AKENTEN APPIAH-MENKA UNIVERSITY OF SKILL TRAINING AND ENTREPRENEURIAL DEVELOPMENT

ASSESSING THE QUALITY MANAGEMENT PRACTICES OF BUILDING ELECTRICAL SERVICES CONTRACTORS IN GHANA

ALFRED BOHAM

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A Thesis in the Department of Construction and Wood Technology Education, Faculty of Technical Education, submitted to the School of Graduate Studies, Akenten Appiah-Menka University of Skill Training and Entrepreneurial Development, in partial fulfilment of the requirements for award of the Master of Philosophy (Construction Management) degree

MARCH, 2022

DECLARATION

STUDENT'S DECLARATION

I, ALFRED BOHAM declares that this thesis, with the exception of quotations and references contained in published works which have all been identified and acknowledged, is entirely my own original work and it has not been submitted either in part or whole, for another degree elsewhere.

Signature..... Date..30-01-2023.....

SUPERVISOR'S DECLARATION

I hereby declare that the preparation of the thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the Akenten Appiah-Menka University of Skill Training and Entrepreneurial Development.

Name of Supervisor: Dr. Nongiba Alkanam Kheni

Signature..... Date..January 30, 2023.....

DEDICATION

I dedicate this thesis to my wife, Stella Nyarko-Afriyie and my sister, Joyce Ofori Manso.

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ABSTRACT

Quality management has increasingly been adopted by construction companies as an initiative to solve quality problems and to meet the needs of the final customer. However, poor quality performance of construction projects due to poor implementation of effective quality management practices is major concern in the construction industry. The aim of the study was to assess the quality management practices of building electrical services contractors in selected regions in Ghana. A cross sectional descriptive survey design was used for the study. The target population of the research comprised site managers of all service contractors registered with their respective associations in the selected regions (Ashanti Region, Bono East Region). Purposive sampling technique and snow ball sampling techniques were used to select the study's respondents. The findings of the study suggest that the level of implementation of quality management practices among building electrical services contractors for attaining high quality standards was acceptably high. The survey respondents demonstrated a general awareness of the need for effective quality management practices. The study revealed that the most significant role of main contractors in building electrical services contractors' quality performance included proper and more effective planning followed by training services contractors' personnel on quality issues, enhance reputation of the project team members/client, effective/efficient site management, ensuring general and special attendance for services contractors meets their needs, and certifying works carried out by services contractors. Also, findings suggest that the most significant barriers inhibiting the application of quality management included; lack of regular or intermittent training and workshop for capacity building, lack of adequate resources and low skill levels of building electrical services contractors' personnel. The study established that there is a statistically significant and positive correlation between quality management practice of building electrical services contractors and construction project delivery. It was recommended among others that efforts should be made by the top management of construction firms to create a quality management culture throughout the entire organisations.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The construction industry is a complex and challenging industry owing to the technical advances, tighter regulations and need for effective management of resources for competitive edge. Construction projects involve many parties namely the contractors, consultants, clients, suppliers, subcontractors and other project parties (Quentin et al., 2017). Construction projects have become increasingly complex due to their increasing size and use of state-of-the-art technologies (Koppenjan et al., 2011). Subcontracting is a common practice in the construction industry. Subcontracting has been defined as the act of general contractors hiring specialty contractors to help them overcome problems on the jobsite (Koppenjan et al., 2011). These problems include the need for special expertise, shortage in resources of the general contractor, and limitation in finances.

Subcontractors perform specialized duties, which enable them to cut costs and possess a higher level of efficiency (Elazouni & Metwally, 2000). Hinze and Tracey (1994) specified that the general contractor oversees the work performed by subcontractors on the project. As such, the general contractor is perceived as providing guidance and coordination for the subcontractor. Main contractors often require subcontractors for assistance on large, specialized or diversified projects when they do not have the resources on hand or need additional expertise. In these instances, hiring an expert to work on one or more short-term projects can be beneficial in terms of cost, quality and efficiency. Similarly, most main contractors cannot afford to keep an assortment of full-time skilled craftsmen on their payroll, nor can they feasibly own, operate, and maintain the variety of specialized equipment needed on projects. Subcontractors can make the

cost of a project more reasonable by maintaining contracts with material suppliers, manufacturers, distributors, and manufacturer's representatives.

McCord and Gunderson (2013) indicated that on any particular project, general contractors may rely on a number of subcontractors to execute specific works such as construction works, electrical works, mechanical works, drywall, roofing, steel erection and so on. Subcontractors usually are specialist in the execution of a specific job, supplying manpower, equipment, tools, and designs (Colin & John, 1994). Subcontractors are responsible for the execution of part of the workmanship, acting as agents of the production system of the contracting company. Subcontractors play a significant role in construction industry. The relationship between the general contractor and subcontractors is one of the keys to any successful construction project. According to (Colin & John, 1994) ninety percent of construction work is done by the subcontractor in many construction projects, which means that only ten percent of the construction work is physically left to contractor to execute.

Construction quality management is one of the pillars of project management and project delivery. Good construction management can decrease the number of errors and rework in a project, leading to early successful completion of projects, which can help contractors maintain a good relationship and reputation with the clients (Noventry, 2018). The subject of quality management practice in electrical construction cannot be over emphasized since building facilities contribute the largest to national development (Farcoqui et al., 2008). In the Global marketplace, increased levels of competition have resulted in quality becoming of increasing importance to organizations and consequently, Quality Management has become a key management issue. A considerable number of industries are applying quality management and the topic is the

subject of many books and papers. Today Quality Management appears to be a well-accepted system of management (Dey, 2016). For this reason, any organizations that do not pay sufficient attention to the competitive importance of quality are unlikely to survive for long.

Quality Management involves everyone in the organization in the effort to improve performance. In addition, Quality Management permeates every aspect in an organization and makes quality a tactical objective. It is achieved through an integrated effort among personnel at all levels of the organization to increase customer satisfaction by continuously improving performance. It focuses on process improvement, customer and supplier involvement, teamwork, and training in an effort to achieve customer satisfaction, cost effectiveness, and defect-free work. It provides the culture and environment initiative for innovation and for construction technology advancement.

According to Battikha (2002), construction quality management is a serious factor in determining project acceptance and resultant contractual payment levels. This has made participants in the construction industry to become notably conscious of the role of quality as an essential means to achieve client satisfaction and gaining competitive advantage in the industry. Quality has remained in the forefront amongst factors used to determine the degree of success or failure of a project. This long-term development has made it imperative for all parties involved in construction projects to strive at all times to produce commendable structures (Feigenbaum, 1993).

According to Ansah (2014) an electrical contractor means a person affiliated with an electrical contracting firm or business who is licensed by the National Electrical Contractors Association as either a class A or class B master electrician and who is also

registered with the Energy Commission of Ghana, Electricity Company of Ghana, Northern Electricity Company of Ghana to execute electrical works. Electrical contractor means a person, firm, partnership, corporation, or other entity that offers to undertake, undertakes, submits a bid for, or does the work of installing or maintaining wires or equipment that convey electrical current. Electrical contractor specialties include, but are not limited to: Residential, pump and irrigation, limited energy system, signs, non-residential maintenance, restricted non-residential maintenance, appliance repair, and a combination specialty.

From the perspective of a sub-electrical construction company, quality management in construction projects means maintaining the quality of electrical construction works at the required standard and take advantage of latest technology in order to meet the power needs of consumers and to meet clients' satisfaction that would bring long term competitiveness and business survival for the company (Tan & Abdul-Rahman, 2005). Likewise, quality management on the part of an electrical contractor should ensure that contractors take advantage of the latest power management technology capable of saving their clients thousands on their power bill. Further to this, Olatunji (2012) also reiterated that the term quality management as used in the construction industry is all encompassing and embedded in the phenomenon itself and are concepts such as quality control, quality assurance, quality improvement, quality standards etc. James (2008) specified that quality mean how good the product or the service satisfies the customer specifications, either stated or implied.

From the classification, it is clear that quality should be characterized as the element that meets or exceeds customer needs and wants and the features comprising quality include performance, features, durability, aesthetics and service quality (Lian, 2001).

The coordination of large construction projects is a complex task. Due to the increasing interconnection between components and to the specialization of contractors, a large number of participants and their work must be organized. Planning is the most important means by which project planners control the entire process (Bielefield 2008). The large number of details and inability to foresee all circumstances that will occur in the course of a project require that a series of plans of increasing detail be developed, beginning with a design concept and progressing through short term schedules that coordinate the work on a weekly or daily basis (Hinze 2004).

Baisie (2018) indicated that quality management is the sum of all management activities, including planning, organization, implementation, inspection, monitoring, auditing and others, in order that the quality of product can satisfy the updating quality requirements. A project management process is the management process of planning and controlling the performance or execution of a project. Traditionally, project management includes a number of elements. Regardless of the methodology or terminology used, the same basic project management processes will be used. Quality management is a key pillar of overall construction project management, and is often the difference between company's success and failure. Quality management in construction is the policies, processes and procedures put in place typically by management to deliver quality to its customers weather those customers are client, contractors or subcontractors on consistent and constantly improving basic (Sitemate, 2018). Quality has remained in the forefront among factors use to determine the degree of success or failure of a project. This long-term development has made it imperative for all parties involved in construction project to strive at all times to produce commendable structures (Feigenbaum, 1993). Quality is obtained if the stated requirements are

adequate and if the completed project conforms to the requirements (Arditi & Gunaydin, 1997). American Society of Civil Engineers (2005) stated that quality can be characterized as follows; meeting the standard of the client as to functional adequacy, completion on time and within budget, lifecycle cost, and operational maintenance. The management of quality in a construction firm is not an isolated activity, but intervene with all the operational and managerial process of the company. In other words, quality performance improvements are expected to increase the productivity and profitability of contractor as well as increasing client satisfaction.

1.2 Statement of the Problem

According to Koda (2010), the major weakness of construction firms in Ghana and Nigeria are in the areas of staff training, awareness, skills and natural use of total quality tool techniques. Also, the issue of services contractors engaging the services of quark personnel, use of inferior electrical installation materials all in the bid to cut down cost which usually result in accident and death during and after the construction process. Battikha (2002) stated that the lack of quality due to deficiency in construction quality management practice is detected through nonconformance to establish requirements. Quality-related problems during construction can be projected on the operating life of the finished project. To an electrical sub-contractor, nonconformance can yield penalties as well as cost time burdens for re-work, which can convert into productivity loss (Battikha, 2000).

According to Addai (2016), in Ghana, fire incidents have become a regular occurrence, with thousands of lives and millions of dollars lost every year. Hardly a day passes without news of a fire outbreak in some part of the country, causing fear and panic

among the people. This generates much discussion centring on rumour relating to whether the causes of these fire outbreaks are due to the works of poor electrical contractors in the country. Similarly, statistic available from the Ghana Fire Service Department shows that about 90% of all national fire outbreaks was due to poor electrical construction, this involves the use of unprofessional electrical contractors, exposed electrical joints, non-compliance of wiring colour coding rules, unearthed electrical installations among others. Studies have also shown that electrical construction which lacks proper quality management can increase chance of fire, power surges, arc faults, and other serious consequences (Platinum Electricians, 2018). In Ghana, more than 80% of the electrical contractors are untrained and unqualified who lack the capacity to provide quality management skills during electrical construction. Koomson (2019) specified that a lot of concern arisen over the quality of electrical construction project being executed at district levels in Ghana as poor electrical construction causes many problems.

Although uncountable research studies have been carried out to examine quality management practices in industries such as manufacturing, foods, services, and other related construction industry, there are limited relevant studies in the construction industry in the context of the building electrical services contractors (Gyimah & Gyimah, 2014; Yeboah, 2019). Therefore, there is a need to assess the quality management practices of building electrical services contractors. Hence the current researcher considered it necessary to assess the quality management practices of building electrical services contractors in the construction industry, in the Bono East Region.

1.3 Aim and Objectives of the Study

The aim of the study is to assess the quality management practices of building electrical services contractors in selected Regions in Ghana. The objectives of the study based on the aim include:

- to assess the quality management practices of building electrical services contractors in Ghana;
- to assess the extent to which quality management practices of building electrical services contractors affect the delivery of construction project in Ghana;
- to identify the role of main contractors in building electrical services contractors' quality performance in Ghana;
- to explore challenges that building electrical services contractors' encounter;
- to identify strategies which can be adopted to improve quality management performance of building electrical services contractors.

