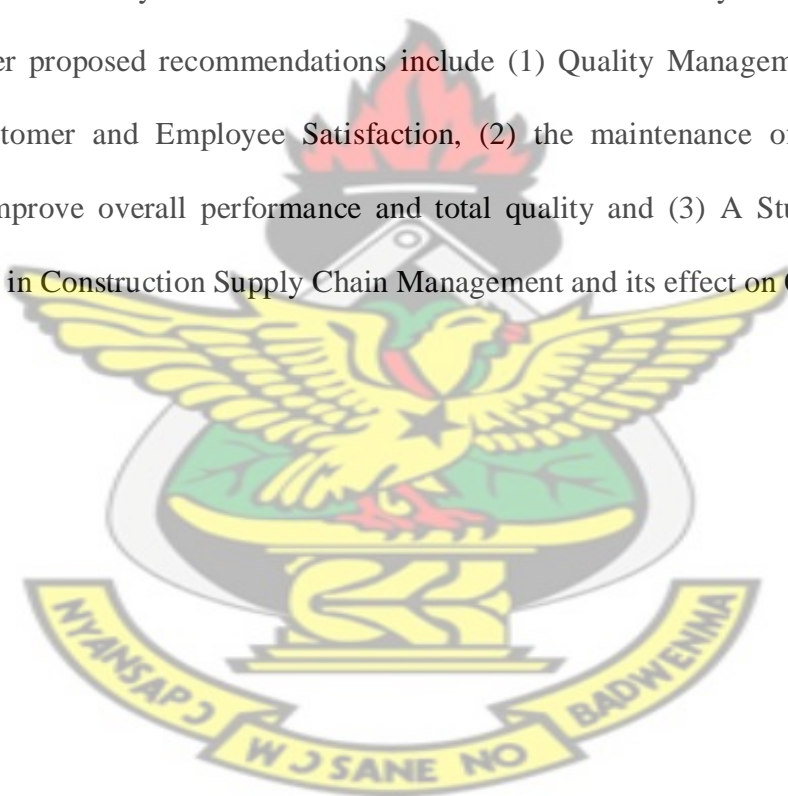
In order to know the quality management practices, questionnaires were administered to project managers, supervisors and construction professionals such as architects and engineers in construction companies in Kumasi to ascertain their perception of quality and their management practices.

Data analysis revealed that Inspection and Quality Control was the predominant Quality Management practice in Ghana. The TQM critical success factors rated in order of importance were process management, continuous improvement, employee satisfaction/empowerment, supplier chain management, customer focus, management / leadership commitment and training.

To enable the implementation of TQM, a framework has been proposed to guide management and this call for a radical cultural change that will transform the construction industry in Ghana.

This research has made a significant contribution to quality management practice in the Ghanaian Construction Industry. It has helped to unearth the basic principles needed in improving competitiveness in Ghana.

In this twenty-first century, Total Quality Management and not Inspection and Quality Control should be the way forward to make the construction industry more effective and efficient. Further proposed recommendations include (1) Quality Management practices in relation to Customer and Employee Satisfaction, (2) the maintenance of a well-trained workforce to improve overall performance and total quality and (3) A Study on Supplier Selection Issues in Construction Supply Chain Management and its effect on Quality.



ACKNOWLEDGEMENT

I wish to express my sincere appreciation and I am particularly indebted to the Head of Department, Prof. Joshua Ayarkwa and my Supervisor Rev. Prof. F. D. K. Fugar for their guidance, encouragement and mentorship throughout this academic period and for sharing their academic and practical expertise.

My profound gratitude also goes to Richmond Adusa-Poku, a faithful friend and husband who has encouraged me at all times.

Finally I thank my parents, siblings and friends.



DEDICATION

This work is dedicated to my God Almighty, for whom I live and move and have my being.

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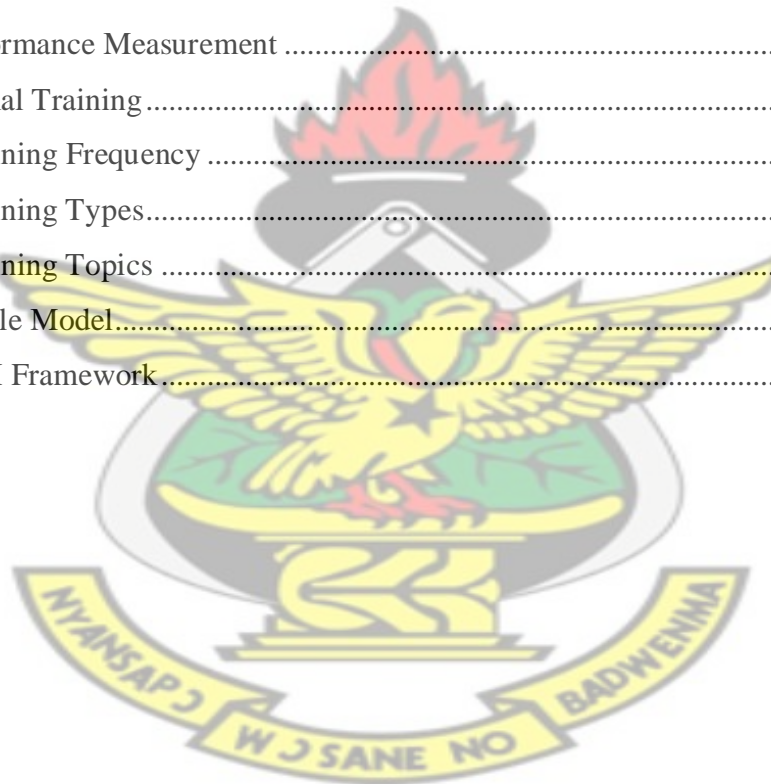
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CHAPTER ONE

INTRODUCTION

1.1 Background

The development of the Ghanaian Construction Industry (GCI) is critical in improving the economic state of the country since it is responsible for the provision of infrastructural development in the country. Moreover, the Construction Industry generates a lot of employment in both the private and public sector. The main contributors to the Ghanaian Industry Sector were the Construction Industry, which recorded a growth of 19.2%, Mining and Quarrying contributed 5.2% and Water and Sewerage activities, which contributed 0.6% (GSS, 2012). It is therefore imperative that the Construction Industry is developed and improved to produce quality works in order to enhance the growth of the national economy.

Ofori (2012) stated that although the Ghanaian Construction Industry (GCI) has much strength, there are myriad of problems that have persisted for a long period. He suggested that an agency is set up to survey and to develop comprehensive policy guidelines for the Industry. In an article named ‘Construction and the Internet’ in The Economist (2000), it was noted that up to 30% of construction costs is due to inefficiencies, mistakes, delays, and poor communications. It is obvious that GCI is affected by factors such as globalization, information communication technology (ICT), increasing knowledge development and the ever-increasing innovative products delivered daily to the market.

A typical construction project consists of the interaction between a client, consultant and a contractor. In Construction Project Management, where the objective is to meet Clients needs and expectations, one must have knowledge in management of time, quality, human resource, risk, etc. to ensure a successful completion. Lad and Beck(2009) noted that

Construction Quality Management is the key to a successful project. They explained that the selection of a Construction Quality Manager (CQM) early in a project gives the overall project a better chance of delivery on time, to budget, zero defects as well as high availability and reliability. However, CQM effort can be a cultural change and a challenge for Contractors. It requires attention to detail, tracking of issues and accountability (Lad and Beck 2009).

One of the means of achieving this feat is by applying the principles of Total Quality Management (TQM) in Construction.

Different people define quality in various ways. Deming (1986) defined quality based on how efficient the management cycle is in planning, implementing and making improvements in the project. He stated that product with good quality does not only satisfy the customers but also makes the customers patronize the product wherein they boast about the product and encourage their friends to try it. On the other hand, Juran (1988) defined quality as fitness for use in terms of design, conformance, availability, safety, and field use. Thus, his concept more closely incorporates the viewpoint of customer. He is prepared to measure everything and relies on systems and problem-solving techniques. Unlike Deming, Juran focuses on top-down management and technical methods rather than worker pride and satisfaction.

Quality Management has evolved over many decades. It started with Quality Control (QC) where products are sampled and inspected for errors or defects. After QC, a new technique, Quality Assurance (QA) evolved. The principles for QA are 'Fit for Purpose' and 'Right first Time'. Total Quality Management (TQM) is another concept of Quality Management that has been in existence over the past years.

TQM involves continuously improving the production processes and then building closer relationships with Clients and Team Members. Studies on Total Quality Management (TQM) showed a reduction in cost and a better employee satisfaction that ultimately increase client satisfaction (Low and Jasmine 2004). According to Tang *et al* (2005), the five (5) core Principles of Total Quality Management (TQM) are:

- Employee Participation
- Customer Focus
- Continuous Improvement
- Process Focus
- Teamwork

These five principles are similar to the five (5) drivers of change recommended by the Egan (1998) report. They are committed leadership, focus on the customer, integrated processes and teams, quality driven agenda and commitment to people.

Regardless of the extensive study on TQM Construction in other countries, there is a paucity of research on implementation of TQM in the Ghanaian Construction Industry.

1.2 Statement of Problem

With the country attaining a middle-income status in addition to the oil-production, which started in the year 2010, there is an increased demand for infrastructural works with its accompanying standard quality requirements. There is an increasing global competition in the Construction sector and Ghanaian Contractors who desire to participate on this global scale need to produce quality works to be more effective and to enhance their competitive advantage.

Moreover, with an increasing awareness of the construction quality, contractors have no option than to ensure that Clients get value for money. Considering the influx of Foreign

Construction Companies in Ghana and the increasing competitiveness in the construction sector, it is important that Ghanaian Contractors deploy appropriate quality management strategies such as TQM to reduce cost and increase value/quality.

For any organization, Total Quality Management (TQM) is the ultimate goal in terms of its Quality Management System. The primary purpose of TQM is to achieve excellence in customer satisfaction through continuous improvement of products and processes by the total involvement and dedication of each individual who is part of that product process (Ahmed, 1993).

Nonetheless, in most developing countries such as Ghana, the principles of TQM are not employed in construction leading to low quality works, high construction costs and dissatisfied clients. There is a major problem in obtaining acceptable levels of quality in the Construction Industry. From both Contractor and Consultant point of view, some of the challenges in the Ghanaian Construction Industry include poor workmanship, inadequate workmanship, low productivity and lack of trained workforce (Ofori, 2012).

In view of this, the construction industry needs proactive management methods such as TQM in order to improve quality of works, reduce re-work and the cost of construction. A TQM approach is essential for long-term survival in all business including the construction industry (Harris et al, 2006).

1.3 Aim

The principal aim of this research is to assess Contractors knowledge in TQM principles in the Ghanaian Construction Industry and to propose a framework needed in implementing TQM in the Construction Industry.

1.4 Objective

The objectives of this research are:

1. To determine from Literature, the TQM practices within the Construction Industry.
2. To identify current quality management practices employed in the Ghanaian Construction Industry.
3. To investigate the knowledge of TQM principles in the Ghanaian Construction Industry.
4. To propose a framework to guide in the implementation of TQM based on recognised TQM principles and existing frameworks.

1.5 Research Questions

This research answers the question ‘how can quality be improved in the Ghanaian Construction Industry using TQM’?

It therefore seeks to answer the following questions

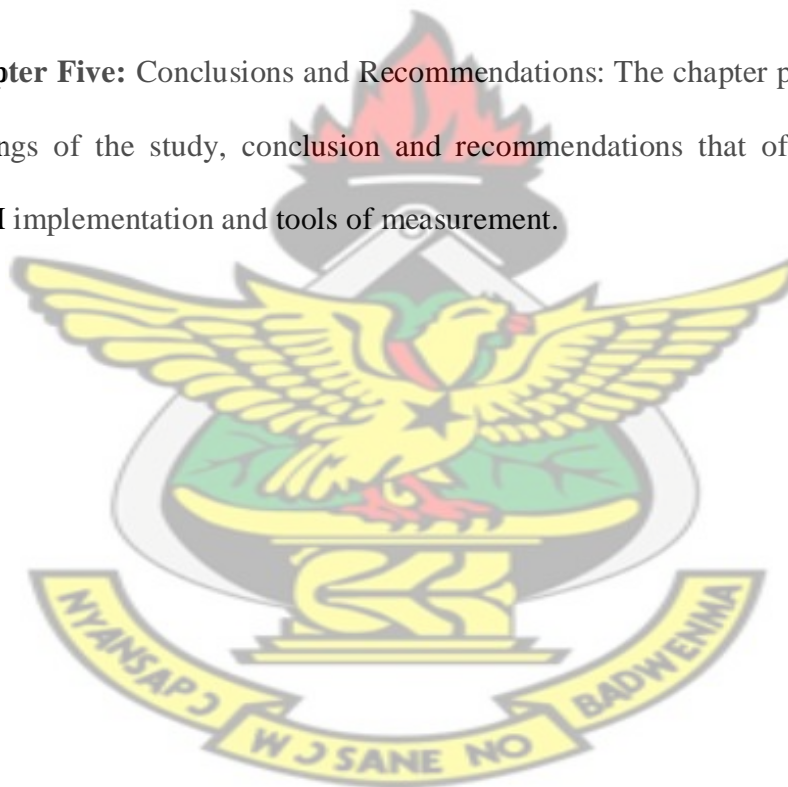
1. What is Total Quality Management (TQM)?
2. What Ghanaian Contractors know about Total Quality Management?
3. How is TQM implemented in the Ghanaian Construction Industry?

1.6 Research Design

The research was designed according to the following chapters:

- **Chapter One:** This chapter provides the introductory aspect of the thesis. It presents the background and problems of the Construction Industry in Ghana. In addition, research questions, objectives and design are explicitly identified in this chapter.

- **Chapter Two:** Chapter 2 provides an integrative review of earlier studies on TQM in the Construction Industry.
- **Chapter Three:** This chapter presents a detailed explanation on the Principles of TQM.
- **Chapter Four:** This section presents research approach and methods of data collection and analysis of the study. The chapter also highlights the profile of the firms studied.
- **Chapter Five: Conclusions and Recommendations:** The chapter presents the main findings of the study, conclusion and recommendations that offer insights into TQM implementation and tools of measurement.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In order for companies to grow and prosper, two basic questions in strategic management are asked. Where do we want to go and how do we get there? In a highly competitive construction market responsible for a nation's infrastructural development, the way forward for construction firms is to assess their business environment and develop a framework to have a sustainable competitive advantage.

This literature review therefore aims at reviewing the current state of the Ghanaian Construction Industry (GCI). In order to sustain a competitive advantage, Quality Management with emphasis on Total Quality Management (TQM) concept is discussed. Its developmental stages, comparison of frameworks, benefits and critical success factors of existing literature on TQM are considered in this chapter.

2.2 General Overview of Ghana and the Construction Industry

Ghana is a sovereign state located on the Gulf of Guinea and Atlantic Ocean in the Sub-Saharan Africa frontier. Ghana consists of ten territorial administrative regions bordered by Ivory Coast to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea and Atlantic Ocean to the south. The regional capitals and land area is as shown in Table 2.1. The national census conducted in Ghana recorded a population of 24,658,823 in 2010. The population was 6,726,815 in 1960 and increased to 18,912,079 in 2000 as shown in Table 2.2.

Table 2.1: Regions showing Land Area

<u>Regions of Ghana</u>	Area (km ²)	<u>Regions of Ghana capital</u>	<u>Regions of Ghana</u>	Area (km ²)	<u>Regions of Ghana capital</u>
<u>Ashanti Region</u>	24,389	<u>Kumasi</u>	<u>Northern Region</u>	70,384	<u>Tamale</u>
<u>Brong-Ahafo Region</u>	39,557	<u>Sunyani</u>	<u>Upper East Region</u>	8,842	<u>Bolgatanga</u>
<u>Central Region</u>	9,826	<u>Cape Coast</u>	<u>Upper West Region</u>	18,476	<u>Wa</u>
<u>Eastern Region</u>	19,323	<u>Koforidua</u>	<u>Volta Region</u>	20,570	<u>Ho</u>
<u>Greater Accra Region</u>	3,245	<u>Accra</u>	<u>Western Region</u>	23,941	<u>Sekondi-Takoradi</u>

Source: Ghana Statistical Service (2013)

Table 2.2: Population Size

Year	Population
1960	6,726,815
1970	8,559,313
1984	12,296,081
2000	18,912,079
2010	24,658,823

Source: Ghana Statistical Service (2013)

Most of the country's larger cities are in the south, which has relatively high population density and low poverty rates whilst the north is sparsely populated but with very high incidence of poverty. This population pattern also reflects the underlying economic activity and hence the distribution of infrastructure in the Ghana. Nevertheless, unlike many other African countries, Ghana's infrastructure backbones cover the entire national territory and help to integrate the different regions. Two road corridors linking north and south, a national power grid, and an ICT backbone interconnect all major population

centres (Pushak, 2011).According to vision 2020, Ghana intends to maintain the ‘middle income’ status by 2020 by UN/World Bank definition.

Studies show that construction contributes between 5% and 10% of Gross Domestic Product (GDP) in all countries, employs up to 10% of the working population, and is responsible for about half of the gross fixed capital formation (Hillebrandt, 2000). In Ghana, the Construction Industry contributes 10.5% of the Gross Domestic Product and employs about 6% of the population (GSS, 2013).

Developmental projects in the transport, water and sanitation, energy, health, education and agricultural sectors in the economy are undertaken by the construction industry. For this reason, developing a competitive construction industry should be an important objective of government policy (World Bank, 1984). It is no wonder that, the Government of Ghana had a theme “Infrastructural Development for Accelerated Growth and Job Creation in the 2012 National Budget. The aim of government was to provide infrastructural activities in various sectors of the economy to stimulate growth and support the private sector in job generation thus improving the wealth and health of the general population. Therefore, construction sector plays an important role in the realization of these objectives.

2.2.1 Political Overview

In Ghana, the Ministry of Water Resources, Works and Housing and the Ministry of Roads and Transport are responsible for the regulation and certification of Construction Contractors. Although these two (2) Ministries issue certificates to contractors they do not ensure the sustainability and development of the Construction Industry.

The construction sector has two main classes of product. One is building which is associated with housing, offices, hospitals, factories, the other is civil works involving the

infrastructure for water supply, transport, irrigation, power generation. The informal sector deals mainly with individuals in the construction of less complex buildings with minimal skilled labour required. Such construction work do not undergo strict adherence to standards. The formal sector is responsible for mostly infrastructural works with the Government of Ghana, public institutions and multi-national companies as the Client. The contractors in this formal sector are normally registered with large capital base.

Housing and construction are generally accepted as potential game-changers to Ghana's developmental prospects but these sectors appear to be quietly slipping out of the hands of local entrepreneurs. Generally, Ghana's housing conditions are poor in nearly all areas including, poor access to improved water sources, poor or non-existent drainage and poor sanitation reflected in inadequate, cooking, bathing and toilet facilities (GSS, 2013). Although there is deficit in housing stock, there is no clear-cut policy to support the local contractors. However, the government initiates policies such as tax rebates, free land as in the failed STX deal proposed by the government in 2011.

At a West Africa Building and Construction Exhibition and Seminar, a former Finance and Economic Planning Minister, Dr Kwabena Duffuor explained that the 120 local contractors listed in the ministry's database have not built the financial muscle required to handle big projects such as major road construction, bridges and housing. This inadequate financial position therefore inhibits the growth of the Construction Industry.

