

**QUALITY CONTROL PRACTICES IN BUILDING CONSTRUCTION
PROJECT IN GHANA**

By
Harry Agbeko Harrison-Zotsi
(BSc. Electrical engineering)

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgement is made in the thesis.

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| Harry Agbeko Harrison-Zotsi | | |
| (PG5040718) | Signature | Date |

| | | |
|--------------------|-----------|-------|
| Certified by | | |
| Mr. Ayirebi Dansoh | | |
| Supervisor | Signature | Date |

| | | |
|----------------------------|-----------|-------|
| Certified by | | |
| Prof. Bernard Baiden | | |
| Name of Head of Department | Signature | Date |

ABSTRACT

The need for quality in construction has become very important to all stakeholders in the industry, since construction has a great impact in contributing to a countries development. This study aimed at exploring the quality control practices in building construction project management in Ghana. The various objectives for the study includes, identifying the quality control practices used in construction projects, to identify factors that hinders the implementation of quality control practices during the execution of construction projects, and to recommend strategies for effective management of quality control in the construction industry. The quantitative approach was adopted for the study. Data was obtained using questionnaire. In obtaining a sample size, the researcher by using the convenience sampling technique, gave out ten (10) questionnaires each to the selected group of respondents who were prepared in answering the questionnaire, these group of respondents were: Project managers, architects, contractors, engineers, and quantity surveyors, and site managers. The study had a sample size of sixty (60) and retrieved forty-five (45) questionnaires back from respondents. With the help of the Relative Importance Index, all factors were analyzed successfully. From the data gathered, factors identified under quality control practices used in construction projects included: “Long term improvement plans of quality is supported by management”, “Management assigning extra significance to quality than any other objective, e.g. cost”, “Quality Assurance: ensuring that policies are developed to promote the satisfaction of customers”, and “Quality Management: quality issues being reviewed in management meetings”. These factors were selected as the best quality control practices. From the second objective, the factors that hinders the implementation of quality control practices during the execution of construction projects were: Lack of management commitment to continual quality improvement, Workers lack information and knowledge on the importance quality, Uncertainties of workers about management’s goals and also, Struggle in calculating the efficiency of quality control. Also the final objective was achieved where by the study recommend strategies for effective management of quality control in the construction industry, based on findings from the literature review, the various strategies includes: Team targets towards quality must be attained and vision of the team must be shared, reworking on that part of the project where quality was not achieved, management of construction, must ensure team work to achieve quality requirement from customer and also, operated effort and sharing the work load equally across the team to aid attain quality. The study came to a conclusion where by at the end of its findings, it was able to attain the quality control practices in building construction project management.

Keywords: Quality, quality control, construction, project management

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ACKNOWLEDGEMENT

My utmost thanks goes to Jehovah

DEDICATION

I dedicate this work to my family

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In construction, the issue of quality cannot be underscored because the field of construction is one of the greatest providers of Gross Domestic Product (GDP) worldwide. According to Betts *et al.*, (2011), construction will contribute to 13.2% of world GDP by 2020. In Ghana, the industry of construction was one of the largest sector in 2015, in regard to growth rate of 30.6% and a GDP percentage of 14.8%, Ghana Statistical Service, (2013). The industry is normally known as one essential element in the economic and social development of the nation by bringing out basic infrastructure advances for the nation, where by it somehow improves the nations growth by its forward and backwards connections with other areas of the country's economy, and this includes industrialization by production, professional and financial services, and as a result, generates one of the highest multiplier effects (Jong, 2018). In human life, infrastructure is very important, and it's key that construction projects are carried out with adequate attention to quality to meet stakeholder requirements as well as meet codes of standard to ensure public safety and prevent wastage of capital, (Pialles, 2017).

The term quality is known as a phenomenon which is universal, and has been a massive concern in all history recorded, it has always been the main focus of most builders and persons who manufacture products by ensuring that these things meets the satisfaction of the customer or client (Rumane 2011). Research conducted by Arditi *et al.*, (1977) mentioned quality as ensuring that the aesthetic and legal together with functional requirement of a project or product is being met, also, the place where requirement of project is complex or simple, or requirement is being mentioned in terms of results at the end of it. The American Society for Quality (ASQ) also explain quality in two ways:

- The physical features of a manufactured good or facility that has its capability to reach clients satisfaction.
- A product which is free from faults

Quality has been one of the main determinant used in proving the level of failure or success of a project, its' long term nature and capital intensiveness has made it authoritative for all persons and groups who are part of construction projects to put in efforts by producing creditable structures with quality (Feigenbaum, 1993). Quality significance in the construction prompted the need to adopt Quality Management practices to ensure that construction projects meet client requirements and standard codes. Quality management practices were developed and used in the manufacturing industry for a long time, have evolved over time and have been adopted by other industries (including the construction sector) and proven to increase productivity, reduce cost and prevent defects in products. Total quality management today is recognized as an essential necessity for any group to strive in attaining, and in a way, in its market (Rumane, 2011). Quality entails not only managers of project but also includes everyone in an organization to ensure a complete transformation as a culture by attaining quality (*ibid*). Total quality theory encompasses quality preparation, quality control and assurance.

In the study of Samuel (2016), a number of buildings have shown signs of distress for the past decade, even though they fall in the range of their design life span, which he attributed to lack of considerations of durability. He adds that if quality control measures had been applied, the costs incurred in restoring these structures could have been avoided. It was also reported by (Bediako, 2015 and Smith-Asante, 2015) that, while under construction, there are more than a few reports of infrastructure failures in Ghana. Many cases of failure of buildings have also been recorded throughout the sub-region, especially in Nigeria. It

illustrates how poor quality activities have been for quite a few years, which is why this study is delving into quality control practices in building construction project management in Ghana.

1.2 STATEMENT OF PROBLEM

In a world of perfectibility and constant improvement, humans are increasingly demanding and are looking for more and more innovation and quality in the goods they produce (Pialles 2017). In construction, quality control means the procedure of sustaining quality of construction task at the needed standard expected so as to reach the satisfaction of customers, in which would deliver long term business existence for the companies or clients involved (Tan *et al.*, 2005). Wanderi *et al.*, (2014) also pointed out that achieving of suitable heights of quality in the industry construction has been an issue for a while. They continued further that, the construction sector is normally observed as the sector with several low quality issues as related to other manufacturing sectors.

The problem of building failure has been rampant in this recent times. Statistics in Kenya indicate that 24 buildings collapsed between 1996 and 2011 killing 41 people and injuring 47 others (Situma, 2013), these failing structures produces death traps and enormous economic losses. Oyedele, (2018), further stated that four buildings collapsed in Ghana between the year 2012 and 2014 which affected families and this was due to low quality performance. Nigeria and Ghana where natural disasters are minimal, structural collapses are mostly due to poor quality of work or use of substandard materials. Collapsing of buildings leads to loss of life, wastage of capital and extra cost is incurred during rescue operations and clearing or debris.

Samuel (2016), mentioned that among the causes of the following failures, lies low quality of the construction buildings and poor management, this proves the relevance of this study, to explore quality control practices used in construction projects in Ghana, the importance of quality control practices and its implementation in project execution and the factors that hinders the implementation of quality control practices.

1.3 AIM AND OBJECTIVES OF THE RESEARCH

1.3.1 Aim

The study aim is to identify quality control practices in building construction project management in Ghana.

1.3.2 Objectives

1. To identify the quality control practices used in construction projects.
2. To identify factors that hinders the implementation of quality control practices during the execution of construction projects.
3. To recommend strategies for effective management of quality control in the construction industry.

1.4 RESEARCH QUESTIONS

1. What are the quality control practices used in construction projects?
2. What are the factors that hinders the implementation of quality control practices during the execution of construction projects?
3. What are the strategies for effective management of quality control in the construction industry?

1.5 SCOPE AND LIMITATION OF THE STUDY

1.5.1 Scope

The research identified quality control practices in building construction project management in Ghana, but the study had its focus on KNUST campus, in the Ashanti region. The study also focused on construction professionals on KNUST Campus, these professionals include: Project managers, architects, contractors, engineers, and quantity surveyors, and site managers. This because there are more than a few projects at KNUST campus, where by the criteria of respondents selected, have the experience in supporting the study achieve its goal.