1.4 Research Questions

The study was guided by the following research questions:

- What are the quality management practices of building electrical services contractors in Ghana?
- What is the influence of main contractors on quality performance of building electrical services contractors in Ghana?
- What are the challenges that building electrical services contractors' encounter?
- What strategies can be adopted to improve quality management performance of building electrical services contractors?

1.4.1 Hypotheses Testing

The study sought to test the following hypotheses:

H_0: There is no statistically significant effect of quality management practice of building electrical services contractors on construction project delivery in Ghana

H_1: There is statistically significant effect of quality management practice of building electrical services contractors on construction project delivery in Ghana

1.5 Significance of the Study

The findings of this research would bring a lot of valuable benefits particularly to the stakeholders of construction project: contractors, government and people of Bono East Region. This is because the outcome of this study would provide better ways and methods in delivering construction projects by maximizing quality management as far as electrical construction is concern and identify the major causes of lack of quality management practice of presents and future projects. Again, this work will be a guideline and working tool for electrical subcontracting firms to ensure that quality assurance stays in electrical sub-construction companies to enhance efficiency and effectiveness so as to increase productivity and cut down cost on government and construction companies at the end.

An effective quality management implementation and adoption can improve competitive abilities and provide strategic advantages in the firms. The study will be a source of reference to government and policy makers that will redirect the attention on

the need to assist electrical contracting firms in the practice of quality management to provide quality services to capture loyal customers.

The study will also provide insight to construction industries in Ghana, more especially to electrical construction firms both private and state-owned, to employ the quality management in day-to-day activities. Also, to business advisors, this study will open avenues for opportunities in business consulting. Small firms that are willing to implement quality management practices will need the services of business advisors or management consultants for quality management implementation. Above all, the study will contribute to existing literature by presenting evidence from the outcome of this thesis.

1.6 Summary of Methodology

The study adopted a cross sectional descriptive survey design. The sample size constituted selected site managers of all service contractors registered with their respective associations in the selected regions (Bono East, Bono, Ahafo, and Ashanti Regions). A quantitative approach was adopted, where structured questionnaire was used to elicit information regarding quality management practices of building electrical services contractors in Ghana. Data collection comprised of primary and secondary sources. Primary data was obtained from the target respondents whereas secondary source of data collection involved review of literature contained in books, journal articles, magazines, published reports of world organisations and others in respect of the research subject. Purposive sampling techniques was adopted for the selection of the sample size. Purposive sampling technique was used to collect data from respondents deemed to have in-depth knowledge on the subject of study.

1.7 Scope of the Study

It would have been more suitable to conduct the research over the entire country of Ghana. However, owing to resource and time constraints, as well as familiarity and closeness to research locations, the study was delimited to the Bono East, Bono, Ahafo, and Ashanti Regions of Ghana. In terms of demographic settings, the general universe was building services contractors, with building electrical services contractors chosen and looked into the commitment of services contractors to quality management practices in the delivery of construction project, the challenges encountered by services contractors while implementing Quality Assurance and strategies which will help to reduce the indirect cost of project and also minimize wastage of resources using quality assurance management practices.. As a result, the scope of the study is conceptually, theoretically, and empirically constrained to the precise aims.

1.8 Organization of the Study

The study was composed of six chapters. The chapter one concentrated on the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, and significance of the study, scope of the study, limitations and organization of the study.

The chapter two focused on the review of related literature to include theories of quality management, quality control tools and technique, International Standardization for Organization and Quality Management systems. Other relevant literature on quality management implementation on performance of construction companies have also been reviewed and the conceptual framework for the study was thoroughly discussed and developed respectively.

Chapter three highlighted on the methodology of the study. The methodology included, research paradigm, research design, the population, sample technique and sample size, sample frame, sources of data, data collection instruments, data collective procedures and the data analysis technique.

Chapter four presents the analysis of the results and chapter five focused on discussion of the findings. Finally, chapter six of the study entailed summary of the findings, conclusions, recommendations and suggestions for further research from the concluding chapter of the thesis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a literature review for the research. Relevant literature on quality management is discussed, the concepts of quality and quality management are explored and the tools and techniques used in quality management in the construction projects are examined. Building electrical services contracting practice in construction industry, theories of quality management, is also reviewed in this chapter, sub-contractor's quality control management practices, the impact of main contractor quality management on services contractor quality performance, challenges of electrical contracting and strategies to improve quality management by sub-contractors.

2.2 Concept of Quality

Quality is one of the aims of standardization. Quality is an important issue in the modern competitive business world and it is acknowledged by most academia, researchers and practitioners, hence, defining it is very important for any organization embarking on quality improvement journey. Thus, it enables employees and management channels their efforts in the vision of the company and their quality improvement goal. However, there is no universally accepted definition for it (Dale, 2003). The definition of quality has gone through a range of thoughts based on the one putting it forth was able to support the definition by facts, perception of excellence or supporting literature (Dale, 2003; Dahlgaard et al., 2002). Hence, one can find a variety of definitions of quality. The International Standard Organization (ISO) defines the term quality as " the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs where the stated needs are determined by a contract or

specifications and the implied needs are a function of the market. Quality is a product or service that helps somebody to enjoy a good and sustainable market (Deming, 2000). Juran and Gryna describes it with the phrase "fitness for use by the customer" as a definition of quality (Juran & Gryna, 1993). Crosby defines it as conformance to requirements or standard (Crosby, 1980). Feigenbaum defines quality as the total composite product and service characteristics of marketing, engineering, manufacture and maintenance through which the product and service in use will meet the expectations of the customer" (Feigenbaum, 1991).

Palaneeswaran et al, (2005) also defined it as the totality of characteristics of a product or service that bears on its ability to effectively and efficiently meeting the outlined requirements/specifications as well as satisfying the stakeholders' needs. Oakland (2000) also presents the following definition of quality meeting the customer requirements. The requirements may include availability, delivery, reliability, maintainability, and cost effectiveness amongst many other features".

According to Harvey (2004) also suggested five discrete and interrelated definitions of quality. They are; exceptional, perfection, fitness for purpose, value for money and transformative. Garvin (1988) who studied and investigated many quality definitions suggested that it is possible to classify definitions of quality into five broad categories; transcendent (excellence); product-based (amount of desirable attribute); user-based (fitness for use); manufacturing-based (conformance to specification), and value-based (satisfaction relative to price).

2.3 The Concept of Quality Management Practice

Quality Management refers to all activities of overall management functions, especially top management leadership, that determines quality policy objectives and responsibilities for all members of the organization. It includes all activities that managers perform in an effort to implement their quality policy. These activities include quality planning, quality control, quality assurance and quality improvement, (McCafer & Harris, 2001).

The concept of quality management has existed for many years, but its meaning has changed and evolved over time. Before the early twentieth century, quality management meant inspecting products to ensure that they met specifications (Reid and Sanders, 2007 cited in Sabah 2011). This is evident in the Egyptian wall painting circa of 1450BC, which showed evidence of measurement. Stones used in the pyramids which were cut so well that a knife could not go between them (Evans and Lindsay, 2008 cited in Sabah 2011). According to (Reid and Sanders, 2007 cited in Sabah 2011) around 1940s, during World War II, quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. In the 1960s, with the help of so-called "quality gurus," the concept took on a broader meaning. Quality began to be viewed as something that encompassed the entire organization, not only the production process. All functions were responsible for product quality and shared the costs of poor quality. However, in the 1970s and 1980s many U.S. industries had to make changes to their quality policies when they lost market share to foreign competition particularly in the auto industry. Many hired consultants and instituted quality training programs for their employees (Reid & Sanders, 2007 cited in Sabah, 2011).

Hoonakker, (2006) established in his study that many of the management practices used to support construction organizations are being challenged. The industry's clients are moving forward. Clients demand improved service quality, faster buildings and innovations in technology. In Kaufmann and Wiltschko, (2006), Quality Management Concept is said to be structured in general according to the "International Organization for Standardization" ISO 9000-series and the "Plan, Do, Check, Act" PDCA-cycle. It further illustrated the two main structures stated above as follows;

a. ISO 9000-series: According to EN ISO 9000 quality, management is defined as "coordinated activities to direct and control an organization with regard to quality". Direction and control with regard to quality generally includes establishment of the quality policy and quality objectives, quality planning, quality control, quality assurance and quality improvement:
    - Quality planning is focused on setting quality objectives and specifying necessary operational processes and related resources to fulfil the quality objectives
    - Quality assurance is focused on providing confidence that quality requirements will be fulfilled
    - Quality control is focused on fulfilling quality requirements
    - Quality improvement is focused on increasing the ability to fulfil the quality requirements.
b. PDCA-cycle: An important mindset of quality management is the PDCA-cycle. This cycle including the four components as Plan, Do, Check and Act (PDCA), was originally conceived by Walter Shewhart in the 1930`s, and later adopted by W. Edward Deming. The model provides in general a framework for the

improvement of a process or system and is an iterative four-step quality strategy cf. Deming, (1982) as cite in Kaufmann and Wiltschko, (2006).

- Plan: Establish objectives and processes necessary to deliver results in accordance to specification
- Do: implementation of processes
- Check: Monitor and evaluate processes and results against objectives and specifications
- Act: Take actions to the outcome for necessary improvement (e.g., improve, standardize).

2.3.1 Quality management in construction

The quality of a product or a complete building or other constructions is the totality of its attributes that enable it to perform a stated task or to fulfil a given need satisfactorily for an acceptable period of time. For a building and civil engineering work, a satisfactory product, although essential in itself, is not on its own sufficient. It must be incorporated in the design and construction in a correct manner. In buildings, more defects and failures arise from inadequacies in the treatment of products in design and construction than from shortcomings in the products themselves (Atkinson, 2005). In their work, Harris et al (2006) stated that Quality Management has seen a transition from reacting to the outcome of site production activities to becoming a strategic business function accounting for the raison d'etre of construction companies. Unless a construction company can guarantee its clients a quality product, it cannot compete effectively in the modern construction market.

There is no precise or single definition of „quality", and although many of the pioneers of the quality movement and gurus, such as Deming, Juran, Crosby, Feigenbaum, Taguchi and others, had their own individual definitions of „quality", ISO DIS 9000:2000 generally defines „quality" as "the degree to which a set of inherent characteristics fulfil requirements" (Tricker, 2008, 4). This means that in the construction industry, quality appears to be achieved whenever the needs of all those entities and individuals involved in projects or production or provision of services, such as consultants, constructors, project customers, and other related stakeholders, are fulfilled. Indeed, understanding the main concepts of quality is essential for a construction company in implementing a „quality management system" as a strategic management tool to gain benefits from the successful implementation of a quality system.

Lam et al. (1994, 15), in the context of construction, define „quality management" as "that aspect of the overall management function that determines and implements the quality policy", and "quality system" as the organizational structure, responsibilities, procedures, processes and resources for implementing quality management". Hoyle (1997) indicated that the production of desirable quality products does not happen by chance, but rather it must rely on the use of a quality system as the management suite to meet all of the established quality goals. Hence, the essence of understanding quality in construction" relates to achieving quality in the construction business performance through the implementation of a quality management system (QMS). It is generally true to say that, in the global construction industry, one of the aims of every construction firm is to win the trust and acknowledgment of customers as a means of gaining business competitiveness and making greater profits.

Quality has a number of components, and a focus on only one aspect may result in a loss of customers (Center for the Advancement of Process Technology, 2011). The application of a quality management practices in order to consider the important aspects of the quality, is one of the key quality concepts reviewed by the writers on quality, these quality concepts including the following:

- a management commitment to reflect that „quality issues" must start from the top;
- management systems to ensure consistency of operations;
- the use of statistics as the tool to run and evaluate processes as efficiently as possible;
- team work;
- training to provide teams with the required knowledge of management systems, statistics, and improvement methodologies (ibid 2011).

2.3.2 Purpose of quality management in the construction industry

The United State (US) Army Corps of Engineers, (2004) states that Construction Quality Management "CQM" is the performance of tasks, which ensure that construction is performed according to plans and specifications, on time, within a defined budget, and a safe work environment. For purposes of this study, quality is defined as conformance to properly developed requirements. For a construction project, quality begins with requirements carefully developed, reviewed for adherence to existing guidance and ultimately reflected in criteria and design documents which accurately address these needs. Therefore, the designer establishes the quality standards and the contractor in building to the quality standards in the plans and specifications,

controls the quality of the work. The purpose of CQM is the Government's efforts, separate from, but in coordination and cooperation with the contractor, assure that the quality set by the plans and specifications is achieved. CQM is the combined effort of the contractor and the Government. The contractor has primary responsibility for producing construction through compliance with plans, specifications, and accepted standards of the industry.