Ofori (2012) recommended the formation of a Central Agency to regulate and develop the Construction Industry. He concluded that the absence of a regulatory body negatively affects the standards and practices of this important Industry. If the government fails in regulating the Industry and does not institute pragmatic measures to grow this Industry, foreigners will take advantage and win most government lucrative jobs. As in all

industries, there are standards that should govern the industry to ensure specifications and quality is achieved. Thus, countries such as UK and Hong Kong adopted ISO 9000 as an international standard for certification of quality management systems (QMS).

In order to develop GCI strategically, politicians should initiate appropriate policies and reforms to improve the standards, financial and regulatory status of the construction business environment.

2.2.2 Economic Overview

Construction is the key sector for every economy. It is known that construction contributes to the national socio-economic development by providing significant employment opportunities at non-skilled and skilled levels.

Ghana's economic history dates back to the days when the economy was dependent on agriculture, trade and industry. Agriculture was booming during those pre-colonial days when citizens were into some form of agriculture (planting or rearing of livestock). Currently, Ghana is the second leading exporter of Cocoa, a crop Tetteh Quarshie brought from Fernando Po in 1878.

Before independence, the industry was also vibrant in mining, pottery, cloth weaving and carving activities. The industry produced exports that the Europeans traded in. Trading in gold, ornaments and cloth were vibrant as the Europeans were involved in the trade activities along the coast. The economy after colonization has grown steadfastly under different government depending on their ideological orientation. Various policies initiated by IMF, World Bank etc. have been introduced to increase productivity and help boost the economy of the nation.

Currently, Services, Agriculture and Industry are the major economic activities affecting the GDP of the country. The Gross Domestic Product (GDP) in Ghana was worth 40.71 billion US dollars in 2012. The GDP value of Ghana represents 0.07% of the world economy. The major contributor of GDP in 2012 was Services, followed by Industry and then Agriculture as shown in Table 2.3.

Table 2.3: Gross domestic product (GDP) at current market prices by economic activities (Ghc Million)

Economic Activity	2008	2009	2010	2011	2012
Services	13,934.6	17,543.5	22,183.6	27,422.7	33,962.5
Industry	5,854.5	6,775.7	8,294.5	14,274.4	18,580.5
Agriculture	8,875.0	11,342.8	12,909.6	14,154.8	15,399.1

Source: Ghana Statistical Service (2013)

In the Industry Sector, Construction contributed highest to the GDP as shown in table 2.4.

Table 2.4: Gross domestic product (GDP) at current market prices by economic activities

Economic Activity	2008	2009	2010	2011	2012
INDUSTRY	5,854.5	6,775.7	8,294.5	14,274.4	18,580.5
Mining and Quarrying	693.2	740.0	1012.7	4,689.9	5,956.1
Crude Oil	0.0	0.0	0 177.5	3,746.3	4,645.4
Manufacturing	2,276.7	2,478.4	2,941.5	3,842.5	4,680.1
Electricity	155.2	166.9	266.0	279.7	329.3
Water and Sewerage	228.9	246.4	368.3	467.4	505.3
Construction	2,500.5	3,144.0	3,706.0	4,994.9	7,109.6

Source: Ghana Statistical Service (2013)

According to World Bank country classifications, the country moved from low-income to lower middle-income status on July 1, 2011. To improve on this economic status, the government intends to improve its infrastructure development especially in the rural and northern sectors of the country where poverty rates are high as compared to the southern sector. Foster & Pushak, (2011) encouraged the country to maintain its middle income status since raising the country's infrastructure endowment to that of the region's middle-income countries could boost annual growth by more than 2.7 percentage points.

Thus, the Minister of Finance stated that the establishment of the Ghana Infrastructure Fund (GIF) as a quasi-fiscal body to deal with the huge infrastructure deficit and to focus on strategic infrastructure will lead to job creation and growth of the economy (Terkper, 2013). This confirms the assertion that construction is seen as a vehicle for dispersing economic activity and raising income levels of the citizenry (Ofori, 2012).

One major challenge facing the GCI is assess to finance to enable Local Contractors compete with the foreign partners. In this regard, the Chairman for the Ghana branch of the Chartered Institute of Building (CIOB), Rockson Dogbegah, is advocating setting up a bank solely for the construction industry. He said this has become necessary due to the high financial cost involved in any construction project.

2.2.3 Sociological Overview

Education and employment are the factors that affect the social state of the country. People with no formal education and those with primary and middle school (basic) education dominate the working population of the country. Thus, nearly 70% of the workforce has no formal or only basic education (GSS,2013) This report also stated that about 67% of the population were self-employed without employees implying small-scale enterprises dominate the economy with little avenues for employing other people.

The Construction Industry employs about 6% of the population (GSS, 2013). This industry has the capability of generating employment especially for the labour-intensive activities. It is known that apart from the labour directly linked to the project, other employment is generated for food sellers, suppliers of goods such as electrical, plumbing, financial sectors (loans) etc.

2.2.4 Technological Overview

Technology is the application of existing body of knowledge to the production of goods and services. It embraces tools, equipment, techniques, materials, systems, the products and their use. There is a general agreement that technology is critical to the development of a nation.

Technological advancement is introduced in the Construction Industry to increase productivity and cost reduction leading to more profit. Studies have proved that technology growth in the manufacturing industry has greatly improved profit margins. However, the CI is slow in adapting new technologies to improve profit. After studying strategies in improving technology implementation in the Construction Industry, Henderson & Ruiker (2010) concluded that the degree of technology implementation success depends on the degree to which changes are planned, managed and evaluated. Therefore, technology implementation within construction organizations is not so much a technological problem as it is a human behavioural one.

2.3 Quality and Total Quality Management (TQM)

“Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction, and skilful execution; it represents the wise choice of many alternatives.”(Foster, W.)

In his study, Anvuur *et al* (2006) concluded that the debilitating factors derailing the efforts in achieving value for money in the construction industry include deteriorating quality of construction force, poor health and safety measures

Foster & Pushak (2011) stated that despite Ghana's success with increasing access to infrastructural services, the quality of service remains low. He explained that perhaps the most dramatic case is in the water sector, where exceptionally high losses of water produced, with little reaching end customers and exposed to intermittent supplies. Until this issue is resolved, Ghana's recent technical achievement of the Millennium Development Goal for water supply will remain a hollow victory. Power supply is also increasingly subject to reliability problems that stem from neglect of aging transmission and distribution assets. Even in mobile telephony, the increasing rate of dropped calls has become a concern. This overall pattern suggests that Ghana may benefit from a systematic framework for regulating the quality of public services (Foster & Pushak, 2011). Therefore, GCI must assess its quality requirements in order to make the industry attractive.

Quality definition is dynamic since the customers vary depending on their opinions. Some common definitions of quality are Conformance to Specifications, Fitness for use, Value for price paid. Tang *et al*, (2005) defined quality as a state that meets the legal, aesthetic and functional requirement of a product or project by customers.

Proponents of Quality started with Quality Control (QC) that deals with the inspection of works. Later on, Quality Assurance (QA) that is about prevention of defects was introduced. Currently the standard for ensuring quality work is by the concept of Total Quality Management (TQM).

TQM is a philosophy that involves every organization in the industry in the effort to improve performance. It permeates every aspect of a company and makes quality a strategic objective (Arditi and Gunaydin, 1997). It integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement. TQM is as a culture that seeks for customer satisfaction through continuous improvement and innovation in all sectors of the business (Harrington and Voehl, 2012).

TQM has many definitions depending on the organisations' perception about quality. BS 7850 (BSI, 1992) defines TQM as the management philosophy and company practices that aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization. Another definition of TQM, which is used by the Department of Defence in USA, is a philosophy and a set of guiding principles that represent the foundation of a continually improving organization (Tingey, 1997). According to the American Society for Quality, TQM is about customer satisfaction, cost-effectiveness and defect-free work.

The TQM philosophy can be broken down into three fundamental concepts. The first is a focus on the customer, both internal and external. The second is the idea of continual improvement. No matter how much improvement you make there is still room for more. The third concept is to focus on problem prevention instead of problem solving (Beckwith, 1992).

The beginning of TQM is traced back to the 1920s when statistical methods were employed in analysing product quality control. Twenty years later, Americans such as Deming, Juran, Crosby and Feigenbaum improved on this concept by expanding its focus from product quality to quality in all issues of an organisation. The concept of TQM

started in the manufacturing Industry giving the impression that TQM cannot be applied in the any Industry but the manufacturing industry.

Regardless of the fact that construction is different from the manufacturing sector in terms of its uniqueness in production, studies according to Ahmed (1993), Arditi and Gunaydin (1997), Harrington & Voehl (2012) and Low and Jasmine (2004) have all confirmed the benefits and applicability of TQM in the Construction Industry.

Harrington and Voehl (2012) concluded that TQM can only help ensure that organizations do the right things right in their never-ending “war on waste.”

2.4 Approaches to TQM Studies

The three different approaches in TQM studies are:

1. Contributions from Quality Pioneers,
2. Formal Evaluation Models
3. Empirical Research

2.4.1 Contributions from Quality Pioneers

Dr. Joseph Juran originally worked in the quality program at Western Electric. He was well known in 1951, after the publication of his book Quality Control Handbook. Juran (1988) introduced the management dimensions of planning, organizing, and controlling and focused on the responsibility of management to achieve quality and the need for setting goals. Juran defines quality as fitness for use rather than simply conformance to specifications. He was a pioneer in teaching the Japanese on Quality Management Improvement and believed in top management commitment, support and involvement in the quality effort. Juran’s ten steps to quality management are

1. Build awareness of opportunity to improve.

2. Set-goals for improvement.
3. Organize to reach goals.
4. Provide training
5. Carry out projects to solve problems.
6. Report progress.
7. Give recognition.
8. Communicate results.
9. Keep score.
10. Maintain momentum by making annual improvement part of the regular systems and processes of the company.

Edwards Deming is often referred to as the “father of quality control.” He was a Statistics Professor at New York University in the 1940s. Deming (1986) insisted management’s responsibility is to build good systems that promote good quality management. He emphasised that employees cannot produce quality goods that exceed what the system was capable of producing. He proposed 14 steps for implementing total quality management to help companies improve on quality and productivity.

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.

9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.
11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.
14. Put everybody in the company to work accomplishing the transformation.

Philip B. Crosby is another recognized guru in the area of TQM. He developed the phrase “Do it right the first time” and the notion of zero defects, arguing that no amount of defects should be considered acceptable. Crosby (1979) coined the term ‘zero defects’ and stated there is absolutely no reason for having errors or defects in any product or service. He said the cost of quality is understated when in comparison with cost of improving quality. Crosby concluded that the cost of quality included all things that are not included in getting it right the first time.

Kaoru Ishikawa was the first quality guru to emphasize the importance of the ‘internal customer’, the next person in the production process. He was also one of the first to stress the importance of total company quality control, rather than just focusing on products and services. Ishikawa (1985) promoted the use of teams or quality circles and the seven tools of quality in performance improvement. He developed the Cause-Effect Diagram known as Fishbone Diagram.

Ishikawa defined quality as the development, design, production and service of products that are most economical, most useful, and always satisfactory to the customer. He emphasized the importance of training, the usage of cause-effect diagrams for problem solving, and quality circles as a way to achieve continuous improvement.

2.4.2 Formal evaluation models

Some organisations use models as a guide in the implementation of quality management systems. These models are the frameworks on which TQM implementation is based. Bou-Llusaret *et al* (2009) support that MBNQA and EFQM are relevant operational frameworks suitable for assessing TQM initiatives. Three commonly used Quality Models are:

2.4.2.1 The Malcolm Baldrige National Quality Award (MBNQA)

MBNQA founded in 1988 recognises US organisations for excellent performance. There are seven (7) categories named as the main values in quality management. They are (1) leadership, (2) strategic planning, (3) human resources orientation, (4) process management, (5) information and analysis, (6) customer and market focus and (7) business results as shown in Figure 1. For organisations that intend on improving TQM, they assess themselves on these criteria in comparison with winners of MBNQA Awards.

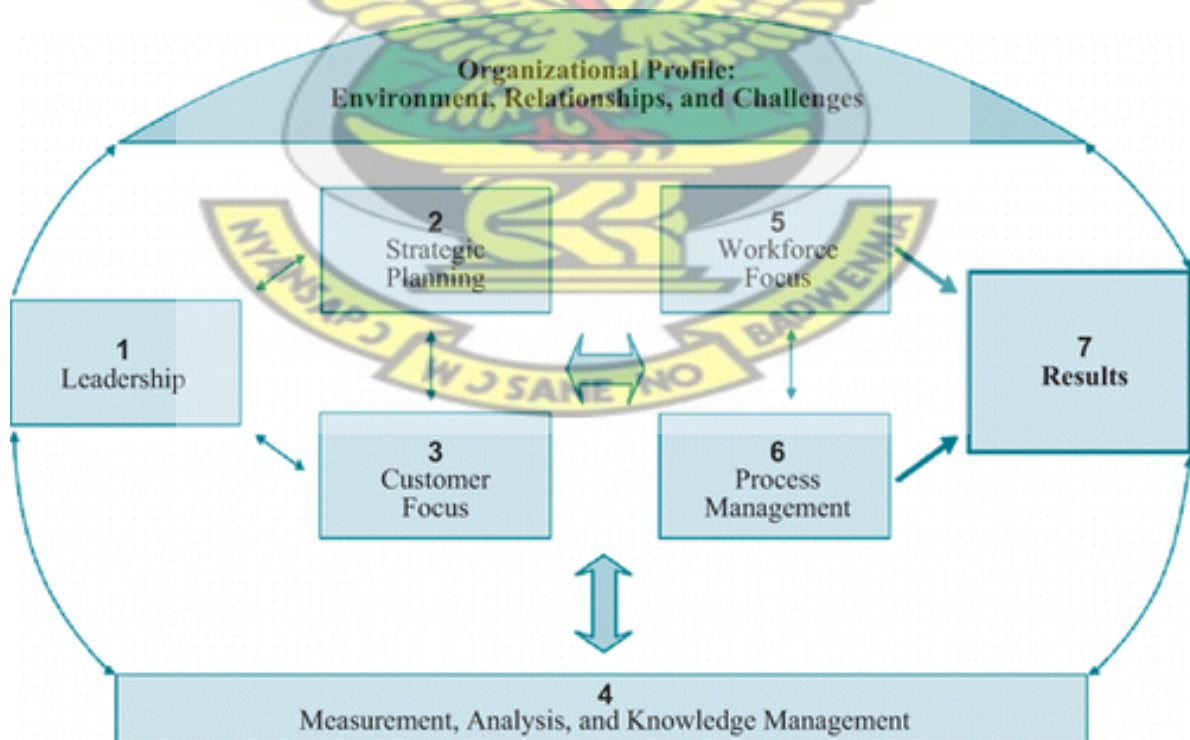


Figure 2.1: MBNQA Framework, NIST (2009), Baldrige national Quality Program, <http://baldrige.nist.gov/>

2.4.2.4 European Foundation for Quality Management (EFQM)

The European Foundation created EFQM in 1991 for Quality Management. It is a framework against which applicants of the European Quality Award are judged and recognized for organizational excellence in European companies. There are nine elements made up of five (5) enablers and four (4) results as shown in Figure 2.2.

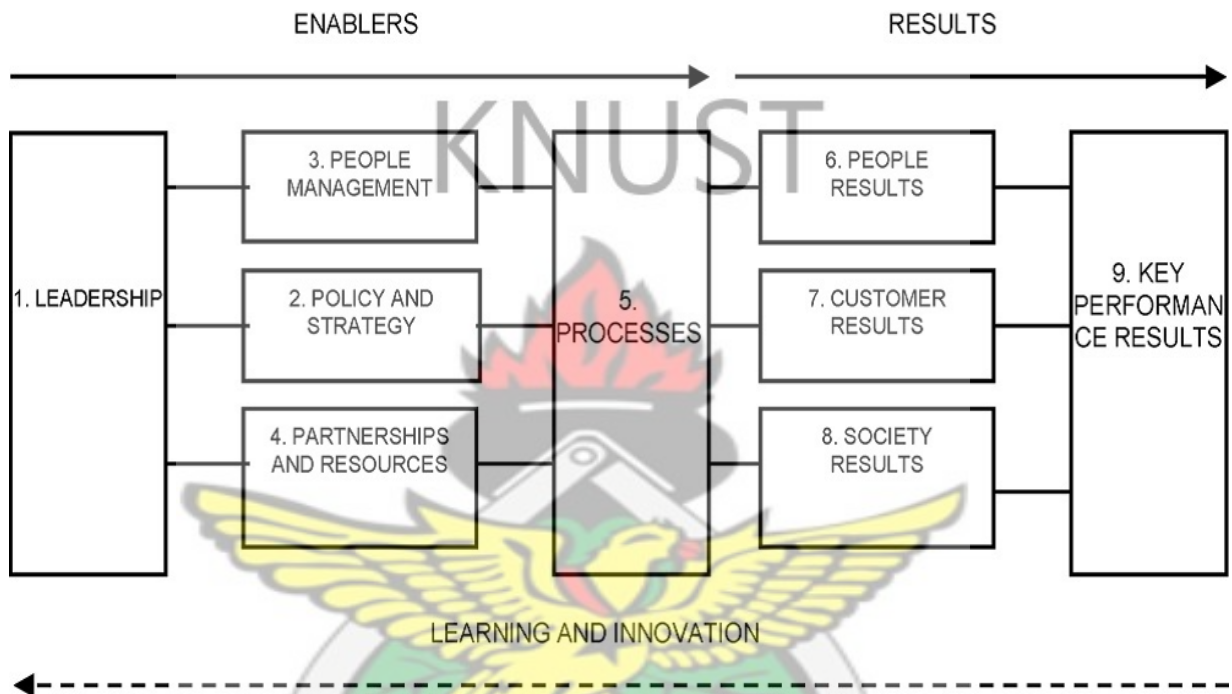


Figure2. 2: EFQM (2010), EFQM Excellence Award <http://www.efqm.org/>.

2.4.2.3 Deming Application Prize (DP)

This model created by Japanese Union of Scientists and Engineers (JUSE) in 1951 is one of the highest awards on TQM in Japan. It was established in commemoration of the late Dr. William Edwards Deming who contributed greatly to Japan's proliferation of statistical quality control after the World War II. .