1.5.2 Limitations

One major limitation to the study is time; very little time is available to conduct the research. Consequently, the study limited the geographical scope to just KNUST campus. Nevertheless, the research used all necessary tools and techniques to ensure that relevant data is gathered and analyzed to attain worthwhile observations and provide valuable recommendations where necessary

1.6 RESEARCH JUSTIFICATION

The ability to manage a task given and deliver the project or product in the exact requirement needed, in relation to budget, time and performance is termed as quality. The study is of much importance because, it helped identify the quality control practices used in the construction process and their influence constructed project quality. Secondly, the issues encountered during the implementing of control practices of quality in the execution of projects was mentioned in this study.

The study is important because, several effective practices used in ensuring quality management during project execution was presented. The study added up to valuable understanding to delivery of construction project, the result of this study supports in enhancing quality project delivery in Ghana and expose the various problems stakeholders face in implementing quality control practices and measures during the construction process. The study adds up to literature in academia to help train upcoming construction professionals together with other professionals already in the system.

1.7 METHODOLOGY

This research used the quantitative approach. The quantitative approach uses techniques that are statistical. This is also because the quantitative approach has an acceptable instrument for data collection for the sample to examine the subject area. The review in the chapter two includes a formulation of a survey in regard purpose of the study with the intention of collecting data from the designated field. The questionnaire was distributed to construction professionals, on KNUST Campus, these professionals includes: Project managers, architects, contractors, engineers, and quantity surveyors, and site managers, who were the research population. The sampling technique used was the convenience sampling technique which also supported in gaining a good sample size. The research launched and continue with the literature review on related focus of the research, in which the progress of sound and serious questionnaire were made, whereby its sources were around the aims and objectives of this study. The source of the information used for the research was mainly through journal publications, newspaper publications, books and the internet. After the review, questionnaires were designed to collect data from the research respondents. The questionnaires were semi-structured and self-administered among construction professionals who have much knowledge in this area of study. Data was

coded using the Statistical Package for Social Sciences (SPSS), and Microsoft Excel 2016 in which analysis of data was done using the Relative Importance Index.

1.8 STRUCTURE OF THE STUDY

The organization of this study was done in five (5) chapters. The primary chapter which is chapter one was basically about the general introduction to the study. The background of the study was discussed which continued with the problem statement. The aim and objectives were all clarified in this very chapter of the study. The chapter two looked into the literature in the area of study. The chapter which was third stated the methodology of the research which delved into the procedural approaches adopted for this study while the chapter four analyzed the data gathered using relevant and accurate tools for the data analysis. The chapter five which was the final chapter, made conclusions and recommendations for the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter offered the review of the literature, in which the main outline of the study was largely deliberated. The chapter defined some relevant definitions in regard to this study and it also researched into quality control practices in building construction project management in Ghana, this opened the opportunity for the study to investigate into identifying the quality control practices used in construction projects, the factors that hinders the implementation of quality control practices during the execution of construction projects and to recommend strategies for effective management of quality control in the construction industry. Information in the chapter was retrieved from research papers, books, journals, web articles, conference proceedings and other educative relevant sources. All these exploration was done to aid the study in arriving at its principal purpose.

2.2 QUALITY

There may be different meanings of quality to several different people. Some may signify it as the satisfaction of customer, others understand it as acquiescence with contractual requirements, yet others equate it to attainment of prescribed standards (Chung, 1999). In structures, more deformities and disappointments emerge from deficiencies in the treatment of items in plan and development than from deficiencies in the items themselves (Atkinson, 2005). In their work, Harris et al., (2006) expressed that Quality Administration has seen a progress from responding to the result of site generation exercises to turning into a key business capacity representing the *raison d'etre* of development organizations. Except if a development organization can ensure its customers a quality item, it can't contend adequately in the cutting edge development advertise. Quality is one of the points

of institutionalization. The nature of an item or a total structure or different developments is the totality of its credits that empower it to play out an expressed errand or to satisfy a given need agreeably for a satisfactory timeframe. For a structure and common designing work, a palatable item, albeit fundamental in itself, isn't individually adequate. It must be fused in the plan and development in a right way. It is likewise characterized by the American Culture for Quality (ASQ) is an abstract term for which, everybody has their key definition. Nevertheless, the non-repetitive nature of construction projects results in unique products thus making it a bit problematic to define quality in construction by completely relying on definitions developed by the assembling or administrations industry. Quality in development undertakings isn't just the nature of item and hardware utilized in the development of an office however the all-out administration way to deal with complete the office.

American Culture of Structural Architects (ASCE) have well-characterized quality as the satisfaction of undertaking obligations in the conveyance of items and administrations in a way that meets or surpasses the expressed prerequisites and desires for the proprietor, plan proficient, and constructor. Obligations allude to the errands that a member is relied upon to perform to achieve the undertaking exercises as indicated by authoritative understanding and material laws and authorizing necessities, codes, winning industry benchmarks, and administrative rules. Arditi and Gunaydin (1997) characterized quality as follows:

1. Qualities of client being met as to useful sufficiency; finish on schedule and inside spending plan; life-cycle expenses; and activity and support.

2. Requirements of design being met as to arrangement of well-characterized extent of work; spending plan to amass and utilize a certified, prepared and experienced staff;

spending plan to get sufficient field data before configuration; arrangements for auspicious choices by proprietor and structure proficient; and contract to perform essential work at a reasonable charge with satisfactory time recompense.

3. Satisfying the requirement of contractor as to delivery of contract plans, specifications, and other documents equipped in adequate detail to permit the constructor to prepare priced proposal or competitive bid; timely decisions by the owner and design professional on authorization and processing of change orders; fair and timely clarification of contract requirements from field design and inspection staff; and contract for performance of work on a sensible schedule which permits a reasonable profit.

4. The public having their requirements being met (the general population) as to open wellbeing and wellbeing; natural considerations; insurance of open property including utilities; and conformance with pertinent laws, guidelines, codes and approaches. Considering all this, it is clear that, during the execution of construction, qualities must be met at all area of the work being given.

2.3 HISTORY OF QUALITY

The issue of quality has been of a great concern since history, (Rumane 2011) According to Rumane (2011), several civilizations emerged during the stone and some 4000–5000 years prior, impressive abilities in development were obtained. The pyramids in Egypt were assembled roughly 2589–2566 BCE. Stones utilized in the pyramids were cut so well that a blade couldn't go between them (Evans and Lindsay, 2008 referred to in Sabah 2011). Hammurabi, the ruler of Babylonia (1792–1750) BCE classified the law, as indicated by which, during the Mesopotamian period, manufacturers were in charge of keeping up the nature of structures and were given capital punishment if any of their

development crumbled and their tenants were executed. China's recorded quality history can be followed back to sooner than 200 BCE. China had established quality control in its crafted works during the Zhou administration somewhere in the range of 1100 and 250 BCE. Scandinavian shipbuilders were utilizing quality improvement systems over the entire initial two centuries BCE and the principal thousand years CE. The Romans institutionalized about all that they contacted from 300 BCE to 300 CE. As indicated by Sebeystyen (1998), Marcus Vitruvius Pollo, the main century BCE military and structural architect, distributed his 10 books (i.e., a book with 10 parts) in Rome. In recent times, quality has evolved from quality inspection, quality control, quality assurance, quality management and to total quality management.

Quality Inspection: Prior to the mid twentieth century, quality administration implied assessing items to guarantee that they met particulars (Reid and Sanders, 2007 referred to in Sabah, 2011). Before the industrial revolution happened, there were crafts-men who personally manufactured items. These items were accountable for securing materials used in manufacturing, examination and trades. In instances where the purchaser has problems with the quality method implemented, the purchaser directly confronts the manufacturer. During this periods, craftsmen were producing merchandises on their own in which they supervised their input and effort at every interval and later made away with defective objects (Rumane, 2011).

Quality Control: In the early years twentieth century denoted the introduction of value control; the Mechanical Insurgency realized this system and denoted the incorporation of procedure in quality practices. Quality control included item investigation and factual quality control. As per Rumane, (2011) and Gryna, (2001) alludes to quality control as the procedure utilized to reliably satisfy guidelines. The control procedure includes watching

real exhibitions, contrasting it and a few principles, and after that making a move whenever watched execution is essentially unique in relation to the standard. As per (Reid and Sanders, 2007 referred to in Sabah 2011) around 1940s, during World War II, quality turned out to be progressively measurable in nature. Factual inspecting systems were utilized to assess quality, and quality control graphs were utilized to screen the creation procedure.