Quality Management is based on three fundamental principles (Evans and Lindsay, 2008) cited in Sabah (2011); these are: focus on customer and stakeholders, participation and teamwork by everyone in the organization and a process focus supported by continuous improvement and learning.

In an attempt to employ quality management as a key component of the success of construction businesses today, many researchers state that it requires a well-implemented QMS in order to ensure the effectiveness of the quality management (Ahmed et al. 2005; Cachadinha 2009; Shibani et al., 2010).

2.3.3 Benefits of quality management

The potential benefits offered by Quality Management techniques are varied and the consensus from various studies is that it has been successfully applied in other industries and can be very beneficial in the construction industry (Chindo, and Adogbo, 2011). The application of quality management programs enables companies to improve long-term relationships, product and process improvement, create a harmonious team spirit, more customer focused, employee job satisfaction, increased revenues, reduction in quality costs, decreasing waste and rework, better coordination of activities,

improved customer service and market competitiveness, enhance professionalism and skills in all spheres of the construction sector. It also encourages open addressing of problems, better control over the construction process, improved safety, building electrical services contractor with proper quality management systems, and closer relationships with building electrical services contractor and suppliers and help to achieve the intended project objectives and benefits (Low & Peh, 1996; Low & Teo., 2004; Khan, 2003; Chindo & Adogbo, 2011). Thus, Competitive advantage is created in these firms by providing that environment of sustainability of competitiveness of a firm against intense global competition through continuously improving every facet of the firm (Cheng and Liu, 2007).

2.4 Quality Management Systems

Hoyle (1997) indicates that the production of desirable quality products does not happen by chance, but rather it must rely on the use of a quality system as the management suite to meet all of the established quality goals. Hence, the essence of understanding quality in construction" relates to achieving quality in the construction business performance through the implementation of a quality management system (QMS). This concept is supported by Thorpe and Sumner (2004) who describe a QMS in companies as "a formal statement of an organization's business policy, management responsibilities, processes and their controls, that reflects the most effective and efficient ways to meet (or exceed) the expectations of those it serves, whilst achieving its own prime business objectives". It is generally true to say that, in the global construction industry, one of the aims of every construction firm is to win the trust and acknowledgment of customers as a means of gaining business competitiveness and making greater profits; it therefore follows that this should also be one of the main

reasons for QMS to become a prime focus in every construction company, for the fulfilment of customers‟ needs and satisfaction.

If properly implemented, formal quality management systems provide a vehicle for achieving quality (i.e., conformance to established requirements). As defined by ANSI, a quality system is "the organizational structure, responsibilities, procedures, processes, and resources for implementing quality management" (Arnold, 1994 cited in Battikha, 2002). In other words, Quality management systems refers to the set of quality activities involved in producing a product, process, or service, and encompasses prevention and appraisal (Burati et al., 1992). It is "a management discipline concerned with preventing problems from occurring by creating the attitudes and controls that make prevention possible" (Crosby, 1979 cited in Battikha, 2002). Quality activities include the determination of the quality policy, objectives, and responsibilities and implementing them through quality planning, quality control, quality assurance, and quality improvement, within the quality system (ASQC, 1997 cited in Battikha, 2002). Other views expressed by (www.abahe.co.uk/business) is that, a quality management system is a management technique used to communicate to employees what is required to produce the desired quality of products and services and to influence employee actions to complete tasks according to the quality specifications. In like manner, (bussinessballs.com) also explained quality management system as a set of coordinated activities to direct and control an organization in order to continually improve the effectiveness and efficiency of its performance.

These activities interact and are affected by being in the system, so the isolation and study of each one in detail will not necessarily lead to an understanding of the system as a whole. The main thrust of a QMS is in defining the processes, which will result in

the production of quality products and services, rather than in detecting defective products or services after they have been produced. The paper continued to say that a fully documented QMS would ensure that two important requirements are met:

- The customers' requirements – confidence in the ability of the organization to deliver the desired product and service consistently meeting their needs and expectations.
- The organization's requirements – both internally and externally, and at an optimum cost with efficient use of the available resources – materials, human, technology and information.

McCaffer (1990) also states that quality management system is required to achieve the specifications of a product or service in four levels. These four levels for the quality management system are: Quality Planning (QP), Quality Control (QC), Quality Assurance (QA) and Quality Improvement (QI).

2.4.1 Quality planning

Harris and McCaffer, (2001) defined quality planning as a set of activities whose purpose is to define quality system policies, objectives, and requirements, and to explain how these policies will be applied, how these objectives will be achieved, and how these requirements will be met. Subsequent to this definition, Construx, (2003) stressed that quality plan is different from a test plan. The study continued that quality plan defines the quality goals, is realistic about where defects come from, selects appropriate detection and prevention methods, and has means not to "go dark". The Project Management Book of Knowledge "PMBOK" 4 also addressed quality planning from a different position to enhance the thoughts earlier expressed.

It said that quality planning has a process input generated by predecessor processes referred to as the Project Scope Statement and Project Management Plan. These processes are introduced by external units like Enterprise Environmental Factors and Organizational Process Assets. PMBOK4 further defined quality planning as the process for "identifying which quality standards are relevant to a project and determining how to satisfy them": In other words, it means planning how to fulfil process and product (deliverable) quality requirements: "Quality is the degree to which a set of inherent characteristics fulfil requirements". By planning the quality one has to respect some principles, and these are:

- Customer satisfaction comes first: Quality is defined by the requirements of the customer.
- Prevention over inspection: It's better to avoid mistakes than to inspect the result and repair the defects.
- Management responsibility: Costs of quality must be approved by the management.
- Continuous improvement: Becoming better is an iteratively structured process.

These sentences implicate the rule, that gold plating is not an indicator of quality; it has to be avoided.

2.4.2 Quality assurance

In recent years, increasing concern has been expressed at the standards of performance and quality achieved in building works. The need for structured and formal systems of construction management to address the aspect of performance, workmanship and quality has arisen as a direct result of deficiencies and problems in design, construction,

materials and components. Many of the problems experienced in building appear as a range of inadequacies from minor technical and aesthetic aspects to major building defects. Irrespective of their degree of severity, such problems are known to cost the industry so much annually, yet, many difficulties might be alleviated through greater care and attention to standards of performance and quality at the briefing, design and construction stages of the building process (Griffith, 1990). If buildings are to be trouble-free, more attention needs to be given to applying quality assurance principles to design and site-work, including project selection and specification, and to supervision of the handling and protection on site (Atkinson, 2005).

Harris and McCaffer, (2001) defined quality assurance as a set of activities whose purpose is to demonstrate that an entity meets all quality requirements. Quality Assurance activities are carried out in order to inspire the confidence of both customers and managers, confidence that all quality requirements are being met. According to Euro Roads, (2006), the main objective of quality assurance measures in information processes is to fulfil a required quality level. By using described probabilistic model, cause and effect diagram, one is able to analyse existing processes and to detect existing quality gaps within these processes. Reference to Hendrickson (1999) cited in Khan et al, (2008), quality requirements should be clear and verifiable so that all parties in the project can understand them for conformance. Harris and McCaffer, (2001) continued that Quality assurance (QA) emphasizes defect prevention, unlike quality control that focuses on defect detection once the item is produced or constructed. It was further established that quality assurance concentrates on the production or construction management methods and procedural approaches to ensure that quality is built into the production system.

2.4.2.1 Quality assurance in construction

The importance of Quality Assurance is based on the principles of getting things right first time. By implementing, maintaining, reviewing and continually improving a Quality Assurance System, a construction company can achieve and reap the benefits of having such a system in place. Quality Assurance exists because of the degree of dissatisfaction experienced by the industry's clients over a long period, combined with a growing impatience by some of their advisers to achieve value for money. An increasing number of building companies are also frustrated by the inadequacy of a system which however valiantly they try, leaves their efforts lacking in some regards. A revolution has occurred in the assembly of buildings from what was a craft process to one where the critical work of connecting interdependent units is done in the main by semi-skilled labour from a multiplicity of separate employers. This makes great demands upon supervision and management systems.

2.4.2.2 Quality standards

The quality system required for quality assurance is based on the meeting of the requirements through a set of standards and defined procedures rather than cultural change. One of the developed quality system standards is the ISO 9000 standard that has been applied in many industries. Quality control systems were originally developed from United Kingdom (UK) nuclear and military standards, and then rolled out as BS5750:1979 in the manufacturing industry. It was much later (in the 1980s and early 1990s) that the systems were adopted by UK construction companies to meet local and national government requirements for the construction industry, when companies were

required to have certified quality systems in order to take up offered bidding opportunities (Thorpe and Sumner 2004).

In 1987, the International Organization for Standardization released the ISO 9000 quality standard series. The ISO quality standards are a series of internationally accepted guidelines as to how companies should set-up quality assurance systems (Kartha, 2004). The standards are designed to guarantee a consistent level of quality of products and services provided by companies through the use of procedures, controls, and documentation, to identify mistakes and streamline its operations. The ISO quality management system is generic in nature and applicable to all companies, regardless of the type and size of the business, including small and medium enterprises (SMEs) (Sroufe and Curkovic, 2008; Kartha, 2004) and is being used by many organizations as a stepping-stone to TQM (Conca et al, 2003; Zhang, 2000; Kartha, 2004; Escanciano et al., 2001; Hiyassat, 2000).

The original ISO quality standards underwent a major revision in 1994 and 2000 (Sroufe and Curkovic, 2008). The revision of the standards, ISO 9000:2000 actually addresses the challenges or issues that the 1994 version could not address. The first series of ISO 9000 developed by the International Organization for Standardization-Technical Committees (ISO-TC 176) in 1987, was updated in 1994 and 2000, with the latest version of this standard being ISO 9001:2008. The 2008 version did not introduce any major changes relative to the 2000 version, and therefore does not require the re-writing of quality documents to suit the most recent version (Vianna 2007; International Organization for Standardization 2011). The ISO 9001 standard is actually a generic one, which can be used successfully in construction companies and on their projects,

even though every project is unique and involves different sub-contractors and suppliers.

The QMS-ISO 9001 standard is made up of five main clauses and 23 sub-clauses, each of which contains requirements that should be fully implemented to gain the potential benefits from the adoption of the system. There are 20 elements of ISO 9001 which are used as the basis of ISO 9001:1994. These elements have been replaced by five clauses for undertaking quality processing. However, the twenty elements are clearly identifiable within the process-based approach for implementing ISO 9001:2008 (Watson and Howarth 2011). The twenty elements have been adapted for construction procedures to cover a wide scope of quality related activities of construction-related firms (Chini and Valdez 2003), as QMS elements to meet construction organization and project conformity needs. In developing and maintaining ISO 9001, the collective experience and knowledge of international experts relating to ISO-TC 176 has been used for the development of the eight major quality management principles embedded in the ISO 9001 standard, that can be used by management as a basis for improving an organization's performance (Tricker 2008). These eight quality management principles are:

- Customer focus: The Company focuses on customer requirements and expectations.
- Leadership: The leaders establish unity of purpose and direction of the company.
- People involvement: Employees are fully involved and their abilities are empowered for the company's benefit.

- Process approach: Project activities and related resources are managed as a process.
- Systems approach to management: The Company identifies, understands, and manages interrelated processes as a system.
- Continual improvement: The Company has a strategic objective for permanent and continuous improvement of overall performance.
- Factual approach to decision making: Decision-making is based on an analysis of relevant data and information.
- Mutually beneficial supplier relationships: The company and its suppliers have interdependent and a mutually beneficial relationship.

In summary, as an international standard for QMS (in comparison with other quality standards and awards - Six Sigma, Malcolm Baldrige National Quality Award Criteria, The European Foundation for Quality Management Excellence Model (EFQM EM), ISO 9001 is now widely accepted in many manufacturing, production and services industries, because it specifies what an organization should do to achieve better quality management and improvement. It is acknowledged by McCornac (2006) that the standard focuses on the way an organization goes about its work, and not directly on the results of this work. This QMS standard is currently being adopted by Indonesian construction companies and is officially recommended by the Ministry of Public Works as an approach to solving quality problems in the construction industry and for meeting customers' needs.

2.4.3 Quality improvement

The Heath Foundation, (2009), said there no single definition of quality improvement and no one approach appears to be more successful than another. However, there are a number of definitions that describe quality improvement as a systematic approach that uses specific techniques to improve quality. The most important ingredient in successful and sustained improvement is the way in which the change is introduced and implemented. According to ISO 9000:2000 Quality improvements is "Part of quality management focused on increasing the ability to fulfil quality requirements."