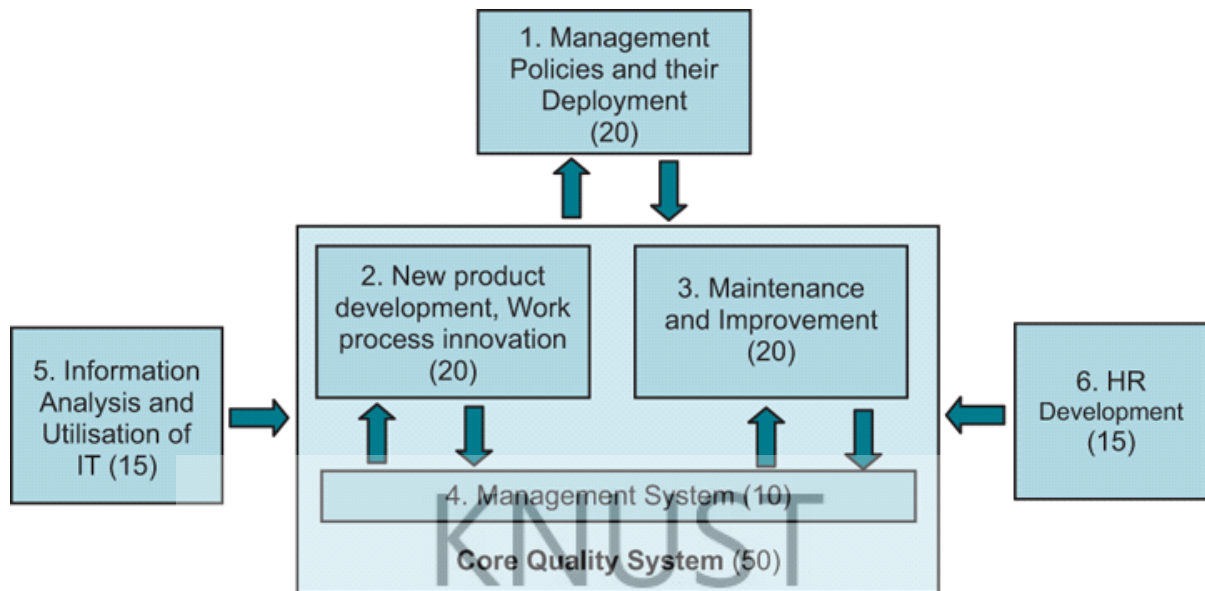


Figure 2.3: DP Model, Juse (2010) <http://www.juse.or.jp/e/deming/index.html>

2.4.3 Empirical Research on TQM and its Critical Factors

Researchers have conducted extensive studies on TQM in the construction industry. Notably among them are Saraph et al (1989), Badri et al (1995), Quazi et al (1998), Black & Porter (1996).

Although there are dissimilar characteristics between the Manufacturing and Construction Sector, Arditi and Gunaydin, (1997) concluded that the basic principles of TQM can be applied in the construction industry to improve on Quality. He proposed that Construction Quality Managers should develop quality systems based on management commitment, training, teamwork, statistical methods, customer satisfaction, cost of quality measures, and clear concise drawings.

Harrington and Voehl (2012) listed ten (10) elements essential in implementing TQM needed to continue the on-going “war on waste” in a Construction Industry. These 10 elements are Leadership and Management Commitment, Customer Satisfaction, Training, Communication, Teamwork, Total Quality and Measurement, Continuous Improvement,

Process Improvement, Employee Focus and Supplier Chain Management. He noted that facilitative leadership and training were very essential in the implementation of a successful TQM Programme.

Imbeah (2012) designed a TQM implementation framework for real estate firms in Ghana. This structure was designed when his study on QMS in real estate firms confirmed that although these firms are aware of the importance of quality, their knowledge about QM is limited. He realised that their perception about quality is of corrective actions (Quality control) rather than preventive actions (Quality assurance, process and continuous improvement approach). Moreover, the survey indicated that the major problems affecting implementation of QM program are lack of expertise/resources in QM, changing the employee behaviour and attitude, lack of education and training to drive the improvement process, lack of employee commitment/understanding, lack of top-management commitment/understanding. Imbeah (2012) identified eleven factors as drivers for an effective quality management.

1. Top management commitment & leadership
2. Employee welfare and commitment
3. Employee training and development
4. Customer focus
5. Planning
6. Process control and process evaluation
7. Supplier management
8. Continuous Improvement
9. Team Work
10. Information analysis
11. Evaluation.

After practising quality assurance based on ISO 9000 for the past 15 years, research proved that project quality in the Hong Kong Construction Industry was still lower than standards expected (Lau and Tang, 2009). They stated that QA was a static approach and TQM being a dynamic approach was needed to be the driving force for quality improvement. The study revealed that Hong Kong Contractors had full knowledge of QA principles but considerable knowledge in TQM principles.

Just as in most developing countries, Pakistan has vulnerabilities posed by economic constraints in the construction industry and these vulnerabilities can be overcome by taking advantage of TQM philosophy (Nawaz and Ikram, 2013). They agreed that although TQM is applicable in the Construction Industry, there is a lack of consensus on the implementation process. Moreover, studies show the absence of quality manuals, training schedules and lack of management support. One major conclusion of Nawaz and Ikram (2013) revealed that current bidding and tendering procedures were not in alignment with TQM philosophy. They recommended that awareness in TQM Philosophy, Training in TQM, Support and Commitment of Top Management, Revision of Traditional Bidding Process and a Quality Policy are the critical factors which when assessed will revitalise the Pakistani Construction Industry.

For a successful implementation of TQM, it is imperative that construction companies understand the critical success factors (CSF's). These CSFs are a guide for construction organizations contemplating on TQM initiatives (Metri, 2005).

2.5 Critical Success Factors of TQM

Different authors have differing views on the basic elements of TQM since its inception in 1920. The basic principles of TQM are based on these constructs as espoused by Metri (2005), Imbeah (2012), Harrington and Voehl (2012).

Metri (2005) discussed other critical factors when he analysed the critical success factors of the fourteen (14) most prominent total quality management frameworks. Based on this, he proposed the following ten critical success factors (CSF) of TQM for the construction industry.

1. Top management commitment
2. Quality culture
3. Strategic quality management
4. Design quality management
5. Process management
6. Supplier quality management
7. Education and training
8. Empowerment and involvement
9. Information and analysis
10. Customer satisfaction.

2.5.1 Management Strategy and Commitment

Management is essentially a way of planning, organising, and understanding the activities in a project and this involves each person at each level. The role of management in TQ is to have a strategic quality management overview that places emphasis on quality as problem prevention and not inspection. Both top and middle management personnel, responsible for spreading TQM principles to all staff must demonstrate their commitment and understanding of these basic principles.

Therefore, an effective TQM must first start with the leadership of the firm. Management must prepare a well-thought out quality policy which must be known to all employees. Within an appropriate organisational culture, management implements and monitors

carefully this policy to ensure the adherence of its contents. In addition, it is the responsibility of Management to provide all resources, training and requisite tools needed to build an effective and efficient TQM system in the Construction Company.

Effective leadership and good quality management result in the company doing the right things, right first time (Oakland, 2004). In his book 'What is Total Quality Control?' Ishikawa (1985) states the fact that, top management cannot be disconnected from the total quality management of the company.

The Business Roundtable (1983) on cost effectiveness concluded that poor management practices are a primary cause for the decline of construction productivity.

Other researchers such as Abdul-Rahman (1996) and Tsiotras & Gotzamani (1996) also indicated that lack of long-term commitment to quality from top management is one of the reasons of quality management failure. This assertion is also confirmed by Polat et al (2011) who concluded that three most important barriers to TQM implementation are lack of top management's support, commitment and leadership

In a survey conducted by Arditi and Gunaydin (1997) to investigate TQM in the design, construction, and operation phases of projects undertaken in the USA, he indicated that the level of management commitment to continuous quality improvement was one of the most important factors that affect the quality of the constructed facility. In conclusion, they stated that Management must participate in TQM implementation process and be fully committed if TQM succeeds. The responsibility is therefore on the leader to build an environment that promotes quality for every employee. Such environment is achieved by articulating the vision, core values, and purpose for existence and mission statements clearly to employees.

2.5.2 Quality Culture

Culture in any business is the beliefs that pervade the organization about how business conduct and how employees should behave and be treated (Oakland, 2004). Oakland listed the following as some of the components that determines the culture of an organisation:

- Behaviours based on people interactions
- Norms resulting from working groups
- Dominant values adopted by the organization
- Rules of the game for 'getting on'

Tang *et al* (2005) described the collective attitudes and a belief of employees towards quality as the quality culture of the organisation. They emphasised that good quality culture is the platform on which quality management system is built. Quality culture is so critical that Cortada and Woods (1995) concluded that the absence of it makes quality management so mechanical and therefore fails to achieve the customer satisfaction so desired.

2.5.3 Process Management

Process is a particular course of action intended to achieve a result. In construction, every activity undertaken by employees is a process. According to TQM philosophy, if the process is correct, so will be the result (product). Therefore, the under-performance of a company is due to poor management of processes. In the EFQM excellence model, process management is the linkage between the results and enablers. Thus, an improved process leads to improvement in performance.

A process is all the internal operations used to generate and deliver a product (Bell *et al*, 2000). In addition they stated that a good process management is as a result of knowing and satisfying the expectations of the customer.

Harris et al (2006) emphasised that Process Focus is one of the main principles in TQM. Thus, the organization should work to improve the process to improve the product or service (Tang et al, 2005). To be process-focused is to focus on design and control of the inputs, work closely with suppliers, and understand the process flows to eliminate bottlenecks and reduce waste (Oakland, 2004).

Analysing accurate data is very important for both employees and management to make better decisions regarding process improvement (Harrington and Voehl, 2012). In monitoring process performance, measurement inevitably identifies necessary improvement actions. Therefore, in many process-managed companies, management has shifted the focus of the measurement systems from functional to process goals and even base remuneration and career advancement on process performance (Oakland, 2004).

In a research on award-winning companies, Oakland (2004) identified process management best practices as:

- Identifying the key business processes:
- Managing processes systematically:
- Reviewing processes and setting improvement targets:
- Using innovation and creativity to improve processes:
- Changing processes and evaluating the benefits:

Some data collection tools include histograms, cause-and-effect diagrams, check sheets, Pareto diagrams, graphs, control charts, and scatter diagrams.

2.5.4 Supplier Chain Management

The basic reason why a company needs to build good supplier base is that you cannot have a good quality product no matter how much you try with defective materials. In order to satisfy the customer, TQM pays careful attention to the supplier of resources i.e. labour,

materials and equipment. Supply-chain management is the integration of the activities that procure materials and services, transform them into intermediate goods and final products and deliver them to customers (Heizer and Render, 2006).

Whereas the manufacturing companies such as Toyota and Honda have improved productivity by having efficient supply chain management (SCM), the construction sector remains characterized by adversarial practices and disjointed supply relationships and commonly, construction clients appear to distrust their main contractors (Briscoe and Dainty, 2005). Construction Supply Chain management (CSCM) is now an emerging phenomenon to be studied to ascertain its effect in the construction industry. It identifies the relationship between companies and their suppliers.

In his conclusion, Adavi and Patil (2012) recommended that suppliers and contractors integrate to form supply chain initiatives which ultimately leads to reduction in cost and time overruns.

In the traditional procurement method where there are competitive bids, the lowest bidder supplies resources cheaply as possible. This method does not build cooperative and collaborative relationship espoused in TQM. Modern procurement strategies appoint an integrated supply chain where all parties in the supply chain have a long-term objective to work as a team and deliver added value to the client.

Harrington and Voehl (2012) stated emphatically that maintaining close and long-term relationships with suppliers' results in achieving the best economy and quality management support this modern procurement strategy. Having close working relationships with a small number of suppliers' means that each supplier can be given larger orders which helps win their loyalty. This fact is emphasised by Deming (Point 4 of 14), "End the practice of awarding business on the basis of a price tag. Instead, minimize

total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.”

2.5.5 Employee Education and Training

Pioneers in Quality Management Systems (QMS), Deming (1986), Ishikawa (1985) and Crosby (1979) have all confirmed that training is fundamental to the achievement of Quality Ideals that promotes organisational performance. Effective training leads to a continuous improvement of the work processes and improves the mental capacities and skills of staff. Employee training is defined as the basic practices that organizations provide to improve specific skills in their employees to boost the organizational performance, quality, and customer satisfaction and then reduce time and costs.

Deming (1986) in the sixth (6th) point of the fourteen (14) points for improvement identified on-the-job training as one of the management guidelines. He explained that training builds a common foundation for the employees to reduce product variation. Moreover, regular employee training encourages them to learn from one other and thus creates a teamwork environment that makes employees know their role distinctly. The inadequate training of supervisors in techniques such as communication and planning contributes to the steady rise of construction costs and dwindling productivity (Business Roundtable, 1983).

It is arguable that the transient nature of construction labour makes training ineffective. However, if all Construction companies were regularly training their employee on basic construction skills, the temporal nature of workforce would not affect TQM implementation. Arditi and Gunaydin, (1997) concluded that employee training and education in TQM theory and practice for all employees are essential to enhance

competitiveness. This conclusion is similar to ISO 9001 standards which emphasize the importance of training especially for activities demanding special skills (Doyle, 1994).

2.5.6 Continuous Improvement

The primary purpose of TQM is to provide excellence in customer satisfaction through continuous improvement by the total involvement and dedication of all employees at all levels within an organization. Continuous Improvement is about improving the processes and products in construction operations. It entails focusing on processes so that they can be more efficient (Harrington & Voehl, 2012). Continuous improvement consists of implementing practices that result in on-going incremental actions aimed at improving production efficiency and efficacy. (Santos *et al*, 2000).

This concept is very vital in achieving the objectives of any QMS. The ability to identify what is changing in the environment and respond proactively through continuous improvement efforts is a key element needed for organizational success (Eisenhardt and Brown, 1998). Thus, Oswald and Burati (1992) stated that TQM is a journey not a destination.

The major finding of a study relating TQM to Continuous improvement in Project Management (CIIPM) concluded that ‘soft’ TQM elements have more significant and positive relationships with the CIIPM (Jung and Yong, 2006)

Egan (1998) recommended that the UK construction industry should adopt lean thinking which is one of the most effective techniques for eliminating waste and delivering significant sustained improvements in efficiency and quality. A tool for improving these processes is by using Deming’s (2000) Plan-Do-Check –Act (PDCA) cycle. This cycle helps in planning and therefore foresees any defects that are then rectified.

2.5.7 Customer Satisfaction

A successful project occurs when the Contractor knows that Customer Satisfaction is the ultimate goal of TQM. Most organisations know throughout its ranks that the purpose for all efforts at work is to please the customer better. This implies that organisations must know through feedbacks and measurements how the customer views their product. (Oakland, 2004).

There are internal and external customers in every organisation. Internal customers are the process owners within the organisation and external customer is the final user of the constructed work.

The key factor to ensure Customer satisfaction is in knowing, understanding and meeting the clear and realistic objectives of the customer. An important variable in organisational success is in developing customer loyalty. According to Oakland (2204), research shows that focus on customer loyalty can provide several commercial advantages:

- i. Customers cost less to retain than acquire.
- ii. The longer the relationship with the customer, the higher the profitability.
- iii. A loyal customer will commit more spend to its chosen supplier.
- iv. About half of new customers come through referrals from existing clients

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

- i. make the customer aware of the organization's quality management initiative;
- ii. determine customer expectations;
- iii. measure the customer's degree of satisfaction

- iv. take action to improve satisfaction

Moreover, Xiao and Proverbs (2003) discuss that measuring customer satisfaction can benefit companies in ways such as: improvement of communication between parties, recognition of the necessity of process improvement, better understanding of problems, evaluation of progress towards the goal, and monitoring and reporting accomplished results.

2.5.8 Employee satisfaction and Teamwork

The most important resource in any industry is the human resource. It is no wonder that TQM focuses on Customer Satisfaction and Employee Satisfaction. It views its employees as internal customers that must be satisfied by motivation. They are motivated when given rewards, recognition, and appreciation. Jung and Yong (2006) suggested that employee relation's elements are the most contributing elements towards achieving continuous improvement aspect of international project management (CIIPM). Investment made in employee training and development, efficient communication mechanisms, flexible work environment and safety make a significant contribution to CIIPM (Jung and Yong, 2006). TQM wholly supports the maxim that two heads are better than one. It notices that individuals working together in teams or groups toward achievement of common goals are generally more effective (Harrington and Voehl, 2012). Tari' (2006) concluded in his study on ISO-guided organisations that, to advance Quality Management from ISO to TQM, management must improve on issues concerning people orientation and employee involvement.

Teamwork is so critical that Landin (2000) stated that TQM will not be successful in the construction industry until it can be implemented in a team spirit with a direct invitation to participate from the bottom up.

2.6 Tools and Techniques

TQM implementation is not just about critical factors but the use of appropriate tools and techniques to satisfy customers. Any organisation that intends to improve on its process management needs to use the appropriate tools and techniques to enable management make decisions based on facts. Seven simple tools in quality management are Pareto analysis, check-sheet, cause-and-effect diagram (fishbone diagram), histogram, flowchart, control charts and scatter chart. These tools help in collecting data used in process auditing and improvements.

1. Check-sheet

A check sheet is a simple document that is used for collecting data in real-time and at the location where the data is generated. The document is typically a blank form designed for quick, easy, and efficient recording of the desired information, which can either be quantitative or qualitative. Information on check-sheets is retrospective and used for problem identification and problem solution.

2. Pareto Analysis

Pareto Analysis is a technique used to identify quality problems based on their degree of importance. The logic behind Pareto analysis is that only few quality problems are important, whereas many others are not critical. The technique was named after Vilfredo Pareto, a nineteenth-century Italian economist who determined that only a small percentage of people controlled most of the wealth. This concept has often been called the 80–20 rule. In order to do the analysis, one has to develop a chart that ranks the causes of poor quality in decreasing order based on the percentage of defects each has caused.

3. Cause-and-effect diagram

They are also called fishbone diagrams and are charts that identify potential causes for particular quality problems. It is used in breaking down the major causes of a particular problem. Basically the 4 M's i.e. machinery, manpower, material and methods are the root of the causes to the problem.

4. Histogram

Histograms provide graphical representations of the individual measured values in a data set according to the frequency of occurrence. They reveal the amount of variation within a process. There are several forms of histograms, which help to visualize the distribution of data.

5. Flow chart

A flowchart is a schematic diagram of the sequence of steps involved in an operation or process. It provides a visual tool that is easy to use and understand. By seeing the steps involved in an operation or process, everyone develops a clear picture of how the operation works and where problems could arise. By visualising the processes, employees know the steps and this helps in problem identification.

6. Control Charts

Control charts are graphs used to study how a process changes over time. Data is plotted in time order. A control chart always has a central line for the average, an upper line for the upper control limit and a lower line for the lower control limit. These three lines are determined from historical data. By comparing current data to these lines, you can draw conclusions about whether the process variation is consistent (in control) or is unpredictable (out of control).

7. Scatter Chart

They are charts that show the relationship between variables. It helps to know the correlation (positive or negative) between these variables. The greater the degree of correlation, the more linear is the observations in the scatter diagram. On the other hand, the more scattered the observations in the diagram, the less correlation exists between the variables.