Quality Assurance is the third time in the quality administration framework. The ASQ characterizes quality affirmation as "all the arranged and efficient exercises executed inside the quality framework that can be exhibited to give certainty an item or administration will satisfy necessities for quality.

Later on, the concepts of Quality Administration and Absolute Quality Administration developed. The ASQ glossary characterizes quality administration as "the use of value the executive's framework in dealing with a procedure to accomplish most extreme consumer loyalty at the least by and large cost to the association while proceeding to improve the procedure. The idea of value the board began after World War II, widening into the improvement of activities that endeavor to connect all representatives in the precise exertion for quality. Quality administration came about because of crafted by the "quality masters" and their hypotheses. Augmentation of value the executive's ideas brought forth Absolute Quality Administration (TQM).

2.4 THE NECESSITY OF QUALITY

Quality does not refer only to the architectural appearance of a building or construction element, but affects also its various performances: physical properties, lifespan, integration with other materials as well as the degree of reaching needs along the construction process

(Rumane, 2011). There are several compelling reasons why stakeholders must ensure quality during construction.

Public health and safety: An inadequately built structure can bomb when exposed to real stacks a lot littler than configuration stacks and can be a danger to open wellbeing. Public health and safety is ensured when construction projects conform to stipulated codes and standards. Information has demonstrated that an absence of value in development tasks prompted disappointments and episodes. In 2007-2008, no under 37 deadly mishaps were brought about by low quality materials on development ventures; in 2009, 306 passings were because of 257 episodes suggesting quality and wellbeing disappointments. Among these occasions, 49 structures fallen as a result of ill-advised materials and procedure concerns (Chen and Luo, 2014).

Maintenance costs and operating efficiency of a venture are legitimately relative to development quality. By and large where there is low quality in development, calamitous disappointment isn't the outcome; rather, there is an expansion of upkeep fix expenses to the proprietor (Treadwell 1971). Its specific to specify that monetary advantages are subject to quality control, implying that financial achievement is influenced when there is no quality control. Over the long haul, the all-out expense of development and lifetime upkeep of all structure industry things is short of what it would have been without quality control and that expanded protection and support would discredit any reserve funds because of the exclusion of value control (Treadwell, 1971). The usage of value practices prompts an increasingly powerful utilization of expense and assets on a building site in light of the fact that less modify is vital. This eventually prompts effective venture conveyance by guaranteeing quality is accomplished while working inside the task spending plan and degree.

Architectural Appearance (aesthetics) is the clearest indication of value control. (Treadwell, 1971). Low quality control can bring about failures in uncovered structural cement due to poor union, splits showing up in dividers, curves resembling "square shapes", paint stripping off completed surfaces, among others. In open work extends the venture appearance will be the main factor in guaranteeing the overall population that they have gotten their cash's value and the property can be utilized without representing any superfluous risk to the general population.

Lastly, quality is needed for competitiveness and survival of an organization, which is one of the key reasons why quality is needed in the execution of construction.

2.5 COST OF QUALITY

There are two distinct views on what constitutes the cost of quality; these are the cost incurred in ensuring that quality is achieved (prevention cost and appraisal cost) and the cost incurred and or the loss of revenue due to poor quality of work (deviation cost). Quality related expense is officially characterized as: "Cost in guaranteeing and guaranteeing quality just as misfortune acquired when the quality isn't accomplished (English Standard BS4778). Counteractive action expenses are those subsequent from exercises used to keep away from deviations or mistakes and these incorporate preparing, examination, preventive activity and so on., while evaluation costs comprise of expenses brought about from exercises used to decide if an item, procedure, or administration fits in with built up necessities and these incorporate structure audits, planning of drawings, materials investigation, survey of administrative prerequisites and so on. Deviation expenses are those subsequent from not meeting the necessities. As per Arditi and Gunyadin, (1997) some deviation expenses are acquired on the undertaking site because of scrap, revamp, disappointment investigation, re-review, provider blunder, or value

decrease because of resistance. Other deviation expenses are brought about once the proprietor claims the built office. These incorporate expenses for modification of protests, fix costs, costs for taking care of and supplanting rejected material, workmanship or gear costs for adjusting blunders, and suit costs. Different expenses of value incorporate the loss of income because of postponement and non-conformance, lawful and medicinal expenses because of mishaps among others.

2.6 THE STANDARDS OF QUALITY

reports used to characterize satisfactory conditions or practices and to give a gauge to guaranteeing that conditions or practices meet the adequate criteria is known as principles. By and large norms characterize least criteria; world class quality is, by definition, past the standard degree of execution. Norms can be composed or unwritten, willful or obligatory (Pyzdek, 1999). The term gauges were additionally characterized as a kind of perspective base that is required to pass judgment on the sufficiency of a quality framework. He further iterated that a "quality framework needs to cover every one of the exercises prompting the completed item. Contingent upon the extent of activity of the association, these exercises incorporate arranging, structure, improvement, acquiring, generation, review, stockpiling, conveyance, and after-deals (Chung,1999).

2.6.1 Importance of Standards

There several importance of standards which helps in the contribution of quality requirement expected. Some of these standards were explained below as stated by Pyzdek, (1999) on the importance of quality standards:

- **Standards instruct** - They put forward standards or objectives for the direction of producers and clients the same. They are priceless to the producer who wishes to enter another field and to the credulous buyer who needs to purchase another item.
- **Principles disentangle** - They decrease the quantity of sizes, the assortment of procedure, the measure of stock, and the administrative work that to a great extent represents the overhead expenses of making and selling.
- **Standards moderate** - By making conceivable enormous scale generation of standard plans, they empower better tooling, increasingly cautious structure, and progressively exact controls, and along these lines lessen the creation of inadequate and surplus pieces. Guidelines likewise advantage the client through lower costs.
- **Standards give a base whereupon to confirm** - They fill in as corridor signs of value which are of limitless incentive to the sponsor who focuses to demonstrated qualities, and to the purchaser who sees the licensed trademark, nameplate, or mark.

2.6.2 International Organization for Standardization (ISO)

ISO is the world's biggest engineer and distributor of Worldwide Norms. The Geneva based Universal Association for Institutionalization originally distributed a progression of gauges in 1987. They are in charge of a progression of universal norms managing item structure, creation, conveyance, administration and testing. An organization enrolled as conforming to ISO models hosts exhibited to a licensed third gathering (an affirmed outside reviewer) that its procedures have been recorded and that the organization is efficiently evaluating and being examined that they are following the arrangements and techniques important to deliver amazing items. ISO guidelines are coordinated towards improving an association's creation forms.

The ISO 9000 was presented in the late 1980s and its ubiquity proceeds with today. The arrangement contains two fundamental sorts of standard: those tending to quality confirmation and those tending to quality administration. The quality confirmation guidelines are intended for legally binding and evaluations purposes and are ISO 9001, ISO 9002, and ISO 9003. The quality administration standard is ISO 9004 and is intended to give direction to organizations creating and executing quality frameworks.

2.7 QUALITY MANAGEMENT

The constant quest for approaches to counteract deformities is known as the management of quality. This is worried about forestalling issues by making the frames of mind and condition that make avoidance conceivable. Quality administration incorporates quality control and quality confirmation, just as the extra ideas of value strategy, quality arranging and quality improvement. Quality administration in development suggests keeping up the nature of development works at the required standard in order to get clients' fulfillment for long haul aggressiveness and business survival. Ozaki (2013) distinguished a three-overlay significance of value the board in development to incorporate taking care of business on schedule; guaranteeing that the essential attributes of the last task fall inside the required determinations; and taking care of business inside spending plan, this is now and then alluded to as the quality set of three. It includes proceeded with assessment of the exercises of arranging, structure, advancement of plans and particulars, publicizing and granting of agreements, development, and upkeep, and the connections of these exercises. Advantages of value the board incorporate higher consumer loyalty and profitability (Akinola et al., 2012). Quality administration includes affirmations that the structure or item will fulfill the expressed or suggested necessities for which it was embraced.