Empirical studies on quality management in construction have shown that various quality improvement practices are common among non-residential builders and developers. Most of these practices have been collectively grouped under a successful management philosophy termed, "Total Quality Management" or TQM. (Shofoluwe et al 2012).

2.4.4 Quality control

Investopedia explains 'Quality Control' as a process through which a business seeks to ensure that product quality is maintained or improved and manufacturing errors are reduced or eliminated. Quality control requires the business to create an environment in which both management and employees strive for perfection. This is done by training personnel, creating benchmarks for product quality, and testing products to check for statistically significant variations. 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. According to Khan (2017), quality control is the process of evaluating whether construction projects adhere to specific standards. The main objective of quality control is safety. Additionally, quality control is also meant to ensure that buildings are reliable and sustainable.

The ISO definition also states that quality control is the operational techniques and activities that are used to fulfil requirements for quality. This definition could imply that any activity whether serving the improvement, control, management or assurance of quality could be a quality control activity. What the definition fails to tell us is that controls regulate performance. They prevent change and when applied to quality, it regulates quality performance and prevents undesirable changes in the quality standards. It continued that quality control is a process for maintaining standards and not for creating them. Standards are maintained through a process of selection, measurement and correction of work, so that only those products or services which emerge from the process meet the standards. In simple terms quality control prevents undesirable changes being present in the quality of the product or service being supplied. The simplest form of quality control is illustrated in the Figure below. Quality control can be applied to particular products, to processes which produce the products or to the output of the whole organization by measuring the overall quality performance of the organization.

It is often deemed that quality assurance serves prevention and quality control detection but a control installed to detect failure before it occurs serves prevention such as reducing the tolerance band to well within the specification limits. So, quality control can prevent failure. Assurance is the result of an examination whereas control produces the result. Quality Assurance does not change the product, Quality Control does. Harris

and McCaffer, (2001) defined quality control as a set of activities or techniques whose purpose is to ensure that all quality requirements are being met. In order to achieve this purpose, processes are monitored and performance problem are solved. Satterfield (2005) pointed out that quality control is critically important to a successful construction project and should be adhered to throughout a project from conception and design to construction and installation. Inspection during construction will prevent costly repairs after the project is completed. The inspector, engineer, contractor, funding agency, permit agency, and system personnel must work together to inspect, document, and correct deficiencies.

2.4.4.1 Importance of quality control in construction

Quality Control (QC) in construction is the process of verifying that the project is built to plan, that the tolerances allowable by industry standard and engineering practices have been met or bettered, and that the finished project (and all phases to get there) meet with the quality standards of the architect, engineer, owner, and general contractor. On construction projects there are dozens of building electrical services contractors, all of which have specific responsibilities. Superintendents and project managers try to maintain high quality standards but they can't be everywhere at once. Required inspections by cities and counties (as well as other jurisdictions, depending on the project) help to ensure safety and code issues. In addition, a good general contractor or developer will have on staff a QC person, someone who is responsible for going through the building or project, ensuring compliance, and maintaining an ongoing list of corrective items that must be accomplished before the contractor who installed it is paid or leaves the job.

2.5 The Effectiveness of Implementing a Quality Management System

Successful implementation of a QMS, as espoused in the relevant ISO 9001 standard, requires effective planning, operation and review, as well as continuous improvement of the system at all levels of an organization. Effectiveness has been defined by the British Standards Institute (2009) as the extent to which planned activities are realized and planned results are achieved. The term "effectiveness" is particularly pertinent to quality management system implementation, as companies that adopt a QMS must meet their specified quality requirements and prescribed quality objectives without any shortfalls, in order to be seen to have successfully implemented their QMSs.

However, according to Al-Nakeeb et al. (1998), the definition of "effectiveness" from BSI appears to mislead people into thinking that it implies that the effectiveness comes from solely meeting the specified requirements and the prescribed quality objectives. In fact, it refers to the effectiveness of the system in meeting and complying with the specified requirements of the adopted standard. This means that effectiveness in the overall sense should really mean both things; the full meeting of a company's own specified quality requirements, together with meeting the prescribed quality objectives (Kam & Tang 1997), referred to in the eight quality management principles and the elements of ISO 9001. In addition, Oztas et al., (2007) argue that the effectiveness of a system needs to be judged by how well a construction company operates and whether it achieves its goals in meeting customer expectations. This view is illustrated in Figure 2.1.

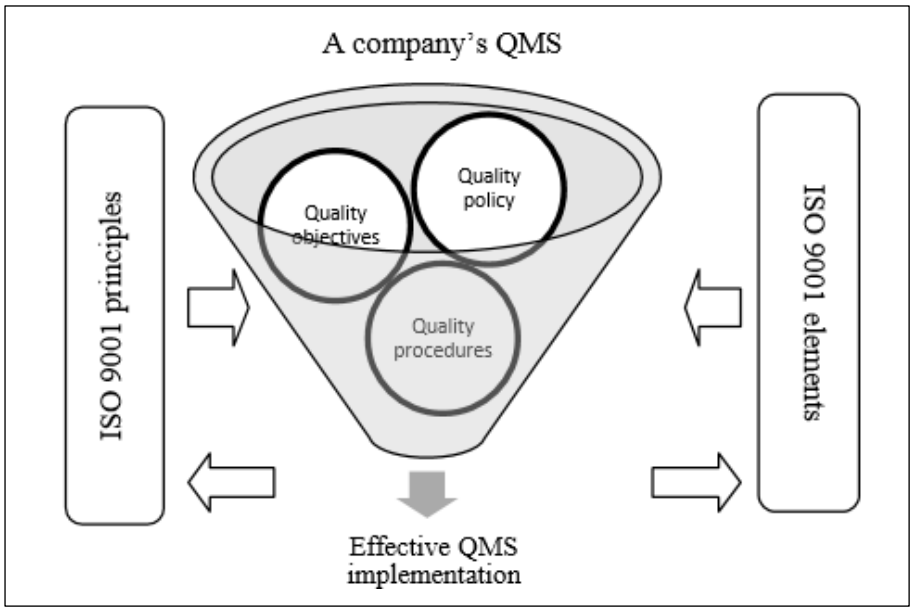

Figure 2.1: An Effective Company's QMS Complies with ISO 9001 Principles and Elements

Source: Oztas et al., (2007)

Recent publications on construction quality management highlight the important activities that should be performed in relation to the application of an effective QMSISO 9001. According to Rumane (2011), an organization needs to demonstrate its ability to consistently provide products that meet or exceed customer expectations and satisfaction, while also adopting appropriate processes for the continued improvement of the QMS and related assurances of conformity to customer and applicable regulatory requirements. Watson and Howarth (2011) also emphasize that for ISO 9001 to remain a process-based system with heavy emphasis on compliance, an organization is required to rigorously conduct an assessment of organizational performance, set against a standard and leading to accreditation. Clearly, the context of an effective QMS implementation is to ensure that work is performed according to specifications, throughout the design and development phases, manufacturing and construction, and

servicing, and also ensure that customers are satisfied with the resulting products and services (Beaumont 2006). Figure 2.2 illustrates the process model of ISO 9001, with the focus on customer requirements and satisfaction.

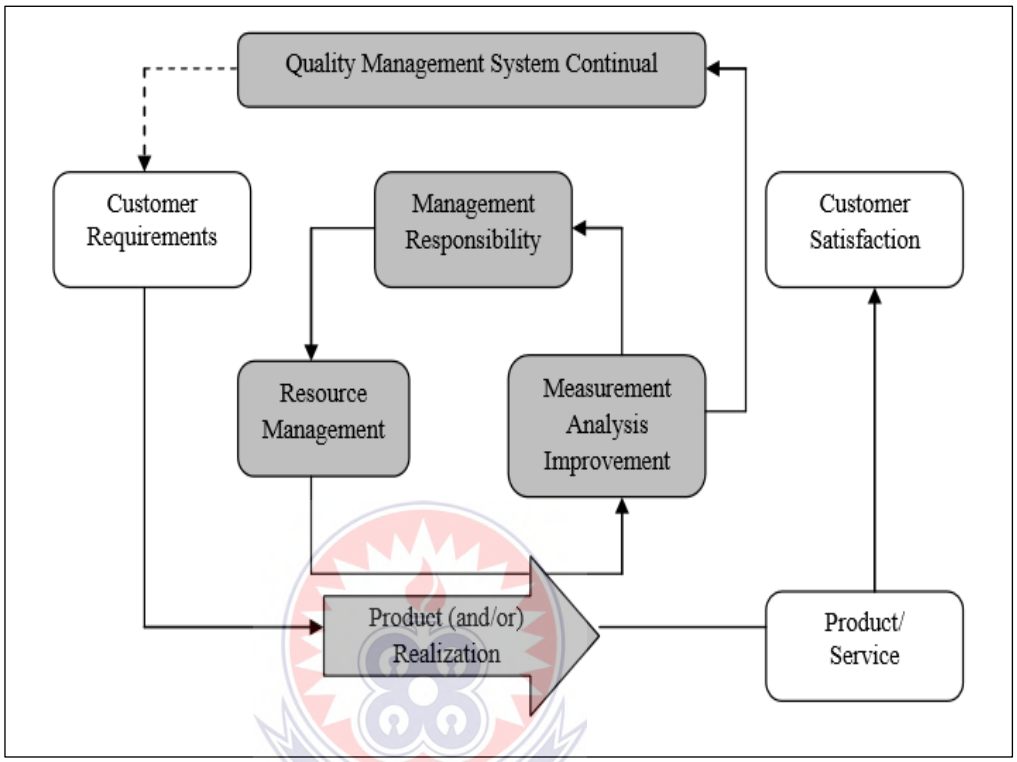

Figure 2.2: ISO 9001 Process Model

Source: Watson & Howarth (2011)

Effective implementation of a quality management system (QMS), and espousing quality values or adopting a high-level quality philosophy, whether by virtue of operating a QMS-ISO 9001 or applying a TQM approach, potentially provides benefits that are needed, even in the most competitive construction environments. All the advantages cited for construction organizations are based on the lessons learned from the use of an appropriate and effective quality system framework for controlling the processes required when constructing a project. An example cited in the research of Zin

et al. (2009) is that the majority of Malaysian constructors have been able to improve their company competitiveness by 80%, after having certified to ISO 9001. This clearly indicates that QMSs need to be developed and implemented effectively, for any construction company wishing to become a sector leader. Nevertheless, given the benefits of ISO 9001 deployment, the implementation process can be a problematic one. The following sub-section reviews critical issues relating to the successful implementation of effective QMSs.

2.6 Tools and Techniques for Quality Management

Quality management has been developed around a number of critical factors. However, TQM is much more than a number of critical factors; it also includes other components, such as tools and techniques for quality improvement (Tarí and Sabater, 2003). The techniques and tools are vital to support and develop the quality improvement process (Tarí and Sabater, 2003). It is evident that some firms fail when they implement TQM because suitable quality management methods such as tools and techniques for quality were not used (Zhang, 2000; Tarí & Sabater, 2003). Researchers have identified a number of tools and techniques for quality improvement. Tool is defined as a device with a clear function and usually applied on its own whereas a technique has a wider application and is understood as a set of tools (Tarí & Sabater, 2003).

2.6.1 Basic Quality Control Tools

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

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

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

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

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

Cause and Effect Diagram (Fishbone Diagram)**:** Cause and Effect Diagram, which was developed by Karoa Ishikawa, is useful in breaking down the major causes of a particular problem. The shape of the diagram looks like the skeleton of a fish. This is because a process often has a multitude of tasks footing into it, any one of which may

be a cause. If a problem occurs, it will have an effect on the process, so it will be necessary to consider the whole multitude of tasks when searching for a solution.

Scatter Diagram: The relationship of two variables can be plotted in the scatter diagrams. They are easy to complete and obviously linear pattern reveals a strong correlation.

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

2.7 Building electrical services Subcontracting in the Construction Industry

Building electrical services contractors are often specialize in one specific area of construction and try to network with contractors who negotiate for larger jobs that include this area of specialty (Novotny, 2018). Many companies work on a construction site because sites use many types of building electrical services contractors in construction. A general contractor might perform some of the work themselves; however, most will hire specialty building electrical services contractors in order to ensure that they can successfully complete the project (Novotny, 2018).

According to Novotny (2018), building electrical services contractors also work on a contractual basis, and they also offer a particular set of skills, which they perform for customers. The key point about building electrical services contractors is that they form agreements with the contractor, not with the customer.