2.7 Benefits of Total Quality Management (TQM)

Studies from the Construction Industry reveal that the following are some of the benefits gained by adopting TQM. Oswald and Burati (1992) proved that TQM has resulted in improved customer satisfaction, reduced cycle times, documented cost savings, and more satisfied and productive work forces

According to Tang *et al*, (2005), from the viewpoint of the individual company, the strategic implications of TQM include:

1. Survival in an increasingly competitive world
2. Better service to its customers
3. Enhancement of the organization's "shareholder value"
4. Improvement of the overall quality and safety of its facilities
5. Reduced project duration and costs
6. Better utilization of the talents of its people

2.8 Challenges in TQM Implementation

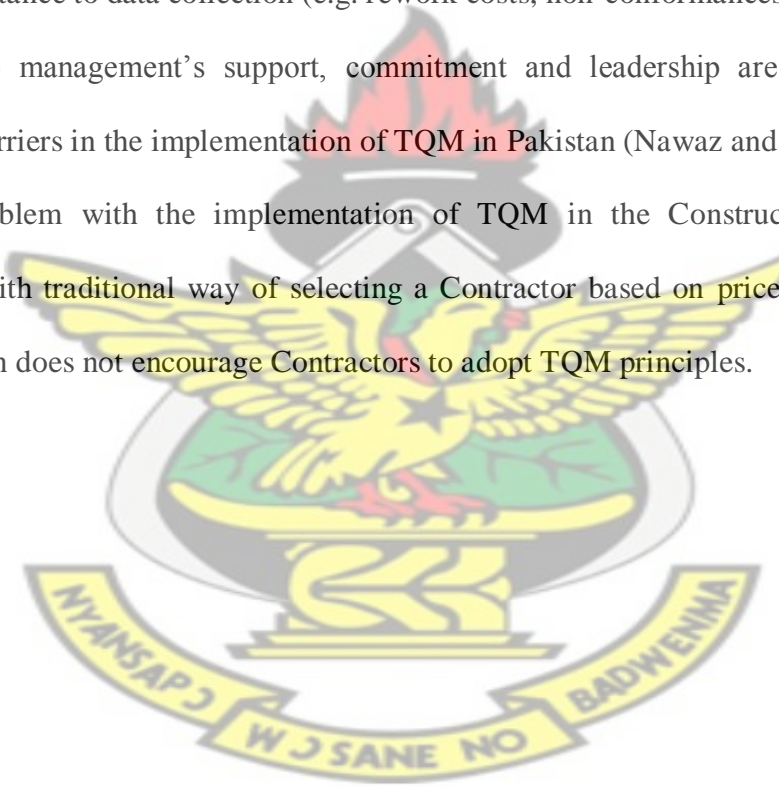
Although TQM has been widely accepted in the manufacturing industry, the Construction Industry is slow in its implementation even though countries like Japan and USA have accepted the concept.

Some reasons as postulated by Tang *et al* (2005) are

1. Perceived threat to foreman and project manager roles
2. Disinterest at the site level
3. Lack of understanding of what TQM was, particularly on site
4. Geographically dispersed sites
5. Fear of job losses
6. Inadequate training
7. Plan not clearly defined
8. Employee scepticism
9. Resistance to data collection (e.g. rework costs, non-conformances material waste)

Lack of top management's support, commitment and leadership are the three most important barriers in the implementation of TQM in Pakistan (Nawaz and Ikram, 2013)

Another problem with the implementation of TQM in the Construction Industry is associated with traditional way of selecting a Contractor based on price and not quality. This situation does not encourage Contractors to adopt TQM principles.



CHAPTER THREE

METHODOLOGY

3.1 Introduction

Extensive studies conducted in the search for quality improvement with respect to TQM led to different conclusions made based on the research methodology. It is therefore important that the appropriate methodology is used to present the work plan of the study. A good research strategy should have clear objectives from the research questions, good source of data and then consideration of the constraints (access to data, time, location and finances).

This chapter describes and explains the procedures employed in undertaking this study. It describes the research design, strategy, population and data collection and analysis procedures. This is an exploratory research based on a quantitative analysis of collected data. Simple random sampling of Construction firms in Kumasi is employed in sampling the firms. Questionnaires were administered to the technical staff to aid in collecting the necessary data.

3.2 Research Aims and Objectives

The basic aim of this research is to assess Contractors Knowledge in TQM principles and its implementation.

The underlying objectives for the aim are

1. To identify current quality management practices employed in the Ghanaian Construction Industry.
2. Investigate the knowledge of TQM principles in the Construction Industry.

3. Propose a framework to guide in the implementation of TQM based on identified critical success factors in Ghana in objective 2.

3.3 Research Design and Methodology

This research intends to assess the quality management practices in Kumasi with respect to TQM and its related CSFs. The research is based on research design stages to ensure the achievement of the above stated research aims and objectives.

Kumar (1999) points out that the term research design refers to researchers' adoption of a procedural plan to answer questions on validity accurately and objectively. Therefore, the research design will identify the research philosophy, approach, purpose, logic and outcome of the research. The function of research design is to ensure that the evidence obtained enables us to answer the research questions as unambiguously as possible. Therefore, research design deals with a logical problem and not a logistical problem.

Research methodology on the other hand is a systematic way to solve a problem. The procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. According to Easter-Smith et al (2004) the Research Methodology is very important for four basic reasons. It helps to

- Design process of the research is clearer.
- Understand the characteristics of the different philosophical paradigms that may help the researcher to foresee which research design may work and which may not.
- Helps the researcher to identify and create research designs that might be unknown
- Helps to develop a research identity

There are two (2) basic approaches in Research Methodologies. They are deduction and induction approaches. Deductive approach is quantitative in nature. It involves the use of statistics in determining the relationship between variables. Quantitative strategies may involve experiments or surveys.

Experiments include true experiments with the random assignment of subjects to treatment conditions. The basic objective of an experiment is to test the impact on an outcome whilst controlling all other factors that can affect the outcome. Surveys on the other hand, include cross-sectional and longitudinal studies using questionnaires or structured interviews for data collection with the intent of generalising from a sample to a population. It produces a numeric trend of opinions or trends within a population by getting information from a sample and then generalising for the population.

Induction approach is usually undertaken using a less structured qualitative research method. Qualitative research involves procedures that rely on text and image data, have unique steps in data analysis and draw on diverse strategies of inquiry.

In this study, I used a deductive approach in addition with triangulation of data to corroborate and support qualitative findings. The data sources for the triangulation will be by interviews, documents and observation.

3.4 Data Collection Methods

There are two (2) main sources of data collected; primary and secondary sources. These two sources of data enable researcher get enough information from Construction Companies in Ghana. The Ministry of Water Resources, Works & Housing (MWRWH) and the Ministry of Roads and Transport (MRT) are responsible for certification of Construction Contractors. MWRWH is responsible for registering Contractors in the Building and Civil Sector and MRT is responsible for Road Contractors. The classification

of contractors registered by MWH is D1K1, D2K2 and D3K3 based on their financial position. Financially, D1K1 handle contracts above \$500, 000, D2K2 handles \$200,000 - \$500,000 and \$75,000- \$200, 000 for D3K3.

Since TQM is about all employees including management, the researcher intends interviewing all participants in the Companies classified under D1K1 and D2K2 categories for the purpose of collecting primary data. Contractors classified as D3K3 were not considered since most of them had no regular office and staff. Secondary sources of data include textbooks on construction and quality management.

For data collection, questionnaires are widely used in providing structured, numerical data, which can be administered without the presence of the researcher. The objective for the questionnaires was to obtain information on their knowledge of TQM practices and how it can be implemented to improve competitiveness and promote growth.

Questionnaire development involves the following four stages as proposed by Hair et al (2003).

- i. Initial Consideration
- ii. Clarification of Concepts
- iii. Typology of the questionnaire
- iv. Pre-testing and correcting Problems

Cohen et al, (2007) also set out an eight-sequence procedure for planning questionnaires.

1. Decide the purposes/objectives of the questionnaire:

A clear purpose of the questionnaire should be obtained and then translated into a set of aims. This survey intends to assess the knowledge of Quality Management practices among Ghanaian Contractors. The main objectives will be to identify current quality practice employed in the Construction Industry, investigate the implementation of TQM

principles in the Construction Industry, and finally propose a framework for the implementation of TQM philosophies in Ghana.

2. Decide the population and the sample

The population for the study will be employees of the Construction Firm registered and actively working in Kumasi. Personal employee information concerning their position, years of experience and qualification was included in the personal details.

3. Generate the topics/constructs/concepts/issues

From the recommendations of Grandzol and Gershon (1998), accepted indicators for TQM surveys in order to meet the objectives of the research are shown in Table 3.1.

Table 3.1: Indicators for TQM Surveys

Constructs	Variables
Leadership	Clarity of vision, long-range orientation, coaching management style, participative change, employee empowerment, planning/implementing change.
Continuous improvement	Refinement cycles, improvements
Internal/external cooperation	Firm-supplier partnership, single-supplier orientation, collaborative organization, teamwork, organization-wide involvement, systems view, trust, elimination of fear.
Customer focus	Customer-driven focus.
Learning	company-wide training, foundational knowledge, process knowledge, educational development, continuous self-improvement, managerial learning
Employee fulfilment	job satisfaction, job commitment, pride of workmanship
Process management	Prevention orientation, reduction of mass inspection, design quality, statistical process control, understanding variation, elimination of numerical quotas, elimination of merit ratings, understanding motivation, total cost accounting, stable employment.

4. Decide the kinds of measures/scales/questions/responses required:

There are different scales of data that can be gathered; nominal, ordinal, interval and ratio. Nominal data indicate categories; ordinal data indicate order ('high' to 'low', 'first' to

‘last’, ‘smallest’ to ‘largest’, ‘strongly disagree’ to ‘strongly agree’, ‘not at all’ to ‘a very great deal’); ratio data indicate continuous values and a true zero.

A simple rule of thumb for questionnaires; the larger the size of the sample, the more structured closed and numerical the questionnaire may have to be, and the smaller the size of the sample, the less structured, more open and word-based the questionnaire may be. There are different types of questionnaires from structured to unstructured questionnaires. If a closed and structured questionnaire is used, enabling patterns to be observed and comparisons to be made, then the questionnaire will need to be piloted and refined so that the final version contains as full a range of possible responses as can be reasonably foreseen (Cohen et al, 2007). Although such questionnaires are time-consuming during design the trade-off is that data analysis can be done rapidly. Unstructured questionnaires have open-ended questions which allow the respondent to answer in his own words. These are normally used when the researcher is not certain of some issues related to the research topic. Generally, closed questions (dichotomous, multiple choice, constant sum and rating scales) are quick to complete and straightforward to code (e.g. for computer analysis), and do not discriminate unduly on the basis of how articulate respondents are (Wilson and McLean, 1994).

In this study, closed questions were asked to facilitate the data collection and analysis. A few open questions in the form of ‘Others’ were asked to enable other respondents answer in their own words. The five-point Likert scale was employed to explore the respondents opinions in relation to the critical success factors (CSF’s) of TQM and the challenges encountered in TQM implementation. This scale provides a range of responses to a given question or statement and was set out as 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree.

5. Write the questionnaire items.
6. Check that each issue from (3) has been addressed, using several items for each issue.
7. Administer the final questionnaire

3.5 Survey Population and Sampling

Apart from research methodology, another important aspect of research that determines the quality of the survey is the sampling strategy that arises directly from the population.

A population is the total of all individuals who have certain characteristics and are of interest to a researcher. Four key factors necessary for the Sampling Strategy are

- i. The sample size
- ii. Representativeness and parameters of the sample
- iii. Access to the sample
- iv. The sampling strategy

There are two types of Sampling: probability and non-probability sampling. The Probability Sampling consists of sampling techniques such as simple random sampling, systematic sampling, stratified sampling, cluster sampling, and multi-stage sampling. Convenience samples, Snowball sampling, Purposive sampling and Quota sampling are some of the methods employed in the non – probability sampling. The best technique is the probability sampling which ensures representativeness and precision.

In determining sample size for a probability sample, one has to consider not only the population size but also the confidence level and confidence interval.

In this survey the probability technique, random sampling method was used in administering questionnaires to the selected Contractors in D1K1 and D2K2 category. The population was assumed to be fifty (50). This assumption was based on the fact that forty-

five (45) active Contractors were listed on the Association of Building & Civil Engineering Contractors of Ghana (Kumasi) register. It was obvious that other well-known Contractors such as Consar Ltd, Stivo Construction Ltd, Berock, etc. actively working in Kumasi had not registered with the Association. Such unlisted Contractors were numbered to be 7. With a 95% confidence interval, the minimum sample size was determined from tables to be 39 persons from a population of 50. In the endeavour to acquire that minimum sample size, the researcher administered the survey to a larger number of 60 construction personnel to cater for non-response, attrition and respondent-mortality.

3.6 Reliability and Validity of Data Collection Methods

Validity and reliability are two (2) measuring instruments used in connection with research questionnaires. Validity tends to ask questions about measuring what we intend to measure (Muijs, 2004). It is an altogether more complex concept that indicates whether an item measures or describes what it is supposed to measure. Validity has to do with whether your methods, approaches and techniques actually relate to, or measure, the issues you have been exploring. In quantitative data, validity is improved through careful sampling, appropriate instrumentation and appropriate statistical treatments of the data (Cohen et al, 2007). There are different types of validity, including face validity, construct validity and internal validity. Face validity encourages respondents and participants involve themselves in the research since they realise that the research is valid when looking at the face value of the research method. Construct validity is applied when the questionnaire measures what it is intended to measure. This is necessary for questionnaires that are not administered face to face but rather sent by email or post. In such cases, the respondents might not understand the questions and therefore respond inaccurately.

Internal validity is related causality i.e. does two variables have a cause and effect issues. It seeks to explain the occurrence of an event derived from the data provided.

To minimise the threats of validity the researcher ensured that elaborate literature review was done on TQM and its related CSFs in order that the well-designed questions conform to standards. Moreover the sample size and selection was done appropriately to ensure representativeness.

Reliability, relates to how well research has been carried out. Findings are said to be reliable if the findings of a study are replicable, consistent and dependable over time by using the same methods. An unreliable item also lack validity but a reliable item is not necessarily also valid (Bell et al, 2000).

3.7 Data Analysis Methodology

Data analysis is the done on collected information from primary and secondary sources. The analysis must answer the research questions and satisfy the research objectives. The basic data analysis tool used was the Statistical Package for the Social Sciences (SPSS version 16).

It is important to identify the type of scale used in the analysis since the statistical test is dependent on the type of scale. Four types of scale are identified as ordinal, ratio, nominal and interval. In this research, the ordinal scale of data (Linkert-Scale) was used whereby 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree.

3.7.1 Importance Index

For analysing data by ordinal scale, the importance index (I. I) of the factors was adopted as confirmed by Enshassi *et al*, (2007). They were computed using the following equation.

Important index (I.I) = $\frac{(5n_5 + 4n_4 + 3n_3 + 2n_2 + n_1) \times 100}{(5(n_5 + n_4 + n_3 + n_2 + n_1))}$

$$(5(n_5 + n_4 + n_3 + n_2 + n_1))$$

Where: n_1 = number of respondent who answered 'Strongly Disagree'

n_2 = number of respondent who answered 'Disagree'

n_3 = number of respondent who answered 'Neutral'

n_4 = number of respondent who answered 'Agree'

n_5 = number of respondent who answered 'Strongly Agree'

Results from importance index calculation were ranked 1st, 2nd, 3rd etc. in order to know their cardinality of importance.



CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, and DISCUSSION

4.1 Introduction

This chapter aims to present and analyse the collected data with respect to the research objectives. The various sections A and B, discussed the characteristics of the respondents and their knowledge of Quality Management Systems in Ghana. Section A intends to identify the characteristics of the respondents and their knowledge of Quality Management Systems employed in Ghana. In Section B, TQM critical factors are analysed using Importance Index to assess the level of Importance of these factors.

The results for the survey are presented in the form of charts and table to allow for easy interpretation.

SECTION A

Section A describes the respondents who are Site Supervisors or Project managers for Construction Companies currently working on projects.

4.2 Characteristics of Respondents

According to the results as presented in Fig 4.1, 80% of respondents were male and 20% female. The minority being females is indicative of the fact that female employment in the Construction Industry (CI) is low. According to CIDB (2007), CI is perceived to be difficult, dangerous and dirty and this perception may prevent females from entering this Industry. Moreover, Owusu (2012) concluded that few women in CI are due to cultural norms in Ghana and the perception that women cannot work up to expectation considering the physical nature of construction work.

Figure 4.2 shows that 26% of the respondents were between 21-30 years, 23% are between 31-40 years, 37% and 14% are respectively between 41-50 years and 51-60 years. The results show a huge drop of Ghanaians in the Construction Industry in Kumasi after the age of 51 years (37% down to 14%).

Majority of the respondents are in the age group of 41-50 years where the respondents are in their prime lifetime and occupy managerial positions. This is consistent with the situation in Ghana since most people complete their tertiary education in their mid-twenties. Fifteen years of working experience then qualifies these people to take up managerial positions.

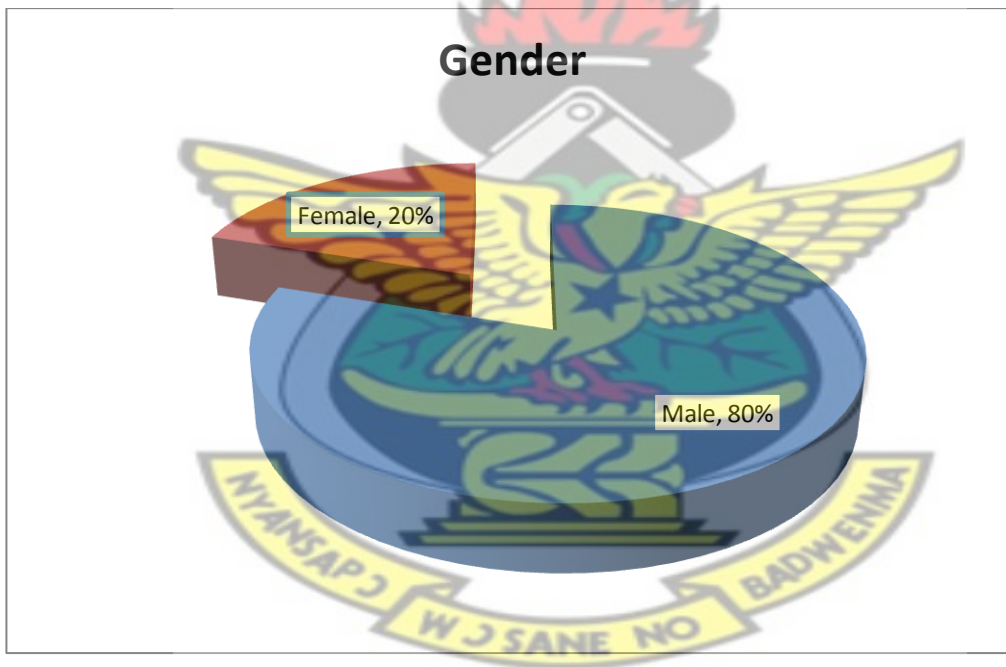


Figure 4.1: Gender

Source: Author's Data , 2014

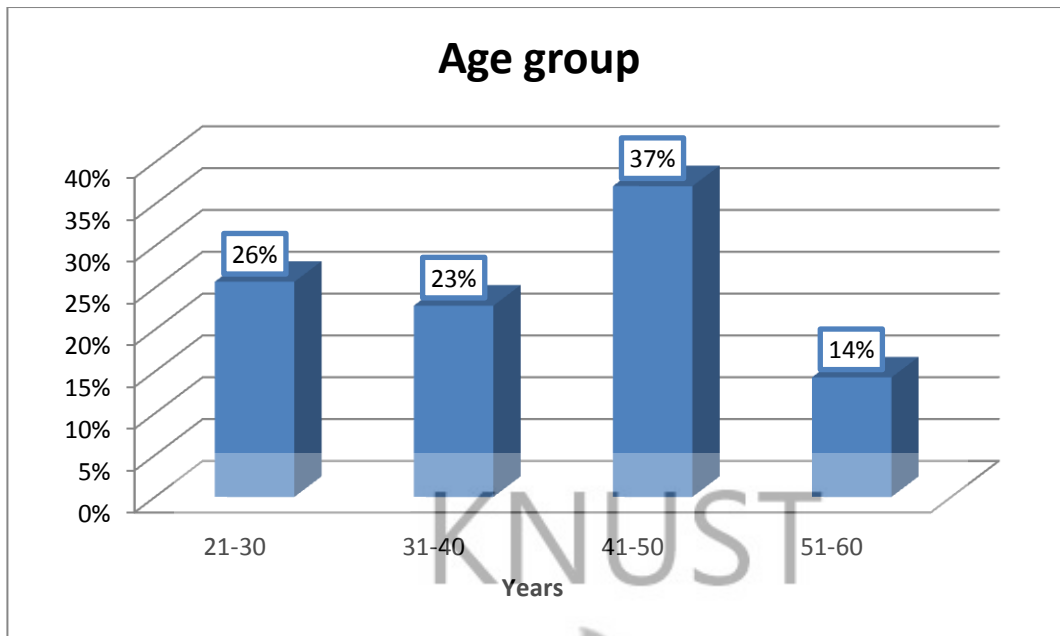


Figure 4.2: Age Group

Source: Author's Data , 2014

It was important to assess the occupational background and work experience of respondents in order to ascertain the validity of information provided for this research work. The qualifications of respondents in Figure 4.3 are University/College and Postgraduate degrees representing 60% and 40% respectively. None of the said respondents was High School Graduates. The researcher can deduce that managers and supervisors on construction sites have the basic tertiary education where they acquire relevant and necessary knowledge in construction works.