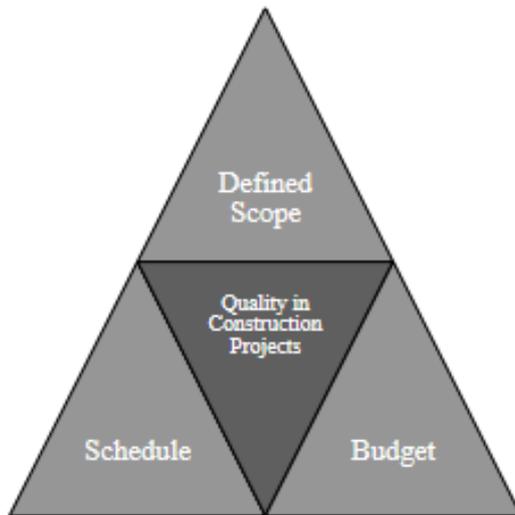


Figure 1: Construction project trilogy (Pialles 2017)

2.7.1 Quality Assurance

The American society for Quality (ASQ) characterizes quality affirmation as "all the arranged and methodical exercises actualized inside the quality framework that can be shown to give certainty an item or administration will satisfy necessities for quality. In the event that structures are to be without inconvenience, more consideration should be given to applying quality confirmation standards to plan and site-work, including venture choice and detail, and to supervision of the taking care of and assurance on location (Atkinson, 2005). As per Ferguson and Clayton (1998) Quality Assurance (QA) is a program covering exercises important to give quality in the work to meet the venture necessities. Quality Assurance includes setting up venture related arrangements, methodology, models, preparing, rules, and framework important to deliver quality. The structure proficient and constructor are in charge of building up a suitable program for each undertaking. (QA) gives insurance against quality issues through early alerts of issue ahead. Such early admonitions assume a significant job in the avoidance of both interior and outside issues. Quality affirmation covers all exercises from plan, improvement, creation/development,

establishment, and adjusting to documentation, and furthermore incorporates guidelines of the nature of crude materials, congregations, items, and parts; administrations identified with generation; and the board, generation, and examination forms, (Rumane, 2011).

2.8 QUALITY CONTROL

Gryna (2001), clarifies 'Quality Control' as a procedure through which a business looks to guarantee that item quality is kept up or improved and fabricating blunders are diminished or dispensed with. Gryna (2001) additionally alluded to quality control as the procedure utilized to reliably fulfill guidelines. The control procedure includes watching genuine exhibitions, contrasting it and a few benchmarks, and afterward making a move whenever watched execution is essentially not the same as the standard.

Quality Control in construction as characterized by Rumane (2011) is checking of executed or introduced attempts to affirm that works have been performed or executed as indicated, utilizing determined/endorsed materials, establishment techniques and determined references, codes, principles to meet expected use. A lot of differing approaches, means and procedures can be incorporated into both quality control and also the developmental stages. These approaches are mainly used to invent a concept, stimulate a preparation process, detect the cause, foster appraisal whilst generating a high level of diversity in circumstances for continual quality advancement. A major aspect of quality control is the establishment of well-defined controls. These controls help standardize both production and reactions to quality issues. Limiting room for error by specifying which production activities are to be completed by which personnel, reduces the chance that employees will be involved in tasks for which they do not have adequate training.

2.9 PRODUCTION FACTORS OF CONSTRUCTION QUALITY CONTROL

Human control

The effect of humans in construction cuts across every aspect of the construction process. From funding, designing, drafting of contracts, operating machinery and pouring of concrete, humans are present and therefore play a vital role in ensuring quality is achieved. The general quality and individual capacity of human will decide the consequences of every single quality action. Along these lines, human is considered as both the controlled targets and controlling inspiration of other quality exercises (Cao Ying, 2010). The substance of human control includes the general nature of association and person's learning, capacity, physical condition, mental state, quality awareness, conduct, idea of authoritative order, and expert morals.

2.9.1 Materials control

Another major and essential component of construction is materials. These could be raw materials, finished products, semi-finished products, components and parts. Material quality has a direct impact on construction quality. The main actions taken to control the quality of materials include material procurement, material inspection and testing and proper storage, (Cao Ying, 2010).

2.9.2 Material procurement

Involves the purchase materials in view of the incorporated thought of building qualities, development necessities, the exhibition and cost of materials. The acquisition ought to be organized ahead of time as indicated by the development plan. It should also be ensured that purchase orders, materials received and invoices match, (Cao Ying, 2010).

2.9.3 Material inspection and testing

Involves checking to ensure there is no disparity between purchase orders, and invoices and actual materials received. It also involves a progression of discovery strategies by contrasting the material information with quality benchmarks, to pass judgment on the dependability of value materials, and whether they can be utilized for designing. Testing review is ordinarily utilized (Cao Ying, 2010).

2.9.4 Storage and usage

Is a critical material control process because the right materials could be procured and dully received but the quality of these materials may deteriorate if not properly stored. Agglomeration of wet cement, corrosion of steel, and mixing of similar materials (nails, reinforcements etc.) of different sizes amongst others are some of the problems related to poor material storage, (Cao Ying, 2010). The contractual worker should likewise make sensible game plan to abstain from overloading bunches of materials on location. Then again, materials ought to be put away with signs for the various classes, and with assessment and supervision on location when being utilized.

2.10 QUALITY AND CONSTRUCTION PERFORMANCE

In the 21st century innovative progressions have joined second to none to make quality mindfulness which has increased critical acknowledgment on development execution, and this is in the area of real estate. Total quality management within real estate industry has resulted in developments in quality, efficiency and effectiveness through strategic administrative process in order to produce goods of high value to meet the vibrant market Matthews et al., (1991). Hence, continual sustainable development of several industries has its roots planted deeply in quality. Therefore, these industries possess market

opportunities since they have established competitive capabilities which makes them exert positive influence on the general performance of industries. David & Gunaydin (1997), Anderson et al., (1994). Therefore, one approach of enhancing the maintenance of quality administration is to place more value on the creation of goods. Due to the high value which is placed on goods, it tends to create challenges for firms because of the execution of that particular quality procedure. The system of high value has become the centre of evaluating success of businesses in this dispensation. In addition to the views of Narver & Slater (1990), the alignment of a market is targeted at organising activities that puts the consumer first. All the same, the quality of a product has been enriched in terms of value in order to satisfy the client. The comprehensive nature of the market has witnessed an upsurge in demands from customers regarding products of high quality Anderson et al., (1995). Consequently, both present and future problems concerning quality has been thought through strategically by real estate firms in order to avoid negative effect on the performance of the industry. As a result of real estate industries making the most out of quality, they also stand a chance to enjoy the profits accrued from quality methods. These profits are applied to business in a way that will expand the quality of the business, meet the needs of clients as well as decrease the rate of construction. This has consequently led to the adoption of several alterations in machineries by industries in the real estate sector in order to create value in bulk production, six sigma and average ISO 9000 Mohamed et al, (2014).

2.11 Factors that hinders the implementation of quality control practices

The building construction sector is a kind of field of work that usually encounters issues which deals and mostly affects the amount produced. Before the start of any building contract, it is critical to detect potential factors that might negatively harm quality, in so

doing these factors can be curbed right away and this foresight activity will certainly lead to contentment on the part of the purchaser when the project comes to an end. Pinpointing these acute elements however, will not entirely prevent the disaster it comes with but rather aid the group of contractors to align their skills to the right measurements and stipulations of the contract and largely limit the probable blunders and miscalculations that comes along with it so that a re-work won't be called upon by consultants. Revising the collected works which makes mention of possible points that upset the performance of quality according to Arditi & Gunaydin, (1998) as quoted by Jha & Iyer, (2006) categorizes among other causes; absence of techniques by administration to yield to sustainable quality progression, inadequate workforce who are trained, lack of visionary leadership; scare and insufficient contributors on the team and shareholders as the basic problems affecting the procedure of quality. Looking at the glitches regarding the rate and worth of construction as studied by Tengan (2014) and similarly; practices that are deceitful and shares; the inability of management to prolong and preserve their concern and obligation; ignorance on the subject of what quality entails, the condition of lack of trust about the plans of leaders, incapability of quantifying the helpfulness of quality maintenance, mismanagement of time, unhealthy cooperation; absence of strategic opponents, when there is little or no solidarity between stylists and contractors, unintelligible handling of finances on site, uncontrollable amount of waste on the premises, past track record of numerous alterations of designs of the outworker which decreases the outcome of quality. Tengan, (2007) classifies the limited intellect on mechanical and proficient skills and means to get a task done, lackadaisical attitude of employees, the educational factor needed to make the progression process a reality was missing during his studies on the practices on quality assurance of certain chosen firms in the capital of Kumasi located in Ghana. Some identified challenges cover the poor competence of the site manager, lapses in

communication structures, lack of appointment of a site leader, inability to organize team members, miscalculations in scheduling and control systems, unsatisfactory gaps in giving and receiving data.