The building electrical services contractor must attend preconstruction meetings where the project quality requirements and the general contractor's quality processes are discussed. At the conclusion of such meetings, the building electrical services contractor's personnel must have a clear understanding of the quality requirements and the process they are expected to follow (Novotny, 2018). This, along with a diligent oversight by the contractor's staff, will ensure that quality is seamlessly addressed and rework minimized. As indicated by Furst (2019), all of these process and practice functions are set up to ensure project quality, but they can be weakened due to a plethora of reasons. These create situations that require project staff to take time to address and resolve these additional time-consuming situations. So, when they reach their total time capacity, they have to reduce their attention to other lesser urgent matters, which may very well be quality-related functions. This highlights the need to conduct the work correctly the first time out. This not only reduces rework, but more importantly reduces the need for continuous checking, inspecting, and recording of the quality process. Such a goal can be achieved by the integration of the TQM concepts onto the organization's QMS.

The majority of construction work is carried out through contracting processes whereby a construction firm wins a contract to complete work and then completes that work in exchange for money. A series of study has been done to enhance the building service contracting (subcontracting) practice by focusing on either registration, selection, or monitoring it (Arditi & Chotibhongs, 2005). Most studies on building electrical services contractors focused on either registration of building electrical services contractors, selection of building electrical services contractors, or monitoring/performance rating during construction stage (Chiang, 2009). Focus of

researchers goes to either determining the constituents of subcontracting or developing new approaches/techniques to select and/or manage building electrical services contractor. Building electrical services contractors has become an issue on its own, separated from selection/management of general contractor by client/consultants due to its complexity (Albino & Garavelli, 1998).

In contracts where a general contractor is hired by the investor, it is common practice for the majority of the work to be contracted out to building electrical services contractor (Topcu, 2004). When managing a contract by the general contractor, it has become customary to outsource specialized works in order to ensure quality in construction. Outsourcing the majority of works to a building electrical services contractor is very safe and convenient for the general contractor, but the failure of a building electrical services contractors can be one of the reasons behind the entire project not succeeding (Tang, 2010).

General contractors are responsible for managing the project such as contract administration with clients, project financing, material and equipment procuring, and monitoring the project progress (Benjaoran, 2007). According to Albino & Garavelli (1998), the general contractor's performance is strongly dependent on building electrical services contractor. This statement is reinforced by Mbachu (2008) which stated that the ability of the general contractor and consultant to deliver the project within time, quality and cost depends largely on performance of building electrical services contractor. When the scope of work and logical dependencies between building electrical services contractor works are not fully understand by general contractor and owners, it became a critical problem to the success of complex and fast-paced projects. Cost litigation and dissatisfied customers due to the conflict between general contractor,

building electrical services contractor and other project participants would then follow (Dossick & Schunk, 2007)

Construction mismanagement might start with a single building electrical services contractor, and cascade through the work force chain to affect the schedule and leading to damages to multiple parties (Shimizu and Cardoso, 2002). Building electrical services contractors is a common term used in construction. Due to the uniqueness of each construction project, the work force is transient, multiple craft are involved, each project is planned and worked in short time frames, and variety of materials and equipment required, one single construction project is often sublet to many building-electrical services contractor (Tang, 2010). Building electrical services contractor can contribute more than 50% (Albino and Garavelli, 1998), and can be as much as 90% of total project value to a construction process (Kumaraswamy and Matthews, 2000).

According to Tang (2010), building electrical services contractor are specialist in the execution of a specific job; they act as an agent of the production system of the contractor company in supplying materials, manpower, equipment, tools or designs. A building electrical services contractor is a construction firm that contracts with a general contractor to perform some aspect of the general contractor's work. In most construction projects, a vital role is played by building electrical services contractor who are hired to perform specific tasks on a project. In the usual case, the general contractor will perform the basic operations and subcontract the remainder to various specialty contractors.

2.7.1 Selection of Building electrical services contractors

Many selection methods of building electrical services contractor have been proposed in the literature. Arslan, et al. (2008) developed a web-based building electrical services contractor's evaluation system (WEBSES) to ease the selection of building electrical services contractor. The criteria for evaluating were identified by estimators of construction firm in USA based on a database of approximately 4000 building electrical services contractors' firms.

Ng and Luu (2008) developed a model for building electrical services contractors' registration decision through case-based reasoning approach. Twelve (12) experts were interviewed to provide essential steps needed for differentiating good and bad building electrical services contractor. The model developed uses each attribute's calculated ratings for identification of matching cases and similarity score of each individual case. The historical data of building electrical services contractor can be retrieved and use for the current evaluation. Weighting of all attributes can be easily modified according to the users' preference; thus, the effectiveness of this model is still very much depending on the experience and knowledge of users.

Manoharan (2005) proposed a building electrical services contractors' selection method using Analytic Hierarchy Process (AHP) based on 29 questionnaires collected from contractors involved in construction projects located at Putrajaya, Malaysia. It is an Expert System to assist the main contractors in making their decision by using pairwise comparison. The decision maker will need to make their own judgment on the relative importance of each element with respect to the elements at a higher level. Argument might occur when the judgment of different decision makers is diverse. As an effort to reduce the incidents of delay, and other possible problems that might be originated from

the problems of selecting the wrong sub-contractor, this study aims to expand the sample of study as suggested by Manoharan (2005) in the effort of create a more reliable and applicable sub-contractor selection model.

2.7.2 Management of Building electrical services contractors

Selecting the right building electrical services contractors does not guarantee the success of a construction project. Coordination and monitoring of subcontracted work during the construction stage is essential. Ko et al. (2007) developed a Sub-contractors Performance Evaluation Model (SPEM) by employing Evolutionary Fuzzy Neural Inference Model (EFNIM). Building electrical services contractor were evaluated by field superintendents according to the types of subcontracts. Different evaluation factors were adopted for different subcontract to achieve fair evaluation.

Albino & Garavelli (1998) proposed a rating system for management of building electrical services contractors by using neural network. An application case related to the evaluation of potential building electrical services contractor competing for a bid has been used to show the practical implementation of this neural network. In accessing the competitor building electrical services contractor, the decision maker has to consider five main parameters, namely price reduction, time reduction, technical/qualitative characteristic of the bid, contractual reliability of the competitor, and management skills of the competitor. The network will propose a suitable building electrical services contractor based on previous decisions made by the expert. Therefore, examples of previous decisions need the expert to be inserted into this neural network. Dainty, Briscoe and Millett (2001) focused on supply chain's management from the perspective of building electrical services contractors. The role of building

electrical services contractor in UK construction industry is explored and followed by proposal of a framework for addressing current barriers to supply chain integration.

Effective building electrical services contractors' selection and monitoring which can minimize the problem would determine the success of construction companies. Problems of building electrical services contractors, if ignored, can cause an immense impact to the construction project, and can extend into the operation of the general contractor's organization. Therefore, attention should be given to the issues of building electrical services contractors, which is the main participant in almost all the construction projects.

2.7.3 Types of building electrical services contractors

Attempts have been made to differentiate building electrical services contractor. In Hong Kong, Ng, Tang and Palaneeswaran (2008) classified building electrical services contractor into Equipment-intensive building electrical services contractor (who are hired due to their specialized plant and equipment) and Labor-intensive building electrical services contractor (those who are hired as a result of their specialized labor resources.

Costantino, Pietroforte and Hamill (2001) revealed that labor-only building electrical services contractors beneficial the building electrical services contractors by reducing the cost of mobilization and purchasing material. Furthermore, it also offers economic advantages to the general contractor by avoiding the mark-up of full subcontracting. Quality problems and claims may still occur in getting the supply of material for application of this labor-only building electrical services contractors. Therefore, some

general contractors prefer full subcontracting to shift risk and liability. Partnering relationship between general contractor and building electrical services contractor were proposed to create a win-win situation.

According to Lee et al. (2009), this long-term relationship must be established to avoid adversarial relationship between general contractor and building electrical services contractors. Several types of relationships between general contractor and building electrical services contractors are discussed; competitive relationships and strategic relationships were among them. Comparison model based on transaction cost for both general contractor and building electrical services contractors are developed respectively for each relationship. Further subcontracting by building electrical services contractors, or called multilayer subcontracting/latent building electrical services contractors, allow the building electrical services contractors to be less vulnerable to fluctuation in business, have more flexibility in workforce coordination, and be able to reduce cost of management (Yik & Lai, 2008).

In Turkish, practice of subcontracting work by building electrical services contractor to secondary building electrical services contractors is widespread. A study by Assaf and Al-Hejji (2006) on 35 general contractors and 56 building electrical services contractors' organizations revealed that most of them are willing to sublet their work under overload of work or time pressure. When "latent" building electrical services contractors happened, the extent of subcontracting is even larger. "Latent" subcontracting or multilayer subcontracting is the further subcontracting down the stream by building electrical services contractor with or without the knowledge or consent of the general contractor or client. This has been alleged to be one of the major causes of poor construction quality and construction site safety in Hong Kong (Chiang,

2009). Ekström, Björnsson and Nass (2003) argued that payment to the second tier building electrical services contractors/suppliers can be part of the performance measurement when evaluating building electrical services contractors.

The following are some of the general building service contractors in the construction industry which are electrical building service contractor, plumbing, heating, and air-conditioning, painting and paper hanging, roofing, siding, and sheet metal work, masonry, stonework, tile setting, and plastering, special trade contractors, concrete work and carpentry and floor work.

Electrical Building Service Contractor: Electrical building electrical services contractors are a broad type of building electrical services contractors in construction. There is a lot that an electrical building electrical services contractor could work on. OSHA defines electrical building electrical services contractors as those that work on electrical work at a site rather than in a repair shop or similar. Electrical building electrical services contractors might be fire alarm installers, work in telecommunications equipment and installation, or even what most people would think of for electrical work. There is a lot that an electrical building electrical services contractor might work on (Novotny, 2018).

Plumbing, Heating, and Air-Conditioning Service Contractor: One of the types of building electrical services contractors in construction is plumbing, heating, and air-conditioning. These building electrical services contractors or specialty contractors are also known as mechanical contractors when they can do work on all three. Contractors sometimes choose to specialize even further in plumbing or heating and air conditioning or cooling. Specialty contractors that specialize in heating and air conditioning are

known as HVAC contractors. Plumbing, heating, and air-conditioning is an important subcontracting type in construction (Novotny, 2018).

Painting and Paper Hanging Service Contractor: According to Novotny (2018), another of the types of building electrical services contractors in construction is painting and paper hanging. Painting and paper hanging are a type of specialty trade that primarily engages in painting and paper hanging. So, they might paint bridges, electrostatic, and more. According to OSHA, businesses that are classified as painting and paper hanging do not engage in roof painting. Roof painting is a separate trade from painting and paper hanging. As a whole, the industry is of great value to every project.

Roofing, Siding, and Sheet Metal Work Service Contractor: Roofing, siding, and sheet metal work specialty contractors are important types of building electrical services contractors in construction. These building electrical services contractors can hold a variety of jobs. From working with architectural metal to skylight installation. They are responsible for the roofing, gutter installation, possibly ductwork installation or fabrication. Roofing, siding, and sheet metal also sometimes will fabricate the pieces themselves. With more industrial spaces and changes in design, roofing, siding and sheet metal work will be busy fields of subcontracting (Novotny, 2018).

Masonry, Stonework, Tile Setting, and Plastering: Novotny (2018) classifies these four types of building electrical services contractors in construction under one umbrella. However, it does divide further down in order to be more manageable. It can include masonry, stone setting, plastering, drywall, insulation, and even more. Plastering, drywall, and insulation are important to most building types since most buildings have a layer between the exterior walls of the building and internal sections. These types of

building electrical services contractors in construction build many of the projects from foundations to finishing touches.

Special Trade Contractors: Novotny (2018) leaves this field rather wide, but it encompasses many types of building electrical services contractors in construction. Glass and glazing work, excavation, demolition, steel erection, and more are lumped into special trade contractors. Ironworkers, excavators, and the like are also experiencing growth like other fields in the construction industry. Some of the special trade contractors make more and have greater growth at this moment over others; however, with the construction boom, many of the fields are growing larger.

Concrete Work: Concrete contracting is one of the large types of building electrical services contractors in construction. These specialty contractors can work on a variety of projects. Some will be concrete finishers, work primarily with foundations, or work primarily in asphalt. All of these types of concrete specialists fall into the concrete work subcategory in OSHA also under the same subcategory in other government fields. According to the Bureau of Labor Statistics (2016), it is a fairly popular field with an opportunity for growth.

Carpentry and Floor Work: Carpentry and floor work are crucial types of building electrical services contractors in construction. Carpenters can build and install cabinets, but they also work in joinery, garage doors, framing, and doors. Often times they will be responsible for all trim and finishes in the project. Since flooring is always important in every project, these building electrical services contractors will be seen on most sites. Knowing that the flooring is correctly installed and the project's needs taken into

account make flooring building electrical services contractors so important (Novotny, 2018).