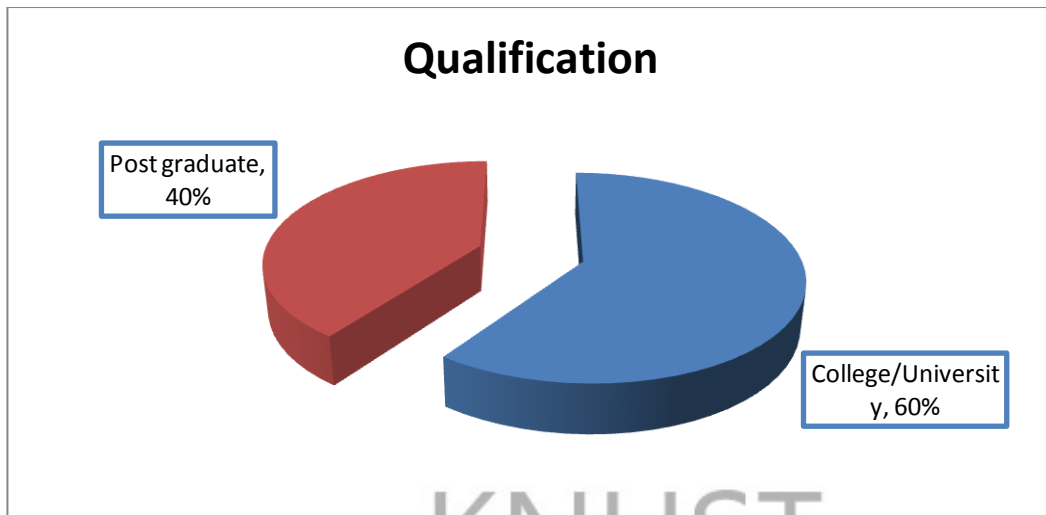


Figure 4.3: Qualification

Source: Author's Data , 2014

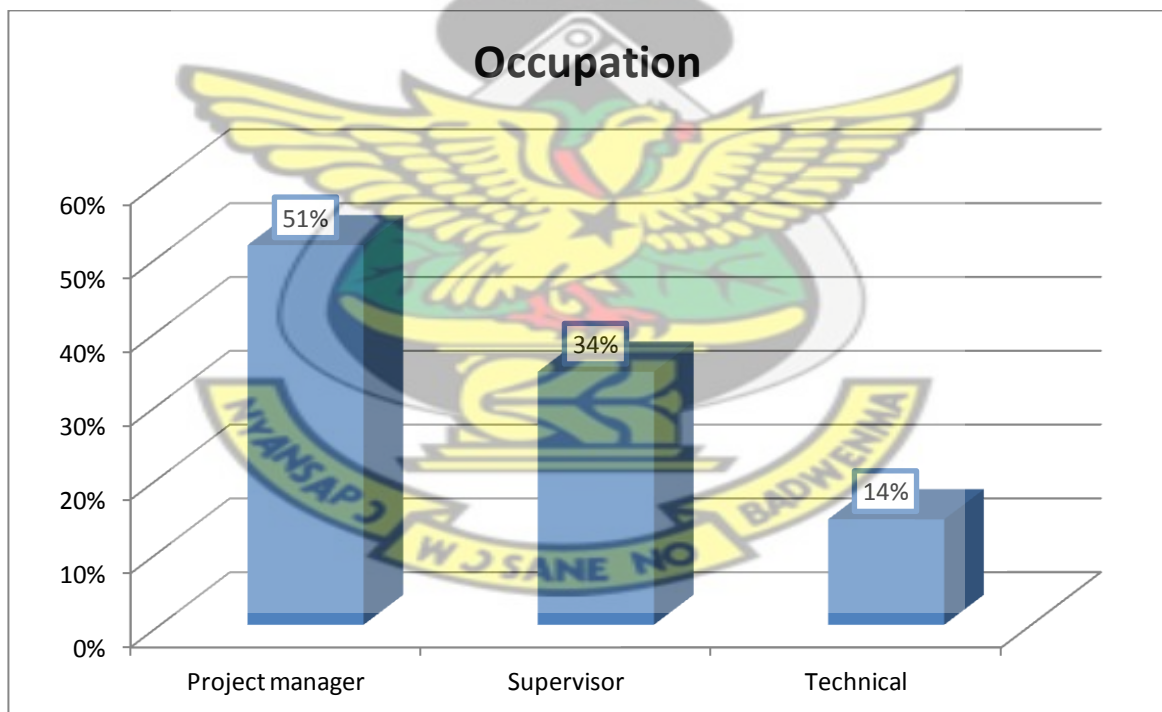


Figure 4.4: Occupation

Source: Author's Data , 2014

From figure 4.4, the results show that 51% are project managers, 34% are supervisors, and 14% are technicians. In perusing this result, the researcher realized that project managers

and supervisors are the majority of respondents in this research. With over 50% of respondents being Project Managers and having a University degree, it gives an indication of the level of respondents understanding of Management issues that arise in the Ghanaian Construction Industry.

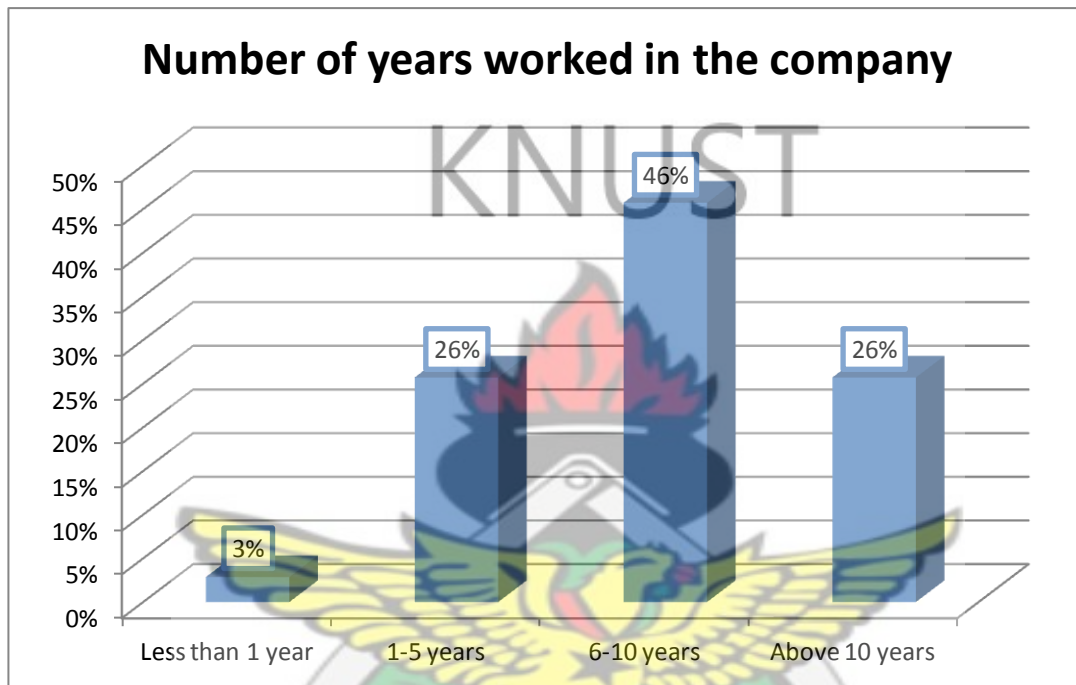


Figure 4.5: Number of years worked in the Company

Source: Author's Data , 2014

Respondents indicated the number of years they had worked in the construction industry. Figure 4.5 denotes the number of years respondents have worked in the industry. Majority had worked between 6-10 years representing 46% of the respondents. Twenty-six per cent (26%) have worked between 1-5 years, 26% have above 10 years. Only 3% had less than one year working experience.

The high retention of employees according to data collected (46%), indicates that employees in the Construction Industry do not leave the industry quickly. This is a positive sign for employees who would want to maintain their trained employees.

The data shows that respondents have worked in the industry under the study for quite a long time to be able to assess and provide reliable data on TQM practices in the Kumasi Construction Industry.

4.2 Quality Management Systems in Ghana

This section deals with data collected and analysed in accordance with the objectives to identify Quality Management Systems in general and Total Quality Management in particular.

Question: Rank from 1 to 9 against each statement where 1 being the best equivalent word to define total quality and 9 being least word to define total quality. The mean for each definition is shown in Table 4.1.

Table 4.1: Definition of Total Quality

<i>Definition</i>	<i>N</i>	<i>Sum</i>	<i>Mean</i>	<i>Rank</i>
Value for money	35	107	3.06	1
Elimination of defects	34	105	3.09	2
Teamwork	35	158	4.51	3
Satisfying external customer	34	161	4.74	4
Satisfying internal customer	34	168	4.94	5
Solving problems	34	171	5.03	6
Appearance	34	178	5.24	7
Expensive	33	224	6.79	8
Increased profit	34	242	7.12	9

Source: Author's Data , 2014

Table 4.1 denotes the detailed responses on how respondents ranked the words that they think define total quality. Results from the survey proved that respondents gave the best equivalent word to define total quality as value for money with mean rank of 3.06. The

least description for Total Quality is increased profit. As shown in Table 4.1, 4th and 5th positions are satisfying the external and internal customers respectively.

Measuring the responses, value for money is paramount to the construction industry in Kumasi.

Value for money in construction is achieved by completing a project on time, cost and a level of quality that meets the users need. This quality definition by respondents is ultimately the purpose of TQM i.e. satisfying a customer (user). Surprisingly however, customer satisfaction (internal and external) was not ranked in the first to third positions. Such a situation is contrary to the goals of TQM that seeks to produce satisfied customers.

Question: For a Successful Project Management these factors are considered. Please rank the following in order of importance where 1 is the most important and 5 is the least important.

Table 4.2: Factors to be considered for successful project management

Ranking	Time	Scope	Cost	Quality	Safety
1	12	6	7	18	1
2	8	0	16	2	7
3	12	3	7	7	4
4	2	9	5	8	8
5	1	17	0	0	14
Total Respondents	35	35	35	35	34

Source: Author's Data , 2014

Table 4.2 shows the detail rankings. 18 respondents ranked quality as 1, 2 respondents ranked it as 2, 7 and 8 ranked quality as 3 and 4 respectively. 12 respondents ranked time as 1 and 8 and 12 ranked time as 2 and 3 respectively. Respondents ranked cost mostly as 1 and 2.

Scope and safety were not considered a successful project management as compared to quality, time and cost.

A summarised ranking of the factors is shown in Table 4.3.

Table 4.3: Factors considered for Successful Project Management

Analysed Data for Factors to be considered for Successful Project Management				
	N	Sum	Mean	Rank
Quality	35	75	2.14	1
Time	35	77	2.2	2
Cost	35	80	2.29	3
Safety	34	129	3.79	4
Scope	35	136	3.89	5

Source: Author's Data , 2014

Results as in Table 4.3 show that Quality had the highest ranking with a mean of 2.14. The order of importance for the other factors according to respondents in the Kumasi Construction Industry is Time, Cost, Safety, and Scope.

This result shows that respondents understand the benefit of quality and therefore place premium on quality than other factors. This observation is contrary from results in Pakistan where Cost is the most critical and important factor (Nawaz and Ikram, 2013). This perception in Pakistan is due to the deficiency in TQM knowledge and philosophy.

]

Question: What Quality Improvement Programme do you have?

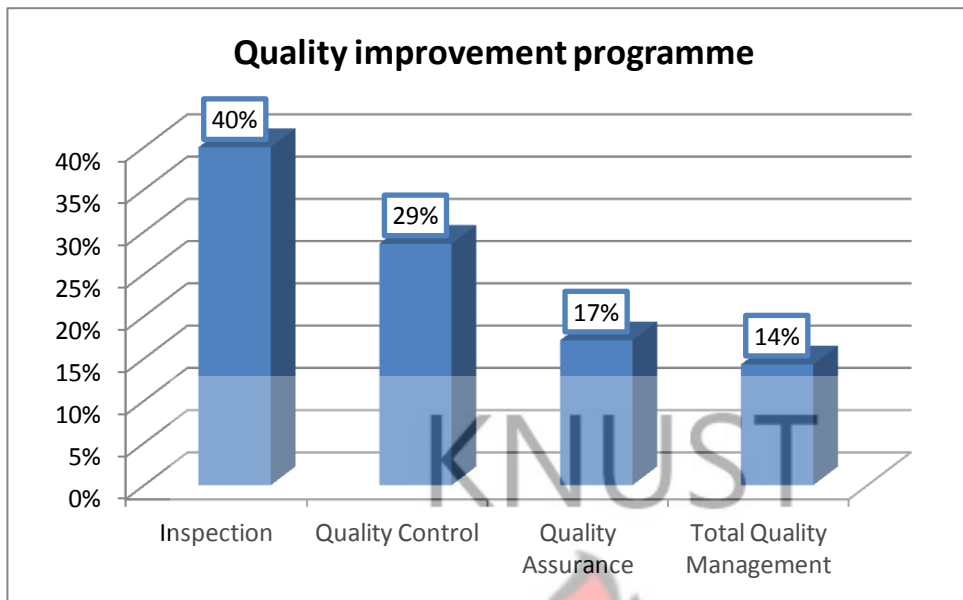


Figure 4.6: Quality Improvement Programme

Source: Author's Data , 2014

From Figure 4.6, 40% of respondents chose Inspection and 29% responded to Quality Control as the two main Quality Improvement Programmes in the construction industry. TQM is rarely an improvement programme in Ghana since only 14% of respondents practice it.

Although these firms are aware of the importance of quality, their knowledge about Quality management is limited and their perception about quality is of corrective actions (Quality control) rather than preventive actions as concluded by Imbeah (2012).

Inspection and Quality Control are retrospective in nature. They deal with assessing problems during construction stage after the problems (defects) have occurred. Quality Assurance (Q.A.) and Total Quality Management (TQM) on the other hand, aim to prevent problems from occurring. It is therefore important that the Ghanaian Construction Industry reviews their quality improvement programmes by implementing Q.A and TQM in the Construction Industry.

Question: What are the major objectives of the Quality Programmes? Please rank these factors in order of importance (1, 2, 3, 4, and 5) where 1 is the most important and 5 is the least important

Table 4.4: Major Objectives of the Quality Programme

Rank	Increase Productivity	Cost reduction	Involvement of employees in the quality building effort	Compliance with statutory, environment and safety requirement	Customer satisfaction
1	4	7	3	11	8
2	7	9	9	4	2
3	14	6	4	1	9
4	1	7	5	7	9
5	5	2	10	8	4
Total Respondents	31	31	31	31	32

Source: Author's Data , 2014

Table4.5: Major Objectives of the Quality Programme

Quality Programme	N	Sum	Mean
Cost reduction	31	81	2.61
Increased Productivity	31	89	2.87
Compliance with statutory, environment and safety requirement	31	90	2.90
Customer satisfaction	32	95	2.97
Involvement of employees in the quality building effort	31	103	3.32

Source: Author's Data , 2014

Table 4.4 and 4.5 shows the ranking and a summary of major objectives of quality programme from most important to least important. From the data above, cost reduction with mean of 2.61 is the most important objective of quality programmes. The second most important objective is increased productivity with mean ranking of 2.87 which

respondents averagely ranked it as important. The results in the table above depict that Customer satisfaction and involvement of employees are not major objectives in Quality Programmes. This result confirms that if TQM is not a major quality programme then obviously satisfying the customer an employer will not be paramount to the Ghanaian Construction Industry.

SECTION (C): ACQUISITION OF QUALITY DATA

Question: Do you collect data to monitor performance of works or processes?

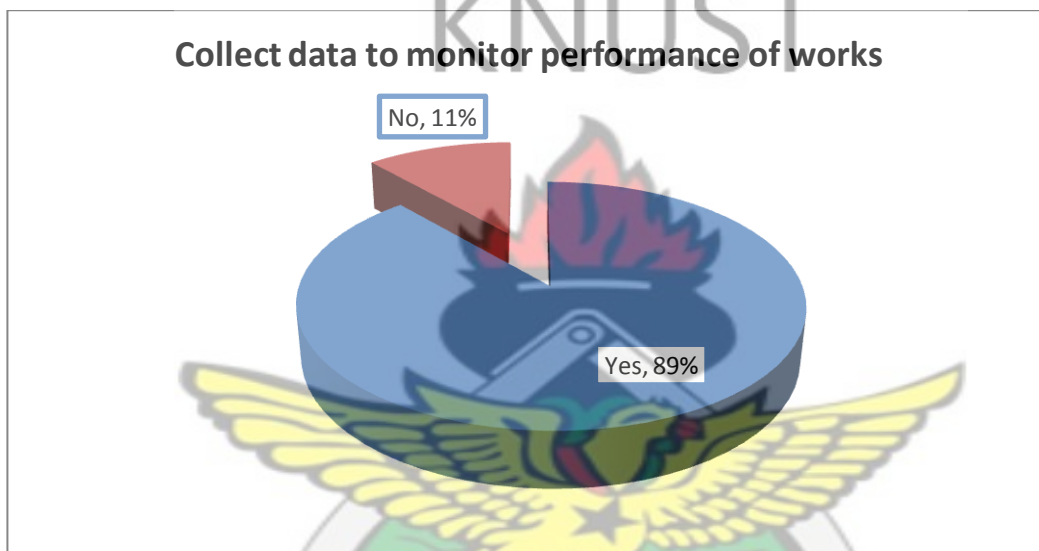


Figure 4.7: Data Collection to monitor works

Source: Author's Data , 2014

From Figure 4.7, 89% of respondents collect data to monitor performance of work while 11% do not collect data to monitor performance of works. It is therefore observed that majority of the respondents collect data to monitor performance of works or processes.

Question: How do you measure performance?