2.12 STRATEGIES FOR MANAGEMENT OF QUALITY CONTROL IN THE CONSTRUCTION INDUSTRY

In the study of Cao Ying, (2010), he stated that treatment of quality problems is wisely dealt with by carrying out research established on the accurate exploration and conclusion of the source of the problem. Per the cause and severity of downsides of quality, there are four different types of strategies as mentioned by (Cao Ying, 2010), these are:

1. Overhaul

Majority of people have resorted to this curbing alternative. This is mostly used when there are flaws or in other words, the quality of some parts of the project do not meet standards or design requests. In this situation, the result of reparation management can be made if the repairs will ensure the requirements are met.

2. Rework

It is worthy to state that the conclusion of a work can be remade in a situation whereby the particularly known and recognized dimensions of a good quality work has not been meet and because of that it's substantial value and usage is undermined since it possesses threats on the security and protection of the edifice and its dangers cannot be rectified using the overhaul tactic.

3. Practice restriction

In instances where modification cannot be amended in the current condition and the project cannot match up to the full standard concerning the usage of security requirements by the overhaul mode, constraints on the usage can be implemented.

4. Avoidance of treatment

In addition, when the project work has trivial impact on the routine and shelter of the edifice even after caution has been applied when the quality principles and criteria do not meet that of the project quality, the choice of no superior treatment can be derived.

2.12.1 Treatment of quality problems in construction

Mostly the challenges accompanied with quality is separated into two categories namely; flaws and basic issues. Flaws in quality construction simply means the state of occurrence where standards of technicality fall below the expected as against the set technical pointers. Basic issues on the other hand speaks of issues derailing organizations, roles and customs of construction. The types of development quality issues are extraordinary and shifted, however the reasons can be essentially condensed in the accompanying perspectives, (Cao Ying, 2010).

1. Issues concerning the development strategies and guidelines.
2. Issues of plan and counts.
3. Unsatisfactory materials and items
4. The influence of natural conditions.
5. Improper use of facilities.

The origin of treatment

Cao Ying, (2010) went further to say that the best way to tackle difficulties surrounding quality is first to bring out the causes and thereafter suggest the various methods of solving these difficulties through evaluation and examination process. Before arriving at a decision, there should be thorough investigation and collection of precise data since that will be the ground work for concluding on any chosen method. The following stated information is essential for dealing with concerns regarding quality

1. Sketches of buildings linking to the quality problem.
2. Documents, statistics and archives gathered in the aspect of construction, for example pamphlets relating to construction supplies, assessment papers of different transitional products, test records and building accounts.
3. Enquiry accounts of quality problems and investigations should include cause, time of occurrence, location, description, the record of observations etc.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter is the methodology of the research. The strategy for the research, techniques, design and methods are also discussed including collection of data, analysis and presentation of the analytical tools to be used. This chapter also explains the determination of the sampling size, sampling population and data analysis method.

3.2 RESEARCH STRATEGY

According to Weisberg and Bowen, (1997), there are two approaches that are well known, and these are qualitative and quantitative research. They have certain differences in numerous ways however can supplement one another. The decision to pursue a particular methodology can be affected on the goal of the research, (Naoum, 2002). The selected research method is explained below:

3.2.1 Quantitative research

The quantitative procedures also have the capability to make good use of group of persons that are small to make inferences about greater group of persons that would be excessively costly to the research. Therefore, the quantitative study is objective in nature and dependent on a theory made out of factors being tested (Naoum 2002). Several characteristics considered for quantitative research comprise of: “it numerical characteristics, its use of statistics or mathematics; non-descriptive and it uses numbers, it is also a repetitive procedure in which data is assessed; the results are frequently showed in tables and graphs. (Rajasekar et al., 2006). In a quantitative research according to Matveev, (2002), the approach evidently identifies the self-determining, mediating and the

dependent elements under investigation. The quantitative procedures also have the capability to make good use of group of persons that are small to make inferences about greater group of persons that would be excessively costly to the research. Results and its validity is dependent on the careful choice of evaluating instrument and how precisely it target are being measured (Weisberg and Bowen, 1997).

As stated initially this study selected the quantitative approach which will be used in reaching the goal of the study.

3.3 POPULATION OF STUDY, SAMPLING AND SAMPLE SIZE

The targeted population for the study were construction professionals on KNUST Campus, Kumasi. This is because, these respondents provided knowledgeable judgments on the issues involved with quality control practices in building construction project management. The targeted professionals include: Project managers, architects, contractors, engineers, and quantity surveyors, and site managers.

A method or procedure for choosing an appropriate sample, is normally termed as sampling (Fugar and Agyakwah-Baah, 2010). The convenience sampling technique was selected for this study. This is a non-probability sampling technique, whereby in this type of sampling, the researcher is allowed to choose, available and prepared respondents for the study. The researcher adopted this sampling technique because it helped grasp respondents that are ready to answer the given questionnaire.

In obtaining a sample size, the researcher by using the convenience sampling technique, gave out ten (10) questionnaires each to the selected group of respondents who were prepared in answering the questionnaire, these group of respondents were: Project

managers, architects, contractors, engineers, and quantity surveyors, and site managers, (10 × 6 = 60). In all, the study obtained a sample size of sixty (60) in conducting the study.

3.4 DATA GATHERING AND INSTRUMENTATION

3.4.1 Questionnaire Design

An official set of questions used in getting information from respondents is known as questionnaires. In questionnaires, Frazer and Lawley, (2000), states that the questions might be close-ended, open- ended, or both. There are four methods of administering questionnaires: mail questionnaires, telephone questionnaire, internet questionnaire and personally administered questionnaire. In attaining the various objectives of the study, the questionnaire was specifically presented in line with the studies objectives. The questionnaire used in this research entailed four parts. Part A which is the demographic background will be made up of questions that are close-ended in nature. Part B, Part C and Part D which is made up of tables that have close-ended questions are also based on the objective of the study. A five-point Likert scale was adopted in this study to measure the response of each respondent. According to Bertram (2007), Likert scale is a psychometric response scale mostly adopted in questionnaires; it aids the researcher to easily ascertain the degree to which a respondent agrees with a statement.

3.4.2 Instrument Administration

The researcher will personally administer the questionnaire to the respondents, where by it will be ensured that all respondents receive the questionnaire. Follow ups were conducted to retrieve the questionnaires.

3.5 DATA PREPARATION AND ANALYTICAL TOOLS

Individual responses were aggregated into units that are large, which were well analyzed by the help of the Relative Importance Index. All data were gathered and based on the analytical tool selected, the data were analyzed. Data Analysis took place to show the most important factors under each objective. Presentations will be aided by the help of Microsoft Excel.

3.6 DATA COLLECTION INSTRUMENT

Collection of data instrument is the questionnaire. Close-ended questions were inclusive in the questionnaire where by the respondents were asked to tick the answer that is suitable, and also based on their level of understanding. The questionnaires were allocated into several divisions to get the serious areas signified out in the objectives for the research. Explanation of the questions was given to the respondents after the questionnaire has been given to them, and this is in a way of guiding them to understand the questionnaire and bring out their individual answers and opinions to the research study. To have a dependable and valid data, the researcher ensured that the questionnaires is well organized to the understanding of the respondents. A total of sixty (60) questionnaires will be sent out and distributed to the construction professionals.

3.7 TECHNIQUES FOR DATA ANALYSIS

Consistency was checked for data collected; this was done based on the answers specified by the respondents in the questionnaires gathered. Data gathered were coded and analyzed using the selected analytical tool. These tools comprised of the descriptive statistics and relative importance index.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

This chapter offered the analysis of data and discussion of results. The chapter have also been considered to meet the objective necessities for the research. And this was to identify the quality control practices used in construction projects, the factors that hinders the implementation of quality control practices during the execution of construction projects, and to recommend strategies for effective management of quality control in the construction industry. The study was analysed using the Relative Importance index for data gathering, narrating and analysis. Results of the data is presented in this chapter and discussions in tabular forms with results discussed. The study administered sixty (60) questionnaires but based on time constraints the study received forty-five (45) back, which was 75 percent of the data sent out. This percentage of results was analysed to reach the outcome of the study.