2.7.2 Problems of subcontracting

Building electrical services contractors related problems are still quoted as one of the main risks of construction project globally (Arditi & Chotibhongs, 2005; Chiang, 2009; El-Sayegh, 2008). The same applies to Ghana; problems with building electrical services contractor have been identified as one of the important causes contributing to delays in Ghanaian construction industry. Building electrical services contractors was quoted as one of the common causes of construction delays in Ghanaian construction industry (Yeboah, 2014).

Several studies conducted in Malaysia shown that subcontracting practice is creating problems to the construction industry. Sambasivan and Soon (2007) claimed that there are many building-electrical services contractors working under the general contractors particularly for huge projects in Malaysia. But building electrical services contractor are found to be among the top five reasons contributing to project delay. In another study done by Alaghbari et al. (2007), lack of building electrical services contractors' skills is found to be one of the contributors to contractor in causing delay in 78 construction projects studied in Malaysia. Other than causing delay, coordination problems with building electrical services contractors were quoted as factors that affect the construction labor productivity of residential projects in Malaysia.

Building electrical services contractors' failure has been listed as one of the risks allocated to general contractor in construction contracts (Hinze & Tracey, 1994). This is supported by El-Sayegh (2008) which stated that subcontracting is risky and can lead

to low quality, delayed completion and unsafe practice. Another risk created by building electrical services contractors is the possibility of them to breach contract and dispute with the general contractor. Hence, subcontracting has been listed as one of the significant factors causing delay United Arab Emirates (Assaf &Al-Hejji, 2006), and Malaysia (Sambasivan & Soon, 2007). Payment issues, retainage withheld by general contractor, bidding issues, bonding issues, insurance issues, safety issues, partnering issues, and productivity issues are among the issues needs to be investigated in subcontracting practices (Arditi and Chotibhongs, 2005). The problems do not limit to the general contractors, building electrical services contractor also be inflicted with unfairness. An exploratory study participated by 28 building electrical services contractor revealed the fact that building electrical services contractor are often required to assume all risks and obligations stipulated between the owner and general contractor, without given the opportunity to examine them ((Hinze and Tracey, 1994). Meanwhile, a study one in Scotland studied on the set-off, or more often called contra charge, shows that building electrical services contractor has faced the problem to settle these obstacles with the main contractor fairly. Though some building electrical services contractor are protected by the contract clauses, the building electrical services contractor were found reluctant to use their contractual entitlements due to the fear of being denied opportunities to tender for the future jobs (Sambasivan and Soon, 2007).

2.8 Relevant Theoretical Underpinnings of the Study

According to Scott and Cole (2000), the quality effort is not readily linked to a well-identified clearly specified set of ideas and practices but, rather, appears as a loosely coupled collection of orientations and practices. The seminal authors on quality have

presented influential theoretical and philosophical starting points for quality. Unfortunately, those starting points fall outside the usual paradigms of management scholars, and they have failed to spot them. It is therefore deserved to ask from where the theoretical and philosophical ideas of quality management can be found. It is also contending that there are three promising places:

First, quality is usually, although not always, related to man-made artefacts that have been designed and produced. Thus, it seems natural to expect that the concept of quality is related to or embedded in concepts and theories of production. Secondly, for maintaining and improving quality, information and knowledge are needed. The discipline studying such matters has traditionally been called epistemology. Therefore, it can be expected that the concept of quality would entail epistemological considerations and thirdly, for perceiving and acting for the sake of quality, a conception on what is out there in the world is needed. The discipline studying such matters is ontology. It can be expected that the theory of quality would entail ontological considerations. In the following, the three identified themes have been explored by this study: study Theory of Production, Epistemology and Ontology.

2.8.1 Theory of Production

Studies shows that Shewhart started the quality movement through his statistical quality control. In his seminal book (Shewhart, 1931), he related quality to design and production in the following way: Looked at broadly there are at a given time certain human wants to be fulfilled through the fabrication of raw materials into finished products of different kind. The first step of the engineer in trying to satisfy these wants is therefore that of translating as nearly as possible these wants into the physical

characteristics of the thing manufactured to satisfy these wants. In taking this, step intuition and judgement play an important role as well as the broad knowledge of the human element involved in the wants of individuals.

The second step of the engineer is to set up ways and means of obtaining a product which will differ from the arbitrarily set standards for these quality characteristics by no more than may be left to chance. The conceptualization of production used by Shewhart has later been named value generation model (Koskela 2000). In contrast to two earlier conceptualizations of production, the transformation model and the flow model (Koskela 2000), the value generation model introduces the customer into theorizing on production.

Shewhart developed control charts to assist in the management of production processes. A prime assumption of Shewhart control charts is that manufacturing processes can be in statistical control. However, the novelty advanced by Shewhart was that additionally, the scientific method (Shewhart & Deming 1939) is to be used: In this sense, specification, production, and inspection correspond respectively to making a hypothesis, carrying out an experiment, and testing the hypothesis. These three steps constitute a dynamic scientific process of acquiring knowledge. This idea contrasts with the attitude in engineering sciences according to which engineering proceeds from scientific knowledge towards application. This contrast has time-honoured roots – it has been characterized as the difference between Platonic and Aristotelian epistemology (Koskela & al. 2018). In the context of engineering, Platonic epistemology starts from reason (and in extended sense, from existing knowledge) and deduces prescriptions to be pushed towards the world. Instead, Aristotelian epistemology emphasizes observations made on the world and induction of new

knowledge based on them. Deming, a close collaborator of Shewhart, presented his ontological views in his book “Out of the crisis” (Deming 1982): Every activity, every job is part of the process. A flow diagram of any process will divide the work into stages. The stages as a whole form the process. The stages are not individual entities. Further (Deming 1982) work comes into any stage, changes state, and moves on into the next stage. Any stage has a customer, the next stage. The final stage will send product or service to the ultimate customer, he that buys the product or the service. At every stage there will be production – change of state, input changes to output. Something happens to material or papers that come into any stage. They go out in a different state. Continual improvement of methods and procedures, aimed at better satisfaction of the customer (user) at the next stage. Each stage works with the next stage and with the preceding stage toward optimum accommodation, all stages working together toward quality that the ultimate client will boast about. This represents process metaphysics (Rescher 2000), characterized by its focus on temporal developments, and relations between phenomena. It starkly contrasts to the more well-known thing metaphysics, which directs attention to (relatively) stable things and their composition (Koskela & Kagioglou 2005, 2006).

2.9 Quality Management Practices in Construction Project Delivery

Achieving the quality expectation of the project may be seen as meeting the aesthetic and functional requirements of the design, as well as the owner's operational and maintenance requirements and the contractor's compelling value proposition. For the sub-contractor to achieve this, the quality requirements must be adequate, clear, measurable, and universally understood. This also requires that the work is executed in

such a manner that the quality as specified is achieved and that the completed project conforms to the design requirements and meets the owner's expectations.

Construction firms must be committed and determined to do or support quality management. According to Oakland (2000), to promote or execute work efficiently and effectiveness, quality management must be truly organized. It must start at the top with the chief executive or equivalent. The most senior directors and management must all demonstrate that they are serious about quality. The middle management have a particular important role to play. They must not only grasp the principles of quality management, they must go on to explain them to the people for when they are responsible, and ensure that their own commitment is communicated (Oakland, 2000).

Bhat (2019) mentioned that the chief executive of an organization should accept the responsibility for and commitment to a quality policy in which he or she must really believe. This commitment is part a broad approach extending well beyond the accepted formalities of the quality assurance function. It is more an attitude of mind base or pride in the job and teamwork, and it requires from the management total commitment, which must then be extended to all employees at all levels and in all department. Additionally, senior management commitment should be obsession, not lip service. It is possible to detect real commitment; it shows on offices, and on project site how things are being conducted at the point of construction phase. An organization where they are committed to quality or quality means something can be seen, heard, felt (Bhat, 2019). Things happen at the operating interface as a result of real commitment. Material problems are corrected with the suppliers; equipment difficulties are put right by improved maintenance programmes or replacement, people are trained change takes places, partnerships are built, continuous improvement is achieved (Bhat, 2019). For a

construction firm to adhere to all quality control protocols, there must be determine and improve organization commitment, create strong teamwork, communicate clear goals and encourage open communication, maintain work ethics, foster a positive work culture, develop trust, encourage innovation, provide constructive feedback and not criticism, efficiently delegate task, offer incentives (Wick & Veilleux 2003).

Pheng and Hui (2004) indicated that looking at the abandon, delay, and defect of or on structures can tell you that contractors and stakeholders of the industry lack commitment to quality management plan. Failure or collapse of structure says a lot about contractor's commitment quality management strategies. According to Oakland (2000), an organization, which is devoted to quality, or quality means something can be seen, heard, felt at the operating interface as a result of real commitment. Pheng and Hui (2004) concluded that contractors in Africa are not committed, they lack quality management skills.

2.10 The Role of Main Contractors in Quality Management by Services Contractors

The infusion of the total quality management (TQM) practices into the construction company's quality management system (QMS) can result in significant improvement in the quality process and thereby achieve superior outcomes (Furst, 2019). The overall performance of the organization will be considerably improved through the implementation of QMS (Jaafreh & Al-abedallat, 2012). It is apparent that associations that have received a quality management system to center around accomplishing and maintaining a predominant level of value yields using administrative practices as sources of info and quality execution as yields (Jaafreh & Al-abedallat, 2012). QMS

need to be applied as a tool to improve quality performance of organizations as well as their contractors. However, it does not necessarily mean that all contractors will be required to implement a certified QMS, as they just need to have a complaint system, which will be monitored by the client. Implementing QMS is proposed to assist with making the capacity to deliver items and administrations that meet as well as surpass consumer loyalty and material statutory/administrative prerequisites. QMS also assist with identifying and addressing risks associated with your business. QMS further assist with formulating the capacity to exhibit adjustment to determined necessities. QMS also assist with working with aligned process that are understood by everyone, therefore improving productivity and efficiency, bringing internal costs down. Lastly, QMS also assist with characterizing who is influenced by your work and their desires, as it will empower you to unmistakably express your targets and recognize new business openings ((Jaafreh & Al-abedallat, 2012).

According to Furst, (2019), construction industry professionals are aware of the importance of having a robust quality management program with an effective and efficient process, overseen by knowledgeable and trained partners, and supported by involved staff, as well as senior management, as a key requirement to delivering superior quality and adding value to the project delivery process. It is a known fact that many organizations in the construction industry struggle to some degree in achieving acceptable levels of quality in their project delivery endeavors. Many construction firms either have no formal quality management processes or their processes are deficient in one way or another. Many also do not train their project staff in quality management processes or procedures. It is common to expect the superintendent to be responsible for the overall project delivery process, oversee production, coordinate subcontractor

efforts, resolve issues, solve problems, maintain the schedule, control cost, and manage performance, as well as ensure the achievement of the expected level of project quality (Furst, 2019).

A robust quality management system entails having an organizational structure in place; including senior management's oversight and involvement; engaging and involving subcontractors, suppliers, and vendors; defining and supervising production responsibilities; and delineating procedures, processes, and practices. It is important to have planned and available resources for implementing and managing the quality system. This requires a defined and clear framework to ensure that every time a process is performed or a procedure is followed, the same information, means, methods, skills, and controls are used and are practiced in a consistent and repetitive manner (Phew, 2015).

According to Al-Ettayyem and Al-Zu'bi (2015), it is imperative to note that in order to have an effective QMS, the following eight dimensions of Total Quality Management (TQM) should be in place Leadership Employee administration, Customer center, Factual way to deal with basic leadership, Supplier administration, Continual change, System way to deal with administration and Process Management. A couple of studies have investigated the impact of applying quality organization measures on general definitive feasibility and execution; a significant number of these examinations have demonstrated strong and positive relations with quality execution (El-Tohamy & Al Raoush, 2015). The enforcement of quality management system will also address production performance issues in terms of projects execution and completion.

2.11 Challenges to the Implementation of Quality Management Practices during Project Execution

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

Bubshalt and Al-Atiq (1999) enumerated eight obstacles to Quality Management as seen by contracting firms and they include: High cost, especially initial cost, Resistance to change at various levels in the organization, Loss of productivity of the workforce due to the effort exerted in learning the new system and implementation, besides their regular duties, Management interference, Limited ability of personnel, Remote job sites, making it hard to control and track the quality system implementation in all sites, Communication problems between personnel because of language differences and Cultural differences within the workforce. In reality, no firm can fully implement TQM; it is a continuous improvement process and as such never ending. Its culture and philosophy must infiltrate an organization, and can thrive only under senior management when it establishes it as a top management priority and commit itself to its success.