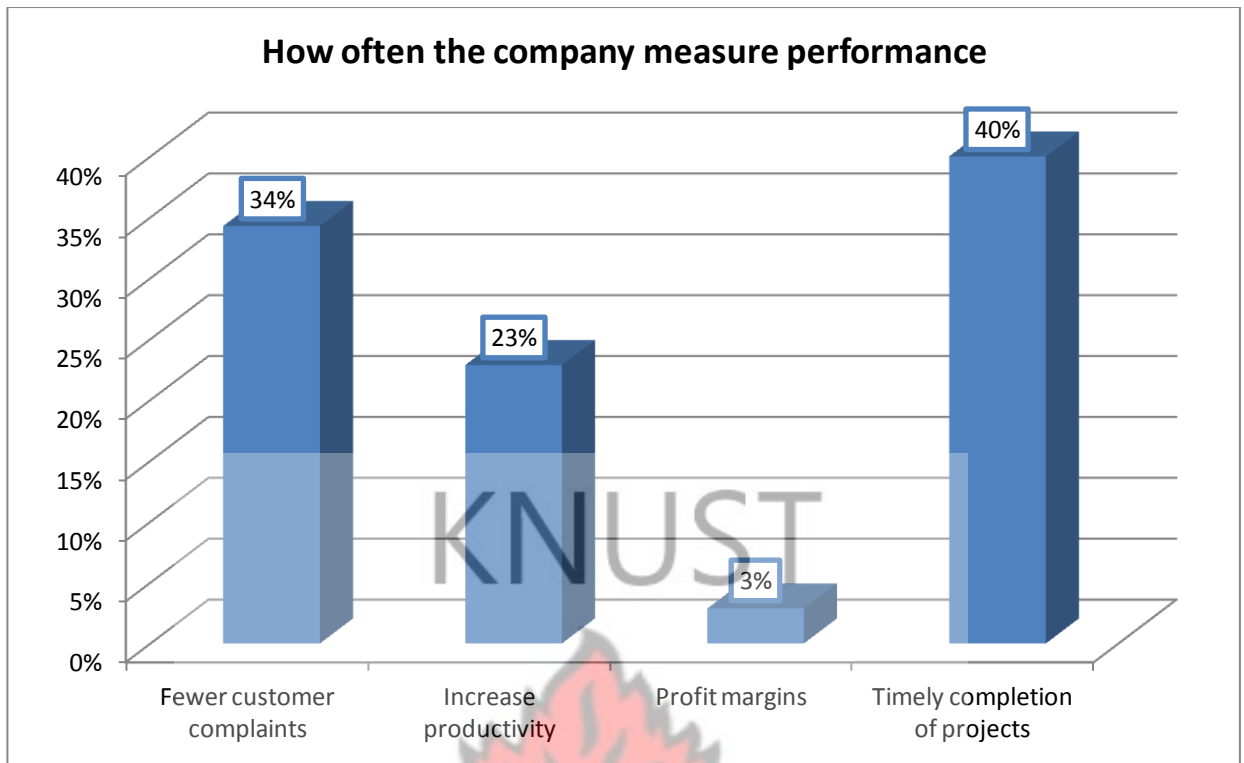


Figure 4.8: Performance Measurement

Source: Author's Data , 2014

From figure 4.8, timely completion of work of projects is the measure of performance mostly used in companies as indicated by 40% of the respondents. Thirty-four per cent (34%) of the respondents indicated fewer customer complaints as measures often used for measuring performance. Increase productivity and profit margins represents 23% and 3% respectively.

SECTION (D): TRAINING

Question: Is formal training in Quality Policy or TQM given to employees?

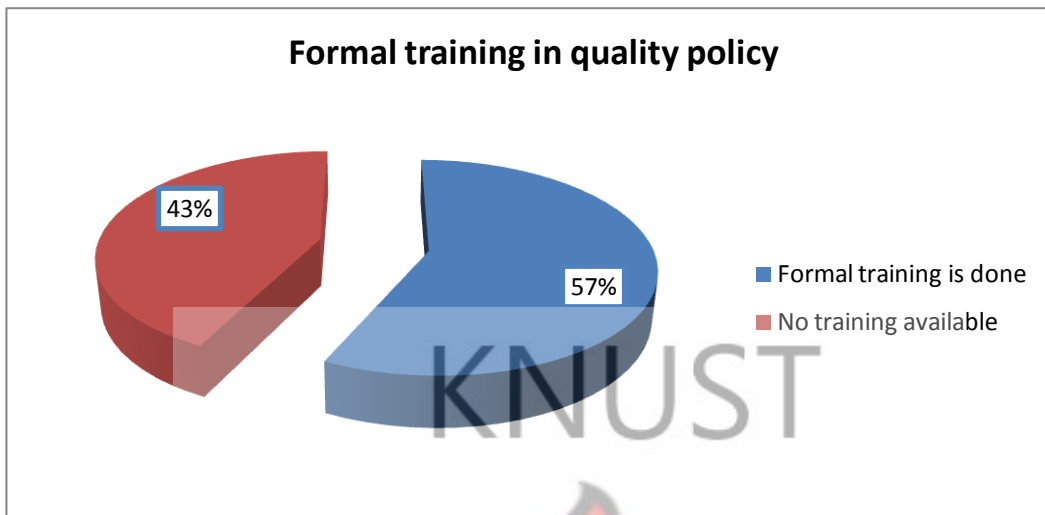


Figure 4.9: Formal Training

Source: Author's Data , 2014

From the results in Figure 4.9, 57% of the respondents receive formal training in quality policy.

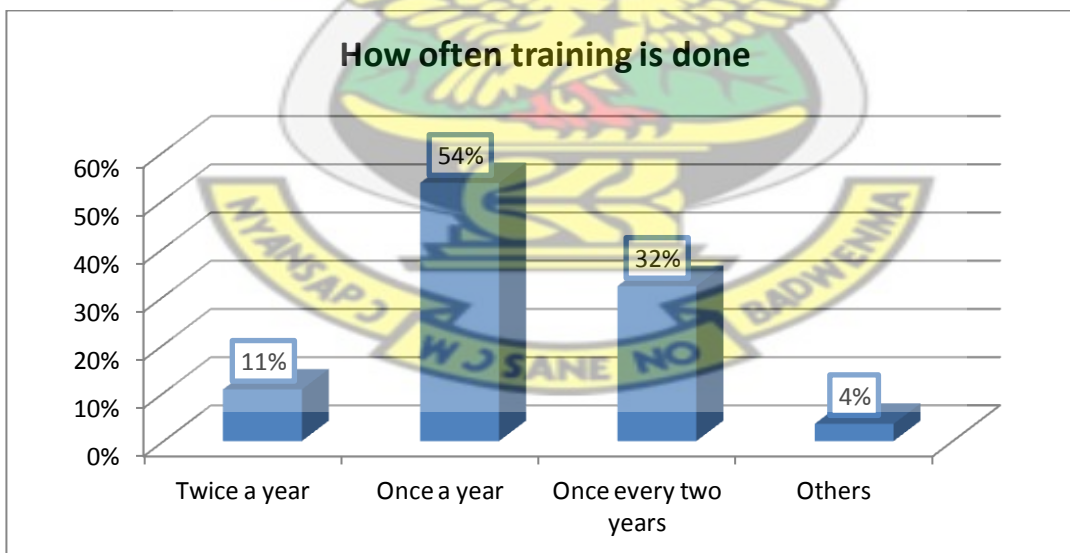


Figure 4.10: Training Frequency

Source: Author's Data , 2014

Figure 4.10 above shows the frequency of the trainings done. 54 % said organised training are held yearly, 32% said once every two years and 11% said twice a year.

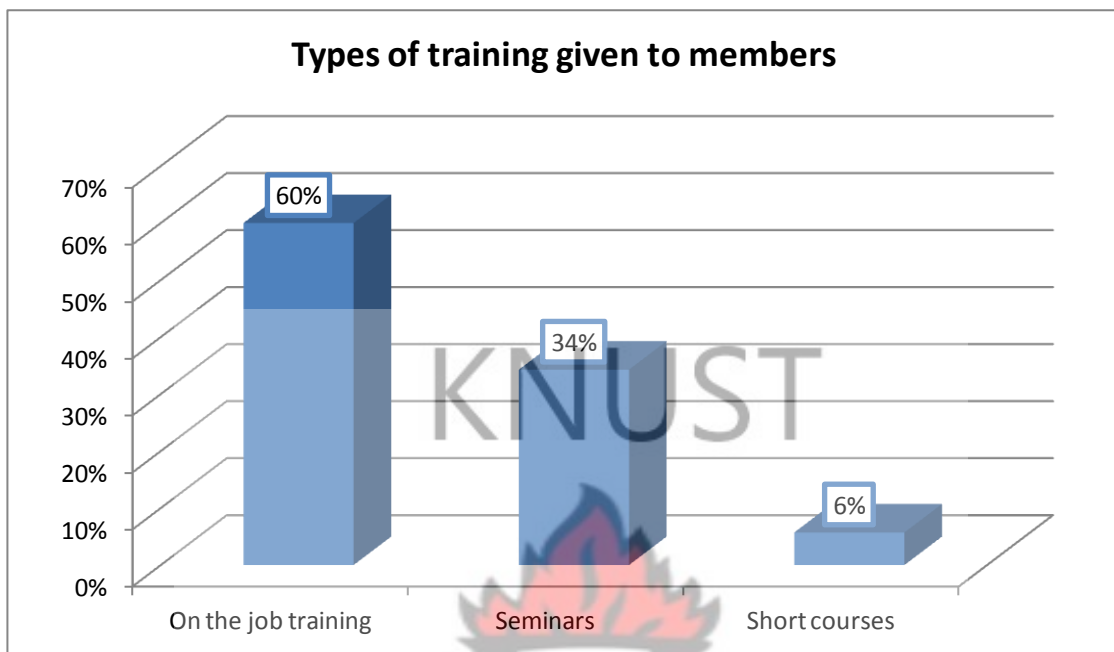


Figure 4.11: Training Types

Source: Author's Data , 2014

The type of training given to employees is mostly on the job training representing 60% of the responses as shown in figure 4.11. Thirty-four per cent (34%) of the respondents indicated that they use seminars and 6% use short course type of training for their employees.

Figure 4.12 shows topical trainings undertaken by the respondents. Majority of respondents 49% receive training on teamwork issues. Thirty-one per cent (31%) of respondents receive training on Customer Satisfaction and Process Management. In the Kumasi, only 3% receive training on data collection as indicated by the survey.

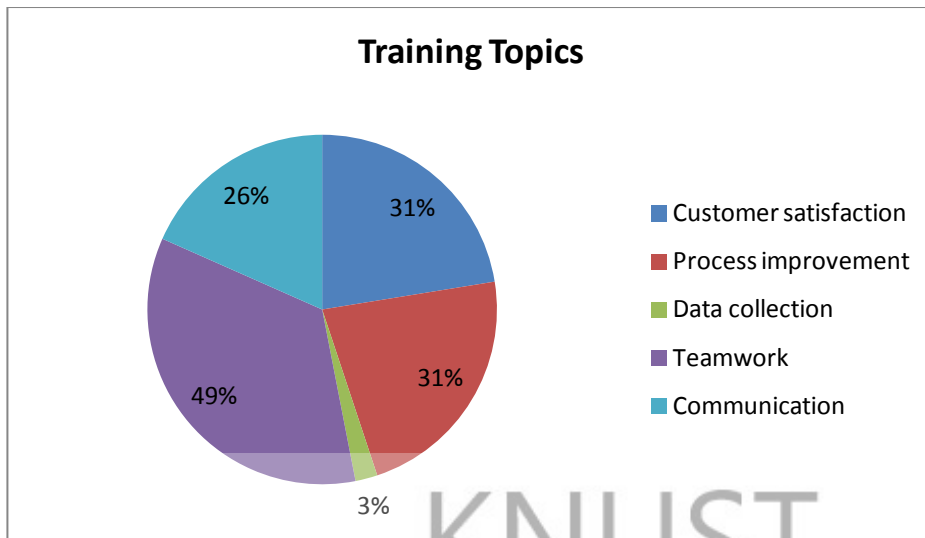


Figure 4.12: Training Topics

Source: Author's Data , 2014

Training on the above five (5) topics namely, customer satisfaction, process improvement, data collection, teamwork and communication provide a holistic knowledge of the basic principles behind TQM as explained in the literature review.

Empirical research by Ishikawa (1985), Arditi and Gunaydin (1997) and Deming (1986) emphasizes that training and education are essential to promote competitiveness, improved skill and increased productivity

Teamwork training is emphasised in Egan (1998) as they stated that quality will not improve and costs will not reduce until the industry educates its workforce not only in the skills required but in the culture of teamwork. Skill training to improve processes is also critical as the Business Roundtable (1983) recommended that Contractors develop formal and comprehensive programs of combined classroom and on-the-job training for continuing education aimed at improving the skill and competitiveness of the workforce. CIDB (2007), concluded that creation of competent workers through skills-upgrading and knowledge enhancement is one of the eight (8) critical success factors leading to the implementation of CIMP (Construction Industry Master Plan).

Therefore if GCI intends to improve on quality, then efforts must be made to upgrade the skills of employees by training and education.

Question: In your own view, rank the following as problems affecting Total Quality Management in your firm. 1 is the Lowest Rank and 7 is the highest Rank.

Table 4.4 Problems affecting Total Quality Management

Problems	N	Sum	Mean	Rank
Bad attitudes and behaviour	35	118	3.37	1
Lack of management commitment and support	35	120	3.43	2
Lack of statistical quality control techniques	35	130	3.71	3
Difficulties in mapping processes	35	141	4.03	4
No developed standardised procedures	35	142	4.06	5
Excess documentation required	35	151	4.31	6
Lack of resources and skilled expertise	35	169	4.83	7

Source: Author's Data , 2014

Table 4.4 shows the problems affecting TQM in an ordered rank from one to seven. From the data above, bad attitudes and behaviour employees is the leading problem of TQM. Following closely is the lack of management commitment and support. The least problem affecting TQM in the construction Industry is the lack of resources and expertise.

Researchers have different views on the problems affecting TQM. According to Polat et al, (2011) lack of management support and leadership were the most critical barriers to TQM implementation in the Turkish construction industry. In his study on Real Estate

Companies in Ghana, Imbeah (2012) concluded that the absence of expertise/resources in Quality Management Systems is the most critical barrier to TQM implementation.

4.3 Summary

From the analysed results obtained from the survey, the researcher can conclude that in Kumasi, the Construction Industry practices a retrospective type of quality management system. In this system, Management does not make frantic decisions to prevent problems but rather to solve them after occurrence.

According to the Literature review, performance management and training should permeate a TQM organisation. In Kumasi, the results show that not all employees receive training on their jobs. Most of the training is practical on the job training. For improved educated employees, the best training should not be only practical but must include theoretical aspect as well. Studies on ISO certified firms in Spain indicated that 100% of respondents received training of all kinds to improve their knowledge and skill (Tari', 2005).

Finally, it was observed that Customer Satisfaction was neither a critical factor in the definition of quality nor in the objectives of quality programmes. It is however known from the literature review that customer satisfaction is the ultimate goal of any Company that intends practicing Total Quality Management.

This section intends to identify the critical success factors and rank them in order of importance. The respondents ticked the Critical Success Factors (CSFs) that were applicable in their company on basis of strongly agree or strongly disagree. The average of the Likert scale is three (3) therefore, a mean below 3 shows overall disagreement, while a mean above 3 shows overall agreement.

4.4 Critical Success Factors for TQM Implementation

Table 4.5: Showing ranking of Critical Factors

	N	Sum	Mean	I. Index	Ranking
• Management/Leadership				0.706	6
Management has a clear vision for implementing quality goals	35	131	3.74	0.749	1
Management is committed to ensuring the success of the quality policy	34	125	3.68	0.735	2
Management supportive of technology advancement to improve quality	35	123	3.51	0.703	3
Management powers all employees to have adequate knowledge in quality procedures	35	121	3.46	0.691	4
Management creates a quality awareness among employees	35	114	3.26	0.651	5
• Continuous Improvement				0.774	2
Company evaluates performance and take measures to improve on it	33	133	4.03	0.806	1
Company encourages creativity and innovation not just maintaining the old method of doing things	33	130	3.94	0.788	2
Company encourages employees to be creative and innovative in improving processes	33	120	3.64	0.727	3
• Customer Focus				0.746	5
Company gives attention to clients' needs	35	146	4.17	0.834	1
Company gives feedback forms to client after handing-over of construction works	34	120	3.53	0.706	2
Company has a data to measure clients satisfaction	35	122	3.49	0.697	3
• Training				0.640	7

Company gives regular training to all employees on the processes for improvement	35	115	3.29	0.657	1
Company gives regular training to how to gather information concerning client, workforce and general works	35	115	3.29	0.657	2
Supervisor emphasize training in processes and not just inspection	35	115	3.29	0.657	3
Company gives regular training to all employees on client satisfaction	35	103	2.94	0.589	4
• Employees satisfaction/empowerment				0.769	3
Your company encourages team work rather than individual work	35	149	4.26	0.851	1
Good communication is encouraged to eliminate fear/withdrawal or indifference	35	148	4.23	0.846	2
Self-improvement is encouraged to improve skills and performance	35	139	3.97	0.794	3
Employees enjoy what they have been asked to do and working environment	35	134	3.83	0.766	4
Social relationships are present in the company	35	134	3.83	0.766	5
Company encourages suggestions from employees	35	126	3.6	0.720	6
Questionnaires and complaint forms are available to collect employees satisfaction data	35	112	3.2	0.640	7
• Process Management				0.785	1
Drawings and specifications are reviewed prior to construction	32	128	4	0.800	1
Check sheets are available to monitor the adherence of scheduled processes	35	139	3.97	0.794	2
There is clarity of work processes and methods	35	133	3.8	0.760	3
• Supplier Chain Management				0.749	4
Supplied materials are examined thoroughly before being used	35	133	3.8	0.760	1
Company maintains regular suppliers to ensure consistency	35	129	3.69	0.737	2

Source: Author's Data , 2014

Respondents indicated their agreement level on the criteria for identifying successful implementation of TQM principles as applied in their companies. In assessing the views of these criteria, relative importance index was used to rank the variables that are highly

weighted (strongly agree) in relation to the other factors. The mean ranking of all the critical success factors are significantly high showing that there is a general agreement that these factors can be applied in assessing successful implementation of total quality management in the construction industry.

As observed from the Table 4.5, the most important factor is Process Management with importance index of 0.785. The indices of the other factors follow the order as listed in Table 4.6.

Table 4.6: Summary of critical success factors ranking

• Process Management	0.785
• Continuous Improvement	0.774
• Employees' Satisfaction/Empowerment	0.769
• Supplier Chain Management	0.749
• Customer Focus	0.746
• Management /Leadership	0.706
• Training	0.640

Source: Author's Data , 2014

4.4.1 Process Management

Within the process management, respondents believe that carefully reviewing drawings and specifications prior to construction lead to success in QM in construction. All the statements under Process Management had a mean greater than three (3) implying that respondents agree that drawings, check sheets, and clarity of work processes play a significant role in enhancing the quality of construction works.

According to the Literature Review, Harris et al (2006) and Tang et al (2005) stated that process management is one of the main factors needed to ensure an excellent product. This confirms the assertion that process management issues are the most important when compared to other factors (Tari 2006).

These results are similar to results by Harrington and Voehl (2012) who concluded in his study on TQM application in the Construction Industry that a focus on process and measurement would greatly accelerate reductions in cost, defects, and time delays.