4.2 SECTION A: PRESENTATION AND DESCRIPTIVE ANALYSIS OF DATA (DEMOGRAPHIC)

The questionnaire included this part which sorted basic information to detail out respondent characteristics. Data included their profession, the level of education, years of practical working experience do you have in the construction industry, years working with current organization and other relevant information needed by the researcher. This was to help the researcher have much information about the respondents and their level of knowledge in this subject area.

4.2.1 Level of education

Respondents level of education was very vital to the study, this is because the questionnaire was first structured in English and also had some technicalities in the research area that need some level of education to understand. The question was presented to respondents on their educational level and from the Table below (4.1), 22 percent have their HND, 48.9 % have their Bachelor degree, then 20 % have their postgraduate degree, the table also showed that 8.9 % of the respondents have their PhD. The data results prove rightfully that respondents understood the questionnaire given and answered them.

Table 4.1: Level of education

| Education | Frequency | Percent | Cumulative Percent |
|--------------|-----------|---------|--------------------|
| HND | 10 | 22.2 | 22.2 |
| Degree | 22 | 48.9 | 71.1 |
| Postgraduate | 9 | 20.0 | 91.1 |
| PhD | 4 | 8.9 | 100.0 |
| Total | 45 | 100.0 | |

Source: Field Survey, (2019)

4.2.2 Profession of respondents

Respondents professions was needed to contribute to the study, their field of work was a vital characteristic as to their knowledge in the area of the study. These respondents were in the construction field but their positions or category of their work was specified in the table below. We can see from the results of data that, in total of about 45 respondents, 22.2 percent were project managers, 6.7 percent were Architects, 17.8 percent were contractors, 33.3 percent were engineers and 20 percent were quantity surveyors. The following results

in the table below makes the various professions of the respondents very clear and understandable.

Table 4.2: Profession of respondents

| Profession | Frequency | Percent | Cumulative Percent |
|-------------------|------------------|----------------|---------------------------|
| Project Manager | 10 | 22.2 | 22.2 |
| Architect | 3 | 6.7 | 28.9 |
| Contractor | 8 | 17.8 | 46.7 |
| Engineer | 15 | 33.3 | 80.0 |
| Quantity surveyor | 9 | 20.0 | 100.0 |
| Total | 45 | 100.0 | |

Source: Field Survey, (2019)

4.2.3 Years of practical working experience do you have in the construction industry

The study looked forward to having experience persons to answer the questionnaire, because of the criteria of the study, the researcher sought in getting experienced officers and professionals in the construction industry. On this platform, the study asked for the level of experience of each respondent. And from the available data result in Table 4.3, 8.9 percent of the respondents have been in the industry for less than two years, 26.7 percent of the respondents have been in the industry between 2 – 5 years, and between 6 to 10 years about 42 percent have had experience in this industry, 22.2 percent of the respondents have been in the construction with experience for more than 10 years and above. The information below brings out results that, about 60 percent of the respondents have been in the industry with experience for more than 6 years and above. And with level of experience, the results of the data from the respondents is reliable.

Table 4.3: Years of practical working experience do you have in the construction industry

| Years | Frequency | Percent | Cumulative Percent |
|--------------------|------------------|----------------|---------------------------|
| Less than 2 years | 4 | 8.9 | 8.9 |
| 2 – 5 years | 12 | 26.7 | 35.6 |
| 6 – 10 years | 19 | 42.2 | 67.8 |
| 10 years and above | 10 | 22.2 | 100.0 |
| Total | 45 | 100.0 | |

Source: Field Survey, (2019)

4.2.4 Years have you been working with your current organization

Based on the information the study gathered from the various construction firms, it was vital for the study to know how authentic the information from the respondents was. Therefore, the study asked for the number of years' respondents have worked in their current company. From the analysis conducted, a few (6.7%) of the respondents have worked with their organization for less than 2 years, 33.3 percent of the respondents have been working with their company for 2 -5 years, about 22.2 percent of the respondents have also worked with their current company to 6 – 10 and 37.0 % currently work with their firms for 10 years and above. Quite a huge percentage of about 58 percent have been with their current company for more than five years, and with this most of the respondent are in a good position to give enough information about their company on the level of quality that they have seen so far in their various firms.

Table 4.3: Years have you been working with your current organization

| Years | Frequency | Percent | Cumulative Percent |
|--------------------|-----------|---------|--------------------|
| Less than 2 years | 3 | 6.7 | 6.7 |
| 2 - 5 years | 15 | 33.3 | 40.0 |
| 6 - 10 years | 10 | 22.2 | 62.2 |
| 10 years and above | 17 | 37.08 | 100.0 |
| Total | 45 | 100.0 | |

Source: Field Survey, (2019)

4.3 QUALITY CONTROL PRACTICES USED IN CONSTRUCTION PROJECTS.

The heading above was the first objective which is to identify quality control practices used in construction projects. A literature review was conducted by the researcher and seven control practices were presented to respondents to rank. Based on respondent's experience and with the help of the relative importance index, the factors were ranked and presented in the table below.

Table 4.4: Quality Control Practices Used in Construction Projects.

| PRACTICES | $\sum W$ | RII | Ranking |
|---|----------|-------|-----------------|
| Long term improvement plans of quality is supported by management. | 218 | 0.968 | 1 ST |
| Management assigning extra significance to quality than any other objective, e.g. cost. | 212 | 0.942 | 2 ND |
| Quality Assurance: Ensuring that policies are developed to promote the satisfaction of customers | 183 | 0.814 | 3 RD |
| Quality Management: Quality issues being reviewed in management meetings. | 165 | 0.734 | 4 TH |
| Quality Inspection: Inspecting at every stage of the work that quality is in line as expected, to help meet customer satisfaction | 144 | 0.640 | 5 TH |
| Quality planning: Identify customer standards and expectations so as to plan towards them and achieve them. | 104 | 0.462 | 6 TH |
| Quality Control: Quality programs being led by management by evaluating and enhancing management system of quality. | 72 | 0.320 | 7 TH |

Source: Field Survey, (2019)

Quality control practices helps in managing quality during the execution of construction work. Quality issues have been a great difficulty in the management of construction works, this is because some construction firms don't consider quality while executing the project, others also consider, but they do not practice effective quality methods that can help in a successful delivery of project. The table above shows quality practices that have been ranked together with their various RII values. Four of the practices were ranked high, and the first ranked practice was *Management to supporting long term improvement plans of quality* with a RII value of 0.968, The second ranked practice was that the *Management assigning extra significance to quality than any other objective, e.g. cost (0.942)*, the third and 4th factors were ranked 0.814 and 0.734 respectively, and these factors were *Quality Assurance: Ensuring that policies are developed to promote the satisfaction of customers* and *Quality Management: Quality issues being reviewed in management meetings*. All the other factors were ranked accordingly and the above factors mentioned were ranked high. Rumane (2011), mentioned these factors in his research that, top management supporting long-term quality improvement plans, quality Assurance which is management developing policies for promoting customer satisfaction and quality planning which is to identify customer standards and expectations so as to plan towards them and achieve them.

4.4 FACTORS THAT HINDERS THE IMPLEMENTATION OF QUALITY CONTROL PRACTICES DURING THE EXECUTION OF CONSTRUCTION PROJECTS.

The third part of the questionnaire presented the factors that hinders the implementation of quality control practices during the execution of construction projects. The factors of this objective was discovered and selected from the literature review conducted by the study. The factors were presented to respondents to know the level at which they agree or

disagree with these seven factors presented to them. The respondents were asked to tick the elements based on their experience and their level of agreement. And the results of this section was also analyzed using the relative importance index and the results of this was presented in the Table 4.6 below. This has been well ranked using the relative importance index.