Hassin et al., (2007) recommend that training and education are key factors in the implementation of TQM. Other factors include customer satisfaction, employee participation and quality policy. Love et al., (2000) made a case for a cultural and behavioral shift in the mind-set of practitioners, academics and professional institutions if the construction industry is to improve its performance and competitiveness. This

view was reiterated by Ramachandran (2010) and Mahmood and Mohammed (2008) stating that the implementation of TQM requires a culture change and change in management behavior.

Quality management has been widely accepted in the manufacturing industry, the construction industry is slow in its implementation even though advance countries like Japan and USA has embraced the concept. Some of the challenges in implementing quality in construction is political affiliation and financial support from the government. According to Tang *et al.* (2005), some of the challenges of quality assurance are perceived threat to foreman and project manager roles, disinterest at site level, fear of job losses, inadequate training, geographical location of the site, plan not clearly define, lack of quality management practice at site. Nawaz and Ikram (2013) identify that lack of top management support, commitment and leadership are three most important barriers in the implementation of quality management in Pakistan.

There are several factors that impede the management of construction quality in developing countries. These factors can be classified as internal factors and external factors. Vaid (1999) mentioned that internal factors are the challenge in managing and ensuring the construction quality is posed by many critical factors that stem from the internal shortcomings of the industry. Juran (1984) indicated that one of the internal factors is contractual provisions, which comprises of decades old tendering and contracting procedures prevailing in most developing countries lack focus on quality. Unrealistic time schedule is also an internal factor that affects quality management in construction firms. Thus, it is imperative for the construction industry to design an effective system of tendering and contract that can enforce the quality.

According to Love and Li, (1998), organizational structure also affects quality management of a construction firms. Most construction companies lack the well-defined organizational setup. The Indian construction sector comprises of approximately 250 corporate firms as against 72 Class A contractors and sub-contractors who execute 90 percent of construction jobs. Most contractors operate with skeletal and have an adhoc approach towards resource mobilization. Quality management through sound organizational setup is still an alien concept to these firms.

Similarly, Juran (1984) specified that lack of technical expertise affect total quality management in construction organization. Construction industry in developing countries needs to equip itself with technical capabilities, both the human and nonhuman, to ensure effective quality assurance on and off the construction sites. Most contractors lack the financial capabilities to support such kind of in-house facility. The staff responsible for implementation of quality is inadequately trained and in most construction projects on-site quality checks are carried out by relatively less experienced supervisory personnel. Slow pace of mechanization is among the factors that affects quality management of construction firms. Vaid (1999) indicated that construction in developing country is a labour-intesive activity that provides extensive employment with little investment. Like any other labor-intensive industry, the construction industry is also characterized by low productivity and poor quality. Mechanization of construction activities could be a solution to overcome the limitations of labourers that are involved in onsite operations. The level of mechanization of construction industry in developed countries is about 60-70 per cent, compared to 15-20 per cent in Indian construction industry. The slow pace of mechanization of construction industry in developing countries can be attributed to the high investment

and low turnover. Smaller firms which execute 90 per cent of total work, usually opt for hiring the equipment as owning the expensive machineries is not a viable proposition. The imminent reflection of mechanization will be seen on the construction quality as it eliminates the human error.

Lack of training and skills workers was found to be among the challenges that affects construction firms in their attempt to practice quality management (Vaid, 1999). Construction sector in developing countries provides employment to those with little education or skill. A study of construction workers in five major cities India reveals that 73 per cent of workforce did not have any schooling (Vaid, 1999). The situation in China is very similar where 50 per cent of construction workers in Beijing received no more than primary education (ILO, 2001). These facts may support the popular notion that one can do a construction job without much schooling. The objective of improving the construction quality can be realized by upgrading the skills of workforce.

According to Juran (1984), limited financial capabilities is also a problem. To match the requirements of prevailing competitive environment, it is crucial for the construction industry in developing countries to enhance the capabilities of its human and nonhuman resources. The available capital is not adequate to meet the resource requirements. The industry and governments need to evolve a mechanism to allow the flow of funds to the construction industry. The banking sector may be encouraged to develop lending norms that could address the requirements of the construction industry. Highlighting on the external factors, Juran (1984) indicated that internal reforms within the construction industry alone would not yield the desired results with regard to the construction quality unless the industry also addresses the issues stemming from the other fronts. Technological Developments in Allied Industries affects quality

management on construction sites. The construction sector has major linkages with the building material industry since material accounts for 58-60 per cent of construction cost. These materials include cement, steel, building blocks, roofing material, fittings/fixtures, glass, paints, chemicals etc. Bulk of these materials is manufactured in the unorganized sector using low-grade technology. The quality of materials is critical in ensuring the construction quality; ironically, the locally produced materials are characterized by lack of quality and standards (Juran, 1984). Vaid (1999) specified globalization affects the implantation of quality management by construction firms. This is because the emergence of globalization provided the multinational organizations with opportunities of extending their business operations in developing countries. Construction is one sector where globalization made a significant impact. Consequently, one can see the presence good number of foreign construction firms in developing countries.

According to Furst (2019), the primary commercial project delivery process is still the design-bid-build method, where owners try to get the lowest price for their projects, which makes competitive bidding the primary procurement method. If the business environment is very competitive, general contractors or construction managers are going to have to try to aggressively control their costs to be the successful bidder. Since all of the competing general contracting bidders have to procure materials and labor in the project's geographic area, they will be dealing with the same sources. (However, contractors utilizing unionized labor may be at a disadvantage when bidding against nonunion competitors.) Therefore, in all likelihood, every contractor will be faced with the same or similar expenses for the direct costs associated with the project. The

competitive advantage will be in securing competitive subcontractor bids and in indirect costs.

The general contractor has significant control in the project's indirect costs. One of the key elements of the indirect costs is the field-staffing salaries. The contractor has a couple of obvious options in this regard. It can try to "under staff" the project and "hope" that the staff will work harder and/or longer to get the job done, or it can hire (or assign) less-experienced staff whose salaries are lower to oversee project operations. In both cases, the contractor will reduce some cost but will be taking on a higher level of risk with the probability that the project will end up potentially having a greater number or more complicated problems as work is put in place (Furst, 2019).

The American Society for Quality (2005) indicated that naturally, general contractors hire subcontractors to perform most or even all of the production work of the project. The general contractor will break the job up into specific bid packages for which it solicits a lump sum bid from a number of different subcontractors to ensure they get the "best" price for that scope of work. Like the owner, a responsible general contractor may have a list of prequalified subcontractors from whom it solicits bids and selects the lowest bidder to perform the work. The signing of a contract with that subcontractor is subject to the general contractor ensuring that all of the subcontractor pricing falls within their envisioned value for their bid to the owner. If the lowest subcontractor's bid is not at or below this value, the subcontractor is brought in and is subjected to negotiation to lower their quotes. If the subcontractor "needs" the work, they will cut their quoted price and then try to reduce their cost by some means, and thereby increase their inherent risk (American Society for Quality, 2005).

Additionally, Yusoff et al (2006), mentioned that in a way, the owner set up the competitive environment that creates the situation where every organization wanting to secure the work may be forced into the situation where they decide to take on a little more risk in the anticipation that they will be able to manage it effectively. There are many cases where both the general contractor and subcontractor's senior management resorted to this type of cost-reduction activity to ensure they were successful in procuring the job. They hoped the added risk would not result in discrepancies, problems, or losses. In some cases, this sort of risk-taking is successful costs are cut with no, or minimal, resulting negative outcomes. This then serves to reinforce such at-risk behavior, which is then used in similar competitive situations later on. Since the primary tool to manage the project is the schedule, this becomes the principal focus of the project superintendent. Furst (2019) indicated that if the project is understaffed or the staff is less experienced, the superintendent is going to be faced with additional issues, a greater number of problems, and more challenges, all of which will take up more of his or her time. As a result, the quality of the project is going to get less attention, and the risk of discrepancies in this area will invariably increase. Defects in quality will become evident at much later times and, as a result, will become significantly costlier and time-consuming to correct. This can disrupt the progress of the work and adversely impact the project schedule.

2.12 Strategies for Improving Quality Performance

To improve quality management, the general contractor must have a robust quality-management process in place. They also need to have a knowledgeable, experienced, and trained field management staff to oversee the process and ensure that the required

level of quality of the project is achieved. The general contractor's senior management must also be involved and exercise oversight to ensure that everything proceeds as planned and problems are immediately addressed and resolved. Since much or most of the work is going to be performed by subcontractors, the general contractor must ensure that every subcontractor has an acceptable quality-assurance program and that the staff assigned to the project is capable of achieving the acceptable level of quality required by the project.

A number of literatures have given numerous ways and strategies to minimize waste in constructing using quality assurance management plan or practice. According to Gudigar *et al.* (2014), developing of construction waste management plan can generally be categorized into four main groups. These are contract language, design issues and construction techniques, building material specification and education. All these categories fall under the design stage of a project. Osmani *et al.* (2008) mentioned that waste minimization strategies implemented right at the design stage of the project are more efficient and effective the reason being that the bidders are aware even before the project. In view of this a number of researchers like Coventry and Guthrie (1998), Greenwood (2003), Poon *et al.* (2004) and Baldwin *et al.* (2006) have demonstrated that the architect has a vital role play in construction waste minimization and reduction because they are the most active stakeholders in the design stage of the project.

It is very important to hire subcontractors that one trusts, and that have a reputation for both doing quality work and acting in good faith when it comes to their business. Subcontractors should be professional in both their business dealings with contractors and in their behavior in the work environment. As a contractor, the scope of projects you can take on grows with the number of qualities, professional subcontractors you

have access to. Therefore, it makes sense to build your network of professional contacts as much as possible. Working with subcontractors presents a unique set of challenges but is a great way to increase your profits and create customer satisfaction as a contractor.

Coventry and Guthrie (1998) gave three major duties architects should play in minimization in the construction industry and they are; giving advice to client, improving design practices and standardization of design.

2.12.1 Advising Client (Government)

This is done by educating the client the client on the impact of waste production and highlighting benefits including cost savings. According to Dainty and Brooke (2004), many clients do not have adequate information about the severity of construction waste. Waste minimization could be a very significant initiative by both the client and consultants when they know, identify and analyze the merits of waste reduction at various stages of a construction process. In view of this Innes (2004) concluded that saving of about 3% can be made without significant investment outlay.

2.12.2 Improvement of Design Practices

Waste and other problems can be minimized by improving design practices by addressing the key causes of design waste. According to Coventry and Guthrie (1998), design waste could be handled by addressing the various problems encountered during the design process, which will facilitate better coordination at project level. This will eliminate a number of causal agents of waste and save construction cost without any investment outlay. Proper design will eliminate frequent design and detailing changes

so as to avoid unsuccessful work during site operations, design for deconstruction, planning to minimize wastage through off-cuts, the use of reclaimed building materials; and appropriate specification of design performance and products and improve design (Coventry & Guthrie, 1998).

2.12.3 Standardization of Design

Problems, which directly affects construction cost, is generated as a result of late changes during construction site operations. These amendments may change the type or quantity of building materials required at a specific stage of a project (Coventry *et al.,* 2001). The author further stated that standardization of design as a construction method improve the ease of building and reduce the quantity of waste generated. Hylands (2004) had similar findings in his study and argued that standardization of both building layouts and components result in less waste generation. Baldwin *et al.* (2006) agreed with the fact that standardization is a major way of reducing waste generation and he went further to state that pre-casting and prefabrication offer significant avenues to reduce waste generation. Dainty and Brooke (2004) asserted that the use of off-site prefabrication leads to better control of waste and damage.

2.12.4 Effective Supervision and Incentives

According to Teo and Loosemore (2001), proper supervision of works on site will make progress in operatives of work and reduce the quantum of waste generated. Operatives tend to waste more with no or low supervision. In addition, proper supervision will reduce the cases of theft and unnecessary materials wastage as they also form a portion of waste generated on construction site. When quality management is done effectively, it brings about cost savings and it is the most attractive benefits to reduce waste (Teo

& Loosemore, 2001). There, site staff and other employers should benefit from the potential cost savings of waste reduction in the form of reward and incentives so as to encourage them to put more effort quality control. This will also create awareness of the economic benefits of waste reduction.