However, this observation is contrary to Jung and Yong, (2006) who realized that the 'soft' TQM elements such as employee relations and leadership commitment have more positive significance on TQM than the 'hard' TQM elements such as process management.

4.4.2 Continuous Improvement

Company evaluates performance and take measures to improve on it was the highest ranking within continuous implementation with index of 0.806. Encouraging creativity and more innovative methods of improving work processes are other factors that respondents highly agreed.

4.4.3 Employees' Satisfaction/Empowerment

Respondents indicated that teamwork rather than individual work was very critical for employee satisfaction. They also strongly agreed that other factors such as good communication and social environment improved the level of satisfaction and empowerment status. An index of 0.64 indicates that respondents do not strongly agree that employee questionnaires and complaint forms are critical to the success of TQM.

Studies have shown that employee relation's elements are the most contributing elements towards achieving continuous improvement (Jung and Yong, 2006). They emphasised that investment made in employee training and development, efficient communication mechanisms, employee flexible work environment and employee satisfaction play a significant role in TQM. Although literature review shows the importance of employee

empowerment, this result is contrary to the studies that indicate a lower interest in employee empowerment issues (Tari' 2006).

4.4.4 Supplier Chain Management

Within supplier chain management, the factor that was ranked first was 'supplied materials are examined thoroughly before being used' with index of 0.760. Company maintains regular suppliers to ensure consistency was ranked second with an index of 0.737.

Dr.Kulkarni and Khutale (2013) and Harrington and Voehl (2012) identified that relationship building is the key to good supplier management that causes an increased efficiency in delivery and quality of materials.

4.4.5 Customer Focus

Concerning TQM, customer focus should have received the first Importance Index and not the fourth as indicated in the survey data. Giving attention to customer needs received the highest index of 0.834. Respondents perceived data collection from customers to know their level of satisfaction as not very critical and therefore indexed it at 0.604.

For ISO 9000 certified organizations, customer focus and satisfaction received the highest rating (Tari, 2006). Oakland (2004) confirmed that giving attention and meeting customer needs is paramount in customer loyalty.

4.4.6 Management /Leadership

Management has a clear vision for implementation of quality goals with importance index of 0.749-ranked first. Respondents also considered that Management commitment and support for quality policy and technology are critical factors that affect

management/leadership. Management creates quality awareness among employees ranked last with an index of 0.651.

This results indicating management/leadership commitment as the fourth most critical factor is contrary to other studies. As indicated in the literature review, Oakland (2004), Abdul-Rahman (1996), and Arditi and Gunaydin (1997), consider management/leadership commitment as the most critical of all factors that promotes quality management in the construction industry.

4.4.7 Training

Training ranked last among the other critical success factors in TQM as the survey indicated. The three factors, training of employees on processes improvement, data collection and emphasising on processes not inspection ranked equally with an index of 3.29. The only factor that had a mean less than 3 indicating a general disagreement is 'Company gives regular training to all employees on client satisfaction'.

This result proves that GCI employees in Kumasi do not consider training as a critical factor in quality management unlike studies by Arditi and Gunaydin (1997) who considers training as very essential in increasing competitiveness. This is a reflection of the fact that training is an irregular occurrence among construction staff.

4.5 Summary

This chapter presented the results of the questionnaire and analysed the data collected. It illustrates the Quality Management system used in Ghana that is predominantly by the system of inspection.

The critical factors that affect TQM were analysed. The conclusion is that Process Management is the strongly agreeable factor that can be concentrated upon to improve Quality in the Ghanaian Construction Industry.

Based on these results, the next chapter proposes a framework that will guide construction companies in improving the quality of their works.



CHAPTER FIVE

TQM FRAMEWORK FOR THE CONSTRUCTION INDUSTRY

5.1 Introduction

In this twenty-first century competitive world, construction companies face the challenge of providing quality works to their clients to sustain their competitive advantage. Hence, there is the need for the principles of TQM in the Ghanaian Construction Industry to improve the quality of works. The first step towards this feat is to adopt a simple systematic framework to guide all stakeholders in the Construction Industry.

TQM implementation is a never-ending exercise and a very challenging task that calls for a well-structured pragmatic approach (Harrington and Voehl, 2012). This chapter therefore seeks to propose a framework that will guide Construction Companies in the implementation of TQM Principles. The proposed framework is based on the Literature Review and the Critical Factors in the previous chapter. This chapter includes discussion on the purpose and design of frameworks.

5.2 Purpose of Framework

Many researchers have given different definitions of framework. According to Merriam-Webster Dictionary, a framework is a set of ideas or facts that provide support for something. Generally, frameworks show the empirical relationships between aspects. In summary, Aalbrecht et al, (1991) summarises the purpose of frameworks as:

- i. Illustrating an overview and to communicate a new vision to the organisation;
- ii. Force management to address a substantial list of key issues which otherwise might not be addressed;

- iii. Give valuable insights into the organisation's strengths and weaknesses, and its overall strategic position in the market-place;
- iv. Support implementation and to improve the chance of success because it will provide not only overview but also more detailed information describing the content of each framework element and its relationship to other elements.

5.3 Basic Design of Frameworks

Medori and Steeple (2000) summarised the design requirements for developing a framework that include the following steps. They are:

- i. Procedures for selecting and implementing measures;
- ii. Ability to identify whether existing measurement system is up to date and measuring critical issues (i.e. audit capability);
- iii. Selected measures should be congruent with company strategy and have strong relationship with the six core competitive priorities (i.e. quality, cost, flexibility, time, delivery and future growth);
- iv. Facilitates rapid selection of measures from a data bank; and workbook approach (i.e. step-by-step methodology).

5.4 Proposed Conceptual Framework

The proposed TQM framework is built upon a set of core values and factors that is the foundation for integrating the key performance requirements within the quality framework. The set of basic factors forming the building blocks of the proposed TQM framework in accordance with this study are Process Management, Continuous Improvement, Employees' Satisfaction/Empowerment, Supplier Chain Management, Customer Focus, Management /Leadership and Training.

The proposed framework is based on European Foundation for Quality Management (EFQM) EFQM is a quality model based on nine (9) elements; five (5) enablers and the four (4) elements are Results.

A simple model depicting the relationship between enablers and results is that when people acquire proper process management skills then performance increases. The simple model is as shown in Figure 5.1

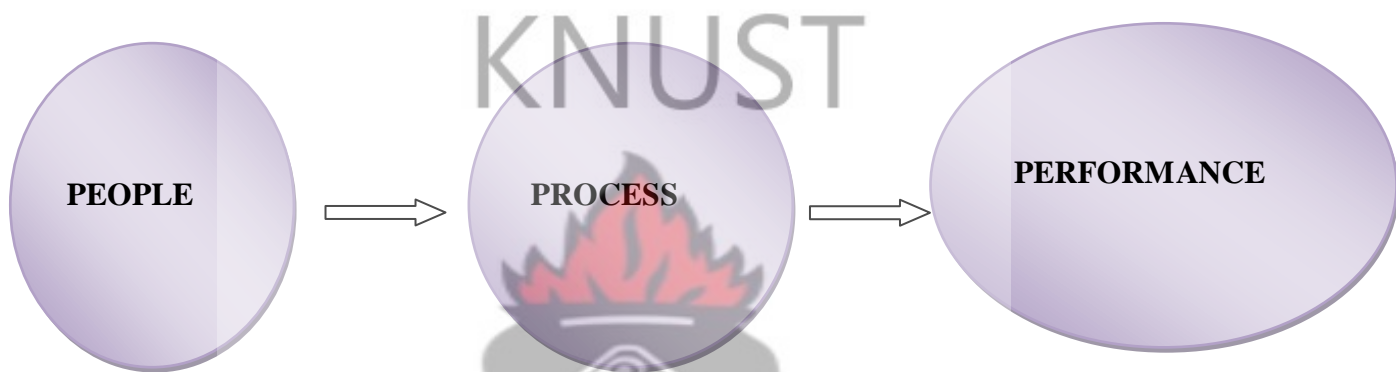


Figure 5.1: Simple Model

Source: Author's Data , 2014

As indicated in the previous chapter, Process Management is at the center of all performances. Good process management leads to better performance. From this simple model, the researcher proposed a TQM framework based on the above simple model and EFQM and is as shown in Figure 5.2.

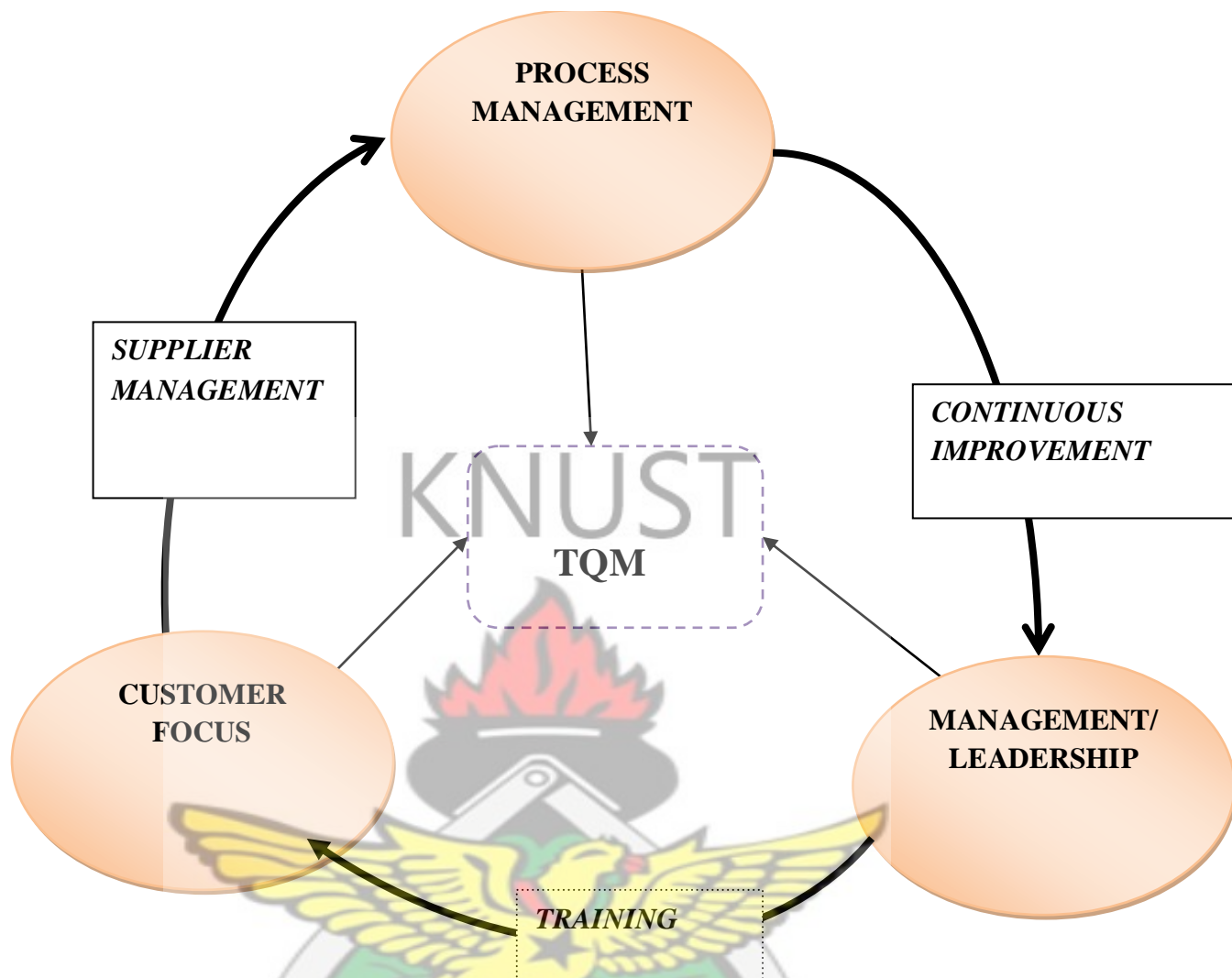


Figure 5.2: TQM Framework

Source: Author's Data , 2014

The proposed framework is based on six criteria. Three basic criteria needed for a successful implementation of TQM Framework are Process Management, Leadership Commitment, and Customer Focus. They are the triangular pillars on which TQM derives its support.

Process Management is at the top of the triangle indicating that without process management the framework will fail. Customer Focus and Management are the Human Resources who play their role effectively in managing all necessary processes.

The Customers include the Internal and External Customers. Any one of these criteria that fails leads to a failure of TQM. Continuous Improvement, Training, and Supplier Management are the connectors to the main pillars for an effective and efficient TQM Implementation in the Ghanaian Construction Industry.

5.5 The Three Pillars

5.5.1 Process Management

A typical construction project consists of various activities executed by different skilled personal at differing times within the Project Time Frame. According to triple role concept, within each activity there are three parties; Supplier, Processor and Customer. For an efficient Process Management within the construction industry the Customer must be satisfied before the next activity starts. The Customer of the preceding activity becomes the Supplier of the successive activity. For example in Reinforced Concrete Activity, the carpenter who prepared the formwork becomes the supplier for the steel bender handling the reinforcement phase.

It is ideal that a Construction Company appoints a Quality Assurance/Control (QA/QC) Manager responsible for construction activities. As in Table 4.10, respondents rated Process management highest. It is the responsibility of QA/QC to ensure that employees adhere to the procedures and standard operating practices (SOPs). To ensure an efficient process management, he must manage the five M's namely man, machine, method, measurement, and material. To attain continuous improvement, which is a necessity in TQM, QA manager must measure and control variation of process using statistical tools as described in the literature review.

5.5.2 Management/Leadership Commitment

Leadership role in the implementation of TQM is very important as indicated in the literature review. He is the driver directing the affairs of the company and therefore has to understand and be fully committed to the TQM principles. Out of the three main pillars of TQM as proposed in this framework, it is leadership commitment that drives TQM to a successful conclusion.

Leadership must first believe in TQM and give support to its implementation. They are responsible for appointing a QA Manager who should liaise between the employees and process management. Leadership communication and involvement in training employees is a motivating factor that builds good environment for employees to thrive.

5.5.3 Customers Focus

The basic aim of TQM system is to produce goods and services consistently for a satisfied customer. These customers can be external (end users) or internal customers (within the company). To achieve this, one would have to know the needs of the customer and then adopt an appropriate framework and environment to achieve the desired needs at the lowest possible cost.

The key to improving internal customer satisfaction is by adding value to employees and making them feel significant. Management strategic decisions to motivate, train, reward and recognizing staff improves the value of human resource of a construction company.

5.6 The Three Connectors

5.6.1 Continuous Improvement

One important step that differentiates TQM philosophy from other philosophies is the concept of continuous improvement. A cycle ensures improvement in products and

services that ultimately improves the quality of works for a satisfied customer. It may follow Deming's (2000) Plan Do Check Act (PDCA) cycle.

Plan: Through measurement of results and feedback from customers, management defines quality problems identified in the construction activities. This step involves listing the problems and states the specific expected objectives. An analysis of the causes of problems and its influence on the quality based on data collected is essential at this phase. Finally, management devices an action plan that will prevent or improve the activity.

Do: This phase involves the implementing the action plan proposed by management. If necessary, it requires training and provision of other material/tools to be able to implement such plans. This calls for total management commitment for the TQM process improvement.

Check: this is the monitoring and evaluation step to check the effects of measure taken.

Act: this is the last phase of the cycle. This entails taking note of all effects and measurements. The results are documented and new standard for works is communicated to all stakeholders.

5.6.2 Training and Development

Results from the survey prove that formal training is not a regular exercise done in the Ghanaian Construction Industry. Training of employees is a key issue linking continuous improvement and process management. In Ghana, the low level of education for most of the artisans calls for management commitment to training programs that will improve the skills of artisans and to increase their knowledge in construction works. With new devised plans, it is the responsibility of management to ensure that employees are trained on new concepts. Other regular training sessions include training on customer satisfaction and data collection and analysis.

5.6.3 Supplier Management

The last connector between Customers and Process Management is the role of suppliers. The timely supply of the right quantity and quality inputs determines the final quality of product. As already indicated in the literature review and emphasised by Deming (1986), it is better to maintain long-term supplier relationships for loyalty and trust.

To improve supplier performance, commitment and involvement of senior management of the Supplier Company and Construction Company is paramount. The synergy between the two knowing and understanding the benefits to be derived from a good product benefits both companies.

5.7 Summary

This chapter discussed a proposed framework that will guide the Ghanaian Construction companies to improve the quality of works by the implementation of TQM in their companies. This simple systematic framework guides construction companies in the assessment of the performance of their works. . Based on Literature review on EFQM and the respondents' results, a framework based on Pillars three (3) and three (3) Connectors were proposed.

The main pillars are Process Management, Leadership Commitment and Customer Focus. To stabilize and reinforce the framework the researcher explained three other connectors: Continuous Improvement, Training, and Supplier Management.

Finally, it must be known that the success or failure of an organisation depends on the quality culture instituted by management to guide employees. Otherwise, as quoted from Cortada and Woods (1995), "the use of quality management techniques will be mechanical and not likely to deliver the long-term results for customer satisfaction, more efficient processes, lower costs, growth, and profitability that it promises."

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Introduction

Research into Quality Management practices in the construction Industry has been increasing to improve on competitiveness, performance, and client satisfaction. This study has added up to the researches on implementation of Total Quality Management in the Ghanaian Construction Industry.

This study had three basic objectives relative to the construction industry. They were to identify the quality management practices, assess stakeholders' knowledge in TQM principles and to propose a framework that will guide Construction firms in Ghana to improve on performance on the basis of quality measures.

The study identified some issues that have been summarized and this led to the conclusion and recommendation in this chapter.

6.2 Summary of Findings

6.2.1 Conclusion of Objective 1

To determine from Literature the TQM practices within the Construction Industry.

The study showed that TQM practices in the Construction Industry were very essential for companies that intend improving competitiveness, productivity and customer satisfaction. Most construction firms in developed countries such as UK and Hong Kong have moved on from quality inspection, quality control, quality assurance and now practice total quality management. The successful implementation of TQM has resulted in continuously improved products and services leading to more satisfied clients. These construction companies have adopted a quality culture that thrives on management commitment,

training, teamwork, employees' satisfaction and emphasizes on the way tasks are accomplished and not just on what tasks are completed.

6.2.2 Conclusion of Objective 2

To identify current quality management practices employed in the Ghanaian Construction Industry.

The study shows that out of the four factors affecting successful project management, quality is the most important factor to ensure a successful completion of project works. Quality Management in construction has become very critical in increasing performance and competitiveness in Ghana.

The definition for quality in the construction industry is value for money as stated by the respondents. In order to improve on quality, the study revealed that the targeted sample improved on quality works by inspection methods. By this method, supervisors issue site instructions to works foremen to rectify any observed defects occurring on site. The study shows that performance is measured primarily by collecting data and by recording the timely completion of works.

Effective and efficient human resource management is the key to improved performance of a company. With this in mind, the study investigated on plans made to develop the human resource available and observed that on the job training was the predominant type of training.

6.2.3 Conclusion of Objective 3

The third objective was to investigate the knowledge of TQM principles in the Construction Industry.

The majority of firms in the Kumasi are oblivious of TQM application in the Construction Industry. The evidence is from the 14% of respondents that implemented TQM principles in their effort to improve the quality of construction works.