Table 4.5: Factors hindering the implementation of quality control practices during the execution of construction projects.

| Factors hindering quality control | ΣW | RII | Ranking |
|--|------------|------------|-----------------|
| Lack of management commitment to continual quality improvement | 214 | 0.952 | 1 ST |
| Workers lack information and knowledge on the importance quality | 206 | 0.916 | 2 ND |
| Uncertainties of workers about management's goals | 181 | 0.804 | 3 RD |
| Struggle in calculating the efficiency of quality control | 162 | 0.720 | 4 TH |
| Struggle in evaluating the expectation and expectations of customers | 133 | 0.592 | 5 TH |
| Inadequate training resources. | 101 | 0.448 | 6 TH |
| Poor internal communication | 58 | 0.258 | 7 TH |

Source: Field Survey, (2019).

The factors above in Table 4.7, were discovered and selected from the literature review conducted by the study, the results of the data from respondents were ranked using the Relative Importance Index. Four of the elements were ranked high with high RII values and these were; *Lack of management commitment to continual quality improvement*, *Workers lack information and knowledge on the importance quality*, *Uncertainties of workers about management's goals*, and *struggle in calculating the efficiency of quality*

control. As stated above the factors were ranked with high mean score values and these was done respectfully as follows: 0.952, 0.916, 0.804 and 0.720. The factors ranked high above proves that respondents had detailed experience with the factors given. Even though all the factors were very needed to be looked at, some were also ranked very low, and these factor; Difficulty in assessing customer expectations and satisfaction, Insufficient training resources and Poor internal communication.

Management must ensure to take these factors into consideration and look out for strategies that can help manage these factors influencing construction projects quality levels. Most projects have led to a halt due to clients not being satisfied with work being done, hence the factors above in Table 4.7, are the reasons why quality expected are not attained and therefore there is a need that strategies for minimizing these factors be found and applied, to attain successful project delivery.

4.5 STRATEGIES FOR EFFECTIVE MANAGEMENT OF QUALITY CONTROL IN THE CONSTRUCTION INDUSTRY

The following strategies were discovered and chosen from the literature review, and the help of respondents, the following strategies were ranked. Several literatures were looked out for, and the study arrived eight (8) factors to help manage quality in construction effectively. This was done to achieve the main aim of the study. As stated initially, eight (8) factors were identified in this section and presented to respondents to know the level to which they agree or disagree with these strategies, results gotten from respondents was analyzed using the Relative Importance Index (RII). After the analysis, the strategies were successfully ranked and this helped in attaining the aim of the study. The relative importance index has its own formulae and this comes in this format; $(RII) = \frac{\sum w}{AxN}$ Whereby;

W = the weighting given to each cause by respondents, ranging from 1 to 5, **A**= the highest weight (i.e. 5 in the study), and the **N** = the total number of samples.

Table 4.6: Strategies for effective management of quality control in the construction industry

| Strategies | ΣW | RII | Rank |
|--|------------|-------|-----------------------|
| Team targets towards quality must be attained and vision of the team must be shared. | 213 | 0.946 | 1ST |
| Reworking on that part of the project where quality was not achieved | 202 | 0.898 | 2ND |
| Management of construction, must ensure team work to achieve quality requirement from customer. | 198 | 0.880 | 3RD |
| Cooperated effort and sharing the work load equally across the team to aid attain quality | 163 | 0.724 | 4TH |
| Devotion by team members to comprehend and identify with each other's goals towards clients quality needs | 138 | 0.614 | 5TH |
| Ensuring that any parts of a project that do not meet the standards of quality requirement can choose the decision of repairing to aid in requirements that were not met. | 120 | 0.534 | 6TH |
| A team whose members, size and resources connect to the task given can attain quality | 86.0 | 0.382 | 7TH |
| After analysis and careful consideration, if the issue is minor and considerate, the decision of not attempting at all can be undertaking. This explains that the option of not applying any treatment can be opted for. | 53.1 | 0.236 | 8TH |

Source: Field Survey, (2019)

The following strategies were discovered and selected from the review of the literature conducted by the researcher, the results of the data from respondents were ranked by based on the level of importance, using the relative importance Index. The strategies ranked above by respondents, brings out the comprehensive ideas of respondents in the study

being conducted. Researchers have also looked out for these strategies ranked above and have mentioned the as good measures for ensuring quality management. According to Rumane, (2011), there are some four different treatment options, and these were repairing, rework, use restriction and no treatment. This brings out the point that, certain strategies that were selected by respondents are genuinely effective to factors that hinders quality management in construction. Based on the results from the respondents, the factors were ranked, and four of these strategies were ranked high with the relative importance index values and these strategies includes: *Team targets towards quality must be attained and vision of the team must be shared* (0.946), *Other strategies for ensuring quality even when is not met is the option of reworking on that stage of the project to achieve quality* (0.898), *Management of construction, must ensure team work to achieve quality requirement from customer.* (0.880) and *Cooperated effort and sharing the work load equally across the team to aid attain quality* (0.724).

Team targets towards quality must be attained and vision of the team must be shared.

Most construction teams do not make quality their target, some may have it in their plan but mostly based on time constraints for the projects being execution, the construction teams end up working in a haste to meet time given. Hence, their vision towards quality reduces, based on this management must ensure that quality is set as a first priority when the construction team is on a project. This helps in attaining customer satisfaction and a successful project delivery.

Reworking on that part of the project where quality was not achieved

It was stated by Rumane, (2011) that, considering quality, it must always be ensured that it meets the expected criteria, the moment quality of the project does not meet the expected quality standards that is required, and there are serious quality difficulties with major

impacts on the use and safety of the structure and defects cannot be corrected by any other process, then the decision of reworking on that defects can be done. This can help attain the quality requirement expected.

Management of construction, must ensure team work to achieve quality requirement from customer.

Many at times team work helps in achieving quality and according research results from several researchers, lack of team work have led to different visions towards the attainment of quality. It has always been the main focus of most designers and persons who are a part in the execution of projects to ensure that these things meet the satisfaction of the customer or client (Rumane, 2011). But mostly based on poor team work quality requirement expected are not met, and therefore management of construction must ensure that team work and good communication on site is attained to help bring a successful project delivery with quality attained in reaching client satisfaction.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

The findings of the study in been summarized in this chapter, in regard to quality control practices in building construction project management in Ghana, further studies will also be done into various objectives of the study. In the conclusion of the research, shows further discussions into the results of the study and makes helpful recommendation which will aid in the advancement of quality control practices in building construction project management in Ghana.

5.2 ACHIEVING RESEARCH OBJECTIVES

From the outline the study, the main aim was to identify quality control practices in building construction project management in Ghana. In the achievement of the main aim of the study, the following objectives were set:

5.2.1 First objective: Identify the quality control practices used in construction projects.

Since the study was dealing with the quality control practices in building construction project management in Ghana. the study decided to through some areas of the study, this includes: the definition of quality, history and evolution of quality, the Need for quality, cost of quality, quality management standards, quality management, construction quality control of production factors, factors that hinders the implementation of quality control practices during the execution of construction projects and the treatment of quality problems in construction. From the literature, the study gathered quality control practices that were presented to respondents during the questionnaire survey process, results from

the survey stated that some of the factor as very effective, and these includes; Long term improvement plans of quality is supported by management. Management to supporting long term improvement plans of quality, Management assigning extra significance to quality than any other objective, e.g. cost, Quality Assurance: Ensuring that policies are developed to promote the satisfaction of customers, and Quality Management: Quality issues being reviewed in management meetings. All the practices were ranked by respondents, but these ones ranked high. The objective above was achieved where by respondents supported the research to select some effective practices.

5.2.2 Second objective 2: factors that hinders the implementation of quality control practices during the execution of construction projects.

The second objective of the study focused on factors that hinders the implementation of quality control practices during the execution of construction projects. With the help of the mean score ranking the various factors presented in this section was analyzed after data was collected from the respondents. After the gathering the results of the data, analysis was done, in which the outcome ranked four of the factors very high, this includes: Lack of management commitment to continual quality improvement, Workers lack information and knowledge on the importance quality, Uncertainties of workers about management's goals, and the struggle in calculating the efficiency of quality control. These factors above were ranked respectively from first to fourth. One of the factors was ranked very low and this factor was "poor internal communication". The ranking supporting in achieving the objective, which revealed the main factors hindering the implementation of quality control practices during the execution of construction projects.