The research identified seven (7) critical factors and analysed them using the Importance Index Analysis to know the importance index for each factor. After the analysis, the ranking order in order of importance for the factors were Process Management, Continuous Improvement, Employees' Satisfaction/Empowerment, Supplier Chain Management, Customer Focus, Management /Leadership and Training. This study proved that customer service, the prime aim of TQM was not considered the most significant factor.

6.2.4 Conclusion of Objective 4

Propose a framework to guide in the implementation of TQM philosophies in Ghana.

Based on the above observations concerning the lack of knowledge in TQM application in the Construction Industry, a framework was proposed.

The proposed framework was based on the EFQM model and supported on three (3) core pillars identified as Process Management, Management Commitment and Customer focus. It is similar to the three-legged stool whereby if one pillar fails the whole framework fails. Three connectors namely Continuous Improvement, Training and Development and Supplier Management links the pillars. These connectors sustain the effective and efficient implementation of the framework.

6.3 Recommendation

With the current inspection method, the construction industry' developmental progress will be gradual. One tested and tried method of improving quality that places value on its products and satisfies the customer is through the implementation of TQM in the industry. It is recommended that

6.3.1 Quality Culture

Construction companies develop a Quality Culture as an organisational behaviour.

6.3.2 Management Role

Management is committed and dedicated to the application of TQM in order to improve quality.

6.3.3 Training:

Management must lead the drive for the establishment of team building activities that understand and utilize TQM principles using the proposed framework as a guide. Training, motivation, and recognition are some of the factors that can improve internal customer satisfaction that achieves high productivity. Moreover, the use of accurate collected data should be encouraged to monitor performance of the construction activities.

As explained earlier, the key to increasing productivity is the adoption of effective process management systems. The team members should also be trained on the core business areas and upgrade their soft skills including Operations, Communication, Time Management, Conflict Management. Another relevant training required is in the collection and analysis of data. This will help track projects and provide information for innovative and improved production methods.

6.3.4 Future Research

This research sought to determine the quality management system in Ghana and to propose a frame work that will guide its implementation. In view of this, there is the need to suggest further research that can improve productivity of the construction industry. The following proposed researches are:

6.3.4.1 Quality Management practices in relation to Customer and Employee Satisfaction.

6.3.4.2 The maintenance of a well-trained workforce to improve overall performance and total quality.

6.3.4.3`Study on Supplier Selection Issues in Construction Supply Chain Management and its effect on Total Quality Management (TQM).

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REFERENCE

- Adavi, P.R. and Patil, S. . (2012). A Survey Study Of Supplier Selection Issues In Construction Supply Chain. *International Journal of Engineering Research and Applications (IJERA)* .
- Bou-Llusar, J. C., . Escrig-Tena, A. B. , Roca-Puig,V. and Beltra, I. . (2009). An empirical assessment of the EFQM Excellence Model : Evaluation as a TQM framework relative to the MBNQA Model. *Journal of Operations Management Vol. 27, Iss 1, pp 1–22* .
- Aalbregtse, R.J., Hejka, J.A., McNeley, P.K. (1991). Total quality management (TQM): how do you do it? *International Journal of Quality & Reliability Management , Automation, Vol 38 No 8, pp30-32.*
- Abdul-Rahman, H. (1996). Some Observations on the management of Quality among Construction professionals in UK. *Construction Management and Economics , Vol 14(6), pp 485–496.*
- Ahmed, S. (1993). *An Integrated Total Quality Management (TQM) Model for the Construction Process*. Ph.D. Dissertation, School of Civil & Environmental Engineering, Georgia Institute of Technology Atlanta, GA, USA.
- Anvuur, A., Kumaraswamy, M. & Male, S. (2006). Taking Forward Public Procurement Reforms in Ghana. *Proceedings of the 2006 CIB W107: New Issues and Challenges. CIB: Rotterdam, Netherlands.*
- Arditi, D. and Gunaydin, H. M. (1997). Total quality management in the Construction Process. *International Journal of Project Management , Vol 15 No.14, pp 235-243,.*
- Badri, M.A., Davis, D. and Davis, D. (1995). A study of measuring the critical factors of quality management. *International Journal of Quality & Reliability Management , Vol. 12 No. 2, pp. 36-53.*
- Beckwith, P. D. (1992). *Total Quality Mangement: A Management Philosophy for Providing High Quality Construction*. A Scholarly Paper Submitted To Professor William Maloney for The University of Maryland for ENCE 689.
- Bell, D., McBride, P., Wilson, G. (2000). *Management Quality*. Oxford: Butterworth-Heinemann.
- Black, S.A., and Porter, L.J. (1996). Identification of the critical factors of TQM. *Decision Sciences , Vol. 27, No. 1, pp. 1-21.*
- Briscoe, G. & Dainty, A. (2005). Construction supply chain integration: an elusive goal? *Supply Chain Management: An International Journal , Vol.10 No.4, pp.319- 326.*
- BSI. (1992). *BS 7850 Total Quality Management*. British Standards Publishing Limited, London.

Business Roundtable. (1983). *More Construction for Money - Summary Report of the Construction Industry Cost Effectiveness Project*. Standards Publishing Limited, London.

CIDB (Construction Industry Development Board). (2007). *Construction Industry Master Plan 2006-2015*. Black and Brown Resources Sdn Bhd.

Cohen, L., Manion, L. ,& Keith, M. (2007). *Research Methods in Education*. New York: Taylor& Francis e-library, Routledge.

Cortada, J. and Woods, J. (1995). *McGraw Hill Encyclopedia of Quality Terms & Concepts*. McGraw-Hill, Inc., New York, USA, p. 102.

Crosby, P. B. (1979). *Quality is Free*. McGraw-Hill, New York.

Deming, W. E. (2000). *Out of the Crisis*. MIT Press, Cambridge, MA.

Deming, W. E. (1986). *Out of the Crisis: Quality, Productivity and Competitive Position*. Cambridge University Press, Cambridge.

Doyle, D. (1994). *ISO 9000 Quality Systems Handbook*. Butterworth, London.

Dr.Kulkarni, S.S. and Khutale, S.D. (2013). Improvement in Supply of Construction Material for Construction Industry in Satara City - By Applying Supply Chain Management Too. *IOSR Journal of Mechanical and Civil Engineering* .

Easter-Smith et al. (2004). *Management Research (2nd Edition)* . London: Sage Publications.

Economist. (2000, January 15). Construction and the Internet. *The Economist* .

Egan, Sir J. (1998). *Rethinking Construction*. Report of the Construction Task Force, HMSO, London. Department of the Environment, London.

Eisenhardt, K. M. and Brown, S. L. (1998). Competing on the edge: strategy as a structured chaos. *Long Range Planning*, Vol. 31, No. 5, pp. 786 to 789, 1998.

Enhassi et al. (2007). Factors Affecting Labour Productivity In Building Projects in the Gaza Strip. *Journal of Civil Engineering and Management* , Vol. XIII, No. 4.

Foster, V., & Pushak, N. . (2011). *Ghana's Infrastructure:A Continental Perspective*. World Bank Policy Research Working Paper.

Grandzol, J. R. and Gershon, M. (1998). A survey instrument for standardizing TQM modeling research. *International Journal of Quality Science* , Vol. 3 No. 1, pp. 80-105, © MCB University.

GSS. (2013). *2010 Population & Housing Census: National Analytical Report*. Ghana Statistical Service.

- GSS. (2012). *Ghana Statistical Service Releases GDP for Third Quarter*. ISD (G.D. Zaney).
- Hair, J., Money, A., Samouel, P. & Babin, B. (2003). *Essentials of Business Research Methods*. USA. John Wiley & Sons Inc.
- Harrington, J.H., & Voehl, F. (2012). Applying TQM to the Construction Industry. *The TQM Journal* , Vol. 24 No.4, pp 352-362.
- Harris, F., McCaffer, R. and Edum-Fotwe, F. (2006). *Modern Construction Management*. Blackwell Publishing.
- Heizer, J. and Render, B. (2006). *Principles of Operations Management*. Pearson Prentice Hall.
- Henderson, J.R. and Ruiker, K. (2010). Technology implementation strategies for construction organisations. *Engineering, Construction and Architectural Management* , Vol. 17 Iss: 3, pp.309 - 327.
- Hillebrandt, P. M. (2000). *Economic Theory and the Construction Industry, 2nd Edition*. Macmillan, Basingstoke.
- Imbeah, K. A. (2012). *Framework For The Implementation Of Total Quality Management(TQM) In Real Estate Firms In Ghana*. MSc Thesis, Faculty Of Architecture And Building Technology, KNUST.
- Ishikawa, K. (1985). *What is Total Quality Control? The Japanese Way*. Prentice-Hall, Englewood Cliffs, NJ.
- Jung, J.Y. and Yong, J. W. (2006). Relationship between total quality management (TQM) and continuous improvement of international project management (CIIPM). *Technovation* 26 pp 716–722 .
- Juran, J. M. (1988). *Quality Control Handbook*. McGraw-Hill, New York.
- Kumar, R. (1999). *Research Methodology: step by step Guide for beginners*. London: Sage Publications Ltd.
- Lad, J. and Beck, B. (2009). Construction Quality: The Key to Successful Capital Projects Delivery. *Pharmaceutical Engineering* , Vol 29, No.6.
- Landin, A. (2000). *Impact of Quality Management in the Swedish Construction Process*. Lund University.
- Lau, A. W. T. and Tang, S. L.. (2009). A survey on the advancement of QA (quality assurance) to TQM (total quality management for construction contractors in Hong Kong. *International Journal of Quality & Reliability Management* , pp. 410-425.

- Low S. P. and Jasmine, A. T. (2004). Implementing Total Quality Management in Construction Firms. *Management in Engineering* , Vol. 20 No. 1, pp. 8-15,.
- Medori, D., Steeple, D. (2000). A framework for auditing and enhancing performance measurement systems. *International Journal of Operations & Production Management* , Vol. 20 No.5, pp.520-533.
- Metri, B. A. (2005). *TQM Critical Success actors for Construction Firms*. India Management Development Institute.
- Muijs, D. (2004). *Doing Quantitative Research in Education: With SPSS*. Sage.
- Nawaz, T., and Ikram, A.A. (2013). Benefits and Impediments in Implementing Tqm in Pakistani Construction Industry. *European Journal of Business and Management* , Vol.5, No.4, .
- Oakland, J. S. (2004). *Oakland on Quality Management*. Elsevier Butterworth-Heinemann publications.
- Ofori, G. (2012). *Developing the Construction Industry in Ghana: The case for a Central Agency*. Retrieved from <http://www.buildingcontractorsgh.com>
- Oswald, T. and Burati, J. (1992). *Guidelines for implementing total quality management in the engineering and construction industry*”,. Austin, TX: Construction Industry Institute.
- Owusu, D. (2012). *Gender and Informality in the Construction Industry in Ghana's Oil City Takoradi*. Master's Thesis, Department of Geography University of Bergen.
- Polat, G., Damc, A. and Tatar, Y. (2011). Barriers and Benefits Of Total Quality Management In The Construction Industry: Evidence From Turkish Contractors. *7th Research/Expert Conference with International Participations*.
- Quazi, H.A., Jemangin, J., Kit, L.W. and Kian, C.L. (1998). “Critical factors in quality management and guidelines for self-assessment, the case of Singapore. *Total Quality Management* , Vol. 9 No. 1, pp. 35-55.
- Santos, A., Powell, J. & Formoso, C. (2000). Setting Stretch Targets for Driving Continuous Improvement in Construction: Analysis of Brazilian and UK practices. *Work Study*, Vol 49 .
- Saraph, J., Benson, G. and Schroeder, R. . (1989). An instrument for measuring the critical factors of quality management. *Decision Sciences* , Vol. 20 No. 4, pp. 810-29.
- Tang, S.L., Ahmed, S.M., Aoieoung, R. T., Poon. S.W. (2005). *Construction Quality Management*. Hong Kong University Press, Hong Kong.
- Tari', J. J. (2005). Components of successful Total Quality management. *The TQM Magazine* , Vol. 17 No. 2, pp. 182-194.

Terkper, S. E. (2013). *Budget Statement and Economic Policy*.

Tingey, M. (1997). *Comparing ISO 9000, Malcolm Baldrige, and the SEICMM for Software: A Reference and Selection Guide*. Prentice-Hall, Englewood Cliffs, NJ.

Tsiotras, G. and Gotzamani, K. (1996). ISO 9000 as an entry key to TQM: the case of Greek industry. *International Journal of Quality & Reliability Management* , Vol. 13, No. 4, pp.64-76.

Wilson, N. and McLean, S. (1994). *Questionnaire Design: A Practical Introduction*. Newtown Abbey: University of Ulster Press.

World Bank. (1984). *The Construction Industry: Issues and Strategies in Developing Countries*. International Bank for Reconstruction and Development, World Bank, Washington DC.

Xiao, H. & Proverbs, D. (2003). Factors influencing contractor's performance: an international investigation. *Engineering, Construction and Architectural Management* , Vol 10 No. 5 pp 322-332.



APPENDICES

APPENDIX

QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BUILDING TECHNOLOGY

TOPIC: ASSESSING TOTAL QUALITY MANAGEMENT (TQM) PRACTICES IN THE GHANAIAN CONSTRUCTION INDUSTRY.

Objectives: The objectives of this survey are to identify Quality Practice employed in the Construction Industry and Investigate the Implementation of TQM Principles and its related Quality Challenges in the Industry.

Instructions

Please examine the questionnaire and try to answer correctly and accurately, as many questions as possible. All the information gathered here will be kept strictly confidential and will be used only for research and analysis purposes without mentioning the person or company names.

SECTION A

Tick As Appropriate: Personal Data

1. **Gender:** ☐ Male ☐ Female
2. **Age group:** ☐ 18 – 30 ☐ 31 – 40 ☐ 40 – 49 ☐ Over 51
3. **Qualification:** ☐ High School ☐ College/University ☐ Post graduate
4. **Occupation:**
☐ Project Manager (Engineer, Architect, Quantity Surveyor)
☐ Supervisor ☐ Technical
5. **How long have you worked at this company?**
☐ Less than (1) year ☐ 5- 10 years
☐ 1 –5 years ☐ Above 10 years

SECTION B: KNOWLEDGE OF TOTAL QUALITY MANAGEMENT (TQM)

6. **In your view, which of these words define total quality? Please rank the FIRST FIVE best words. Place these in rank order of the most to the least definition, by putting the position**

(1–5) against each of the following statements, 1 being the bestequivalent word and 5 being the least word.

- ☐ Appearance
- ☐ Elimination of defects
- ☐ Solving Problems
- ☐ Expensive
- ☐ Satisfying internal customer (Employee)
- ☐ Satisfying external customer (Client)
- ☐ Increased profit
- ☐ Value for money
- ☐ Teamwork

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7. *For a Successful Project Management these factors must be considered. Please rank the following in order of importance (1, 2, 3, 4, and 5) where 1 is the most important and 5 is the least important.*

- ☐ Time _____
- ☐ Scope _____
- ☐ Cost _____
- ☐ Quality _____
- ☐ Safety _____

8. *What Quality Improvement Programme do you have?*

- ☐ Inspection
- ☐ Quality Control
- ☐ Quality Assurance
- ☐ Total Quality Management

9. *What are the MAJOR OBJECTIVES of the Quality Programmes? Please rank these factors in order of importance (1, 2, 3, 4, and 5) where 1 is the most important and 5 is the least important.*

- ☐ Increase productivity
- ☐ Cost reduction
- ☐ Involvement of employees in the quality building effort
- ☐ Compliance with statutory, environment and safety requirement
- ☐ Customer satisfaction

SECTION (C): ACQUISITION OF QUALITY DATA

10. *Do you collect data to monitor performance of works or processes?*

- ☐ Yes
- ☐ No

11. How do you measure performance?

- ☐ Fewer customer complaints
- ☐ Increase productivity
- ☐ Profit margins
- ☐ Timely completion of projects
- ☐ Others_____

SECTION (D): TRAINING

12. Is formal training in Quality Policy or TQM given to employees?

- ☐ Formal training is done
- ☐ Some training is available
- ☐ No training available

13. How often is the training done?

- ☐ Twice a year
- ☐ Once a year
- ☐ Once every two years
- ☐ Others_____

14. What type of training is given to employees?

- ☐ On the job training
- ☐ Seminars
- ☐ Short Courses
- ☐ Others

15. Training is done on the following

- ☐ Customer Satisfaction
- ☐ Process Improvement
- ☐ Data Collection
- ☐ Teamwork
- ☐ Communication

SECTION (E): PROBLEMS AFFECTING TOTAL QUALITY MANAGEMENT

In your own view, rank the following as problems affecting Total Quality Management in your firm. 1 is the Lowest Rank and 7 is the highest Rank.

- ☐ Lack of Management Commitment and Support _____
- ☐ Lack of Resources and Skilled Expertise _____
- ☐ Excess Documentation required _____
- ☐ Difficulties in mapping processes _____
- ☐ No developed standardized procedures _____
- ☐ Lack of statistical quality control techniques _____
- ☐ Bad attitudes and Behaviour _____



PART 2:

Below are the criteria for assessing successful implementation of Total Quality Management Principles. Please Tick (✓) in one space only the appropriate answer as it applies to your Company.

1. Strongly disagree 2. Disagree 3. Neither Agree nor Disagree. 4. Agree
5. Strongly agree

No.	Critical Success Factor	1	2	3	4	5
A	MANAGEMENT/LEADERSHIP					
1.	Management has a clear vision for implementing quality goals					
2.	Management is committed to ensuring the success of the quality policy					
3.	Management empowers all employees to have adequate knowledge in quality procedures					
4.	Management creates a quality awareness among employees					
5.	Management is supportive of technology advancement to improve quality					
B	CONTINUOUS IMPROVEMENT					
6.	Company encourage employees to be creative and innovative in improving processes					
7.	Company has an improvement perception not just maintaining the traditional work methods					
8.	Company evaluates performance and take measures to improve on it					
C	CUSTOMER FOCUS					
9.	Company gives full attention to Client Needs					
10.	Company gives feedback forms to Client after delivery of product					
11.	Company has a data to measure Client Satisfaction					
No.	Critical Success Factor	1	2	3	4	5
D	TRAINING					
12.	Company gives regular training to all employees on the Processes for Improvement					
13.	Company gives regular training to all employees on Client Satisfaction.					

14.	Company gives regular training to how to gather information concerning Client, Workforce and general works					
15.	Supervisors emphasises training of processes and not just Inspection.					
E	EMPLOYEE SATISFACTION/EMPOWERMENT					
	Company encourages suggestions from employees					
15.	Questionnaires and complaint forms are available to collect employee satisfaction data					
16.	Employees enjoy the job descriptions and working environment					
17.	Social relationships are present in the company					
18.	Your company encourage team work rather than individual work					
19.	Good communication is encouraged to eliminate fear/withdrawal					
20.	Self-improvement is encouraged to improve skills and performance					
F	PROCESS MANAGEMENT					
21.	There is clear clarity of work processes and methods					
22.	Check sheets are available to monitor the adherence of scheduled processes					
23.	Drawings and specifications are reviewed prior to Construction					
No.	Critical Success Factor	1	2	3	4	5
G	SUPPLIER CHAIN MANAGEMENT					
25.	Supplied materials are examined thoroughly before being used.					
26.	Company maintains regular suppliers to ensure consistency					

I APPRECIATE YOUR TIME SPENT IN RESPONDING TO THE QUESTIONS IN THIS SURVEY.

THANK YOU.