5.2.3 Third Objective: Recommend strategies for effective management of quality control in the construction industry.

The study also looked into the strategies that can help manage quality control in construction, and help minimize the factors that hinders quality control implementation in construction. Relative important index was applied to analyze the data. And per the rating of the respondents, the following strategies were ranked as most effective: Team targets towards quality must be attained and vision of the team must be shared, reworking on that part of the project where quality was not achieved and management of construction, ensuring team work to achieve quality requirement from customer. All the other strategies selected from the literature was also ranked in this manner. A few factors were ranked very low. This study was able to achieve all three objectives because, it was finally able to bring out the strategies needed for this study to be achieved.

5.3 CONCLUSION

The aim of the study was to quality control practices in building construction project management in Ghana. It has been observed from the result of the study; top management supporting long term quality improvement plans, top management attaching more importance to quality than to cost and schedule objectives, quality Assurance: Management developing policies for promoting customer satisfaction and quality management: Reviewing quality issues in top management meetings, were the main practices selected in the research. Secondly, failure of management to maintain interest and commitment over a long period, inadequate knowledge and information about quality control, doubts of employees about management's intentions and difficulty in measuring the effectiveness of quality control management were the main factors hindering the implementation of quality control practices. Lastly, in achieving the aim of the study this

were the main strategies for effective management of quality control were: team targets towards quality must be attained and vision of the team must be shared, reworking on that part of the project where quality was not achieved and management of construction, must ensure team work to achieve quality requirement from customer, in which these were the most accurate strategies selected by respondents.

5.4 RESEARCH LIMITATION

Quite a few challenges occurred in the execution of this research, the researcher approved approaches to arrive in achieving the main aim of the study. Challenges encountered includes; the busy schedules of getting respondents as they were busy with work and other activities during the period of data collection. Most appointments during the period of gathering data were rescheduled which in the long run affected the studies duration for completion.

5.5 RECOMMENDATIONS

The following recommendations are deduced from this study:

- It is recommended that all construction firms are to formulate quality assurance policies to ensure that all projects are properly prepared for quality methods and that everyone is committed to executing the performance plans that have been made.
- Members of construction teams must firmly stick to specified requirements being satisfied.
- It is also recommended that the construction sector tighten their recruitment policies to be certain that workers are recruited with the right skill set and that their skills fit tasks correctly.

- It is important to also consider adequate supervision by ensuring that all purchased building materials are of higher quality and also qualifies for material management policies of the company. This will boost successful quality management of the company.
- The research concludes that the quality management of a project is affected by financial resources. However, the study showed that the quality of projects executed is dictated by the financial status of a construction company and their project budget. Hence, it recommended that adequate funds be properly allocated in order to ensure that good quality performance is preserved, particularly when considering the acquisition of good quality materials and good employee remuneration.

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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

QUESTIONNAIRE

**Topic: Quality control practices in building construction project management in
Ghana**

INTRODUCTION

Total quality management today is recognized as an essential necessity for any group to strive in attaining. Several projects have failed based poor quality of work done together with poor project delivery. This has led to researchers to find out ways of keeping quality in the execution of work and this study finds it important to delve into quality control practices in building construction project management in Ghana.

Questions related to quality control practices used in construction projects, factors that hinders the implementation of quality control practices and strategies for effective management of quality control in the construction have presented in this study and with your help the main goal of the study will attained. The information obtained from this research shall be kept unknown and totally confidential. Only for academic purpose and this will be submitted to the relevant authorities. I would like to express my gratitude as you contribute in answering these questions.

Harry Agbeko Harrison-Zotsi

Mobile No: 0209060389

QUESTIONNAIRE

PART ONE: DEMOGRAPHIC CHARACTERISTICS OF RESPONDANT

Please appropriately respond to this questionnaire based on an authentic experience and please answer by ticking [✓] the appropriate cell.

1. What is your level of education?

- HND []
- Degree []
- Postgraduate(MSc/MPhil) []
- PhD []
- Others (please specify)

2. What is your profession?

- Project manager []
- Architect []
- Contractor []
- Engineer []
- Quantity surveyor []
- Others (please specify)

3. How many years of practical working experience do you have in the construction industry?

- Less than 2 years []
- 2-5 years []
- 6-10 years []
- 10 years and above []

4. How many years have you been working with your current organization?

- Less than 2 years []
- 2-5 years []
- 6-10 years []
- 10 years and above []

PART TWO

QUALITY CONTROL PRACTICES USED IN CONSTRUCTION PROJECTS.

Based on the review of literature, factors on quality control practices used in construction projects. From practical experience in project activities, please tick [✓] the suitable box.

Key: 1=Least important; 2=Fairly important; 3=Important; 4=Very important; 5=Most important.

| S/N ^o | QUALITY MANAGEMENT PRACTICES | Degree | | | | |
|---|---|--------|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| TOP MANAGEMENT COMMITMENT AND LEADERSHIP | | | | | | |
| QMP1 | <i>Quality Inspection:</i> Inspecting at every stage of the work that quality is in line as expected, to help meet customer satisfaction | | | | | |
| QMP2 | <i>Quality Control:</i> Management actively leading and directing quality management programs and assuming responsibility for evaluating and improving quality management system. | | | | | |
| QMP3 | <i>Quality Assurance:</i> Ensuring that policies are developed to promote the satisfaction of customers | | | | | |
| QMP4 | <i>Quality Management:</i> Reviewing quality issues in top management meetings. | | | | | |
| QMP5 | <i>Quality planning:</i> Identify customer standards and expectations so as to plan towards them and achieve them. | | | | | |
| QMP6 | Long term improvement plans of quality is supported by management. | | | | | |
| QMP7 | Top management attaching more importance to quality than to cost and schedule objectives. | | | | | |

Please specify, if there are other suggestions

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PART THREE

FACTORS THAT HINDERS THE IMPLEMENTATION OF QUALITY CONTROL PRACTICES DURING THE EXECUTION OF CONSTRUCTION PROJECTS. Please select the appropriate response according to the level to which you agree with these factors. (Please tick the suitable cell). [Where Strongly Disagree = SD (1); Disagree = D (2); Neutral = N (3); Agree = A (4); and Strongly Agree = SA (5)]

| No. | FACTORS | Scale | | | | |
|-----|---|-------|-----|-----|-----|-----|
| | | (1) | (2) | (3) | (4) | (5) |
| 1. | Workers lack information and knowledge on the importance quality | | | | | |
| 2. | Doubts of employees about management's intentions | | | | | |
| 3. | Lack of management commitment to continual quality improvement | | | | | |
| 4. | Difficulty in measuring the effectiveness of quality control management | | | | | |
| 5. | Poor internal communication; | | | | | |
| 6. | Difficulty in assessing customer expectations and satisfaction | | | | | |
| 7. | Insufficient training resources. | | | | | |

Please specify, if there are other suggestions

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PART FOUR

STRATEGIES FOR EFFECTIVE MANAGEMENT OF QUALITY CONTROL IN THE CONSTRUCTION INDUSTRY

Quality control ensures maximum customer satisfaction, below are a number of strategies that can be helpful to ensure quality control in the construction industry. Please answer by ticking [✓] appropriate box. [Where Strongly Disagree = SD (1); Disagree = D (2); Neutral = N (3); Agree = A (4); and Strongly Agree = SA (5)]

| No. | STRATEGIES | Scale | | | | |
|-----|--|-----------|----------|----------|----------|-----------|
| | | SD (1) | D (2) | N (3) | A (4) | SA (5) |
| 1. | Management of construction, must ensure team work to achieve quality requirement from customer. | | | | | |
| 2. | Team targets towards quality must be attained and vision of the team must be shared. | | | | | |
| 3. | Cooperated effort and sharing the work load equally across the team to aid attain quality | | | | | |
| 4. | Devotion by team members to comprehend and identify with each other’s goals towards clients quality needs | | | | | |
| 5. | A team whose members, size and resources connect to the task given can attain quality | | | | | |
| 6. | Ensuring that any parts of a project that do not meet the standards of quality requirement can choose the decision of repairing to aid in requirements that were not met. | | | | | |
| 7. | Other strategies for ensuring quality even when is not met is the option of reworking on that stage of the project to achieve quality | | | | | |
| 8. | After analysis and careful consideration, if the issue is minor and considerate, the decision of no special treatment can be made. This explains that the option of not applying any treatment can be opted for. | | | | | |

Please specify, if there are other suggestions

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THANK YOU FOR YOUR TIME