2.12.5 Effective Planning of Construction Process

Construction planning processes is one of the vital strategies in reducing construction waste generation on site. Planning reduces waste generation at source. Experienced practitioners in the waste and environment pollution fields recommend that reduction of waste at sources should be given the highest priority when developing strategies for waste minimization (Crittenden & Kolaczkowski 1995). This is because, conceptually it makes more sense to avoid waste generation that is to develop extensive ways in treating waste.

2.12.6 Management Support

Teo and Loosemore (2001) specify that managers have to show greater commitment to quality management. This will encourage employees to view quality management as a very vital aspect of construction process on site and thus they will strive to reduce waste generation during construction on site. Waste management has a low priority during construction projects and not enough is done to reduce waste generation (Teo & Loosemore, 2001). Management involvement can help raise the importance associated waste management. In addition, they can provide recycling facilities to help reduce unavoidable waste generated.

2.12.7 Contract and Contractual Agreement

At the pre-contract and post contract stage a number of measures can be put in place which could play a very critical role in minimizing waste. This could be done by making room for specifically waste minimization-oriented contract tender clauses (Burati & Farrington, 2003). A typical example was identified by Dainty and Brooke (2004) who suggested the use of contracted clause to penalize poor waste performance contractors. Greenwood (2003) in his literature stated similar recommendation and went further to suggest the incorporation of a fully integrated waste minimization strategy at the contractual stage.

2.12.8 Government Initiatives

The government also have a role to play in the minimization of waste generation in the Ghanaian construction industry. The government of New South Wales, Australia proposed to achieve a 60% reduction in waste Disposal Act that focused on the storage, collection, treatment and disposal of waste (Faniran & Caban 1998). Similar strategies can be adopted in Ghana to reduce the amount of waste generated in our construction site drastically.

2.13 Conceptual Framework

A conceptual framework is a tool that researchers use to guide their investigation; it is a collection of concepts used to arrange the research, similar to a map (Kothari, 2012). It expresses the researcher's point of view on the issue and guides the investigation. It might be an adaption of a model used in a prior research, with alterations to fit the investigation. Aside from indicating the direction of the investigation, the conceptual

framework allows the researcher to demonstrate the links between the many constructs that he wishes to explore. This study was led by the conceptual framework below, which displays the link between the dependent and independent variables.

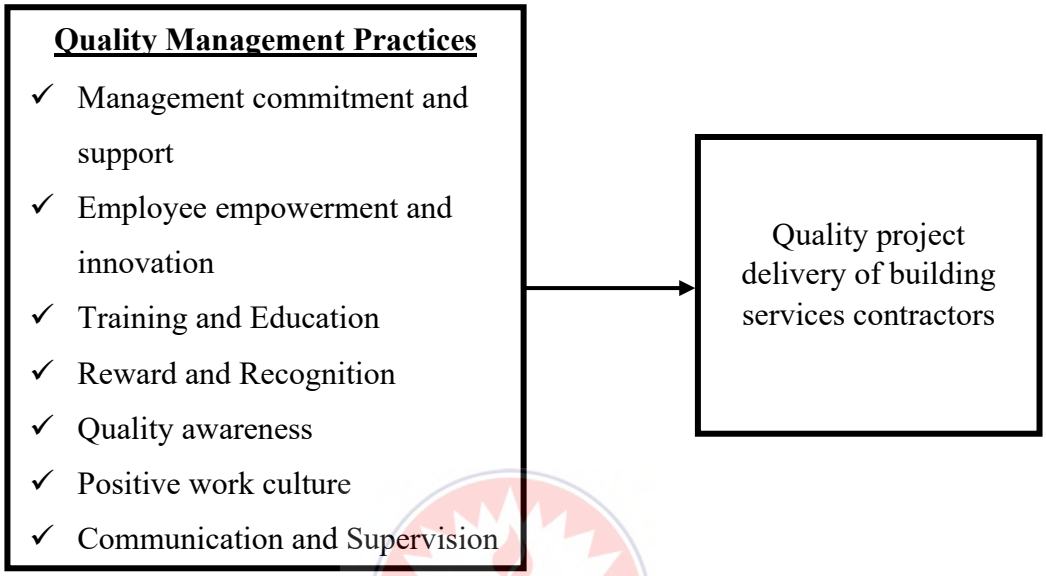

Figure 2.3: The Conceptual Framework of the Study

Source: Researcher's Own Construct

This study utilizes the quality management as the independent variable, and construction project delivery of building electrical services contractors as the dependent variable. Quality management in this case is shown to depend on management commitment and support, employee empowerment and innovation, training and education, reward and recognition, quality awareness, positive work culture, communication and supervision. These items are considered to come together to help the actual implementation of quality management in the Ghanaian construction industry and thus lead to a positive effect on the construction project delivery of building electrical services contractors. Thus, the researcher argues that there is a correlation

between quality management and construction project delivery of building electrical services contractors. The correlations among variables are explored in this framework.

2.14 Summary of Literature Review

The review of literature tried to explain the theoretical framework, concept of quality and quality management, effectiveness of implementing a quality management system, building electrical services contracting practice in construction industry, challenges of contracting and strategies to improve quality management and conceptual framework of the study. The researcher recognised that the emphasis on quality has encouraged organisations to adopt quality management system after reviewing the considerable literature on quality management. According to the researcher's study of the literature, the term "quality" signifies different things to different individuals. This is why, in most quality improvement journeys, identifying quality is the first step. Quality management awareness can be implemented first to create knowledge and consistency in the organisation's work, then the implementation of quality management can enhance employee motivation and operational efficiency, and achieve overall organisational success and performance. The study followed the issues, which emerged, from the literature reviewed.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This part of the study spells out the specific stages and overall procedure and strategies that the researcher employs in the process of acquiring and analysing research data to be able to solve a problem and also create knowledge. The chapter discusses the research paradigm, research design, target population, sample technique and sampling size, sample frame, types of data, pilot testing, data collection, data analysis, validity and ethical consideration.

3.2 Research Paradigm

The foundation of the research is the philosophy (Benton and Craib, 2001), and it develops the research characteristics, central knowledge, and the background of the study (Saunders & Thornhill, 2007). Additionally, it elucidates the essential assumptions of researchers' perception of the world and comprehensively operationalizes their studies (Mora et al., 2012). Dudovskiy (2018), opine that the research philosophy clarifies the source and nature of knowledge development concerning the collection, analysing and interpretation of data on a social phenomenon to interpret and generate desirable results. Researchers in the field of management, business, and other social sciences should have in-depth knowledge about the philosophical approaches and choices available because they depict the inference of one's perception of the social world (Proctor, 2005; Blaikie, 2010). It is vital to understand the philosophical underpinnings of a study to justify your choice and

appreciate the existence of others neglected (Grix, 2002) because the adoption of a philosophy that has no link with the study defeats its central aim (Clark, 2006).

The paradigm gives the set of beliefs and assumptions that guides the research approach (Lincoln et al. 2011). The paradigm presents the philosophical, epistemological and methodological features of the mixed method underpinnings of the study. The foundation of the research is the philosophy (Benton and Craib, 2001), and it develops the research characteristics, central knowledge, and the background of the study (Saunders & Thornhill, 2007). Additionally, it elucidates the essential assumptions of researchers' perception of the world and comprehensively operationalizes their studies (Mora et al., 2012).

Philosophically, the study adopts positivism. The positivist paradigm is a realist view of the world in which knowledge may be seen concrete objective reality that exist outside human mind. Consideration the nature of the phenomenon (quality management) and the information required to answer the research questions posed in chapter one makes the adoption positivism as the most appropriate paradigm. Positivism involves quantification of numerical data using statistical methods (Saleem, 2011).

3.3 Research Design

Research design embodies a coherent plan of research that involves the techniques in collecting data for analysis and interpretation, the conclusion and summary of findings as well as and also considering the constraints of the research (Wills, 2012; Waiganjo, 2013). It is the overall plan for the collection, measuring, analysis, and interpretation of data based on the hypothesis set, and research questions under study (Welman et al.,

2009; Sekaran & Bougie, 2013). Additionally, it serves as an outline to accomplish research objectives and questions in a research methodology (Kelliher; 2005; Burns & Bush, 2010). Mouton (1996) maintains that the overruling drive of a research design is to help the researcher predict the likely decisions, to maximize the validity of prospective results and to minimize errors. Therefore, the research topic and philosophy determine the design of the study (Creswell, 2009). Available literature categorises research design into many groups. These are; experimental research, survey research, ethnography, grounded theory, hermeneutics etc. (Lincoln & Guba 1997; Iacobucci & Churchill, 2010; Sekaran & Bougie 2013). However, the choice of a design depends on the research purpose, research questions, formulated hypotheses, and the data-gathering methods and techniques (Aaker et al., 2013).

The study adopts a cross sectional research design complemented by semi-structured interviews to further explore some key responses of the survey respondents (Robson, 2002; Zikmund 2003; Wilson, 2012). Surveys provide specific and precise, and for that reason, a clear picture of the phenomena under study.

3.4 Research Strategy

Three research strategies predominate management and social science research namely; quantitative, qualitative and mix methods strategies. Qualitative strategy involves textual data or observational data often bordering on the subjective experience of research subjects. Quantitative research is a method that employs techniques from natural sciences by using numerical and statistical methods to explicate mathematical data analysis retrieved from relevant theories with an encoded set of categories to map observations (Kent, 2007) whilst mixed method research combines elements of quantitative research and qualitative research in order to answer your research question.

The present study adopted a quantitative strategy. Quantitative strategy ensures objectivity and reliability in the data collection process from a large sample size by using instruments like the structured questionnaire to alleviate the level of bias (Waiganjo, 2013). Saunders and Thornhill (2007) note that quantitative strategy produces statistical information about aspects of a study that interest policy maker.

3.5 Target Population

The target population of the research comprised site managers of all building electrical services contractors registered with their respective associations in the selected regions (Ashanti Region, Bono East Region) numbering a total of four hundred and seventeen (417). These categories of contractors were selected because they were considered as being in the position with the required information to answer the research questions.

3.6 Sample Technique and Sampling Size

Purposive sampling technique was used to select respondents for the study. This sampling technique was considered because it involves whoever happens to have rich information and available for the study. Kent (2007) sees purposive sampling as hand picking the cases to be included in the sample on the basis of their judgments of the typicality of the issue identified for study. The researcher selected respondents with at least two years of experience in building electrical servicing.

In order to calculate the total number used for the sample size, a mathematical formula adopted Fraenkel and Wallen (2011) was employed. The formula states:

Sample size, $n = \frac{N}{1+N(\infty)^2}$

Where:

N= Population or sample frame and

∞= Margin of error (5%)

Sample size, $n = \frac{417}{1+417(0.05)^2}$

Sample size, $n = \frac{417}{1+417(0.05)^2}$

Sample size, $n = \frac{425}{2.0425}$

Sample size, $n = 204$

Based on this calculation, the sample size for the study was made up of 204 respondents from the target population. The sample size formed 49% of the total population of building electrical services contractors in the Bono East, Bono, Ahafo, and Ashanti Regions of Ghana. According to Creswell (2007), the ideal sample size should be large enough to serve adequate representation of the population about which the researcher wishes to generalize the findings. Jay and Bruce (2007) recommends a sample size of 10 percent, 30 percent and above for descriptive study.

3.7 Data Collection

For the purpose of this study, primary source of data was collected to obtain first-hand information for the research objectives. Primary data is the data which the researcher collects through various methods like interviews, surveys, questionnaires etc. (Kent, 2007). However, the study sees the questionnaire technique as the most appropriate to the research questions and objectives, because it can provide an efficient way of collecting responses from a large sample of prior to quantitative analysis.

The primary data was collected to cover every aspect of the study. Primary data is any information collected by a researcher specifically for a research assignment from the original source or field (location of the respondent). In other words, primary data is information that a researcher gather because no one has compiled and published the information in a forum accessible to the public. Researchers generally take their time and allocate the resources required to gather primary data only when a question, issue or problem presents itself that is sufficiently important or unique that it warrants the expenditure necessary to gather the primary data. Primary data is original in nature and directly related to the issue or problem and current data.

For ethical reasons permission was sought from the management of the selected construction firms concerning the participation of the services contractors. The purpose of the study was also explained to the individual respondents and their consent sought before the administration of the questionnaire. The researcher spent one week on each of the five construction sites to collect data. The construction sites were Justmoh, Consar, Nickseth, CDeck and Ebencle Plus Construction Limited. After the five weeks, five Research Assistants, one for each construction firm, were appointed and trained to make follow-ups to retrieve the remaining questionnaire that could not be completed by the respondents during the one week stay of the researcher on each construction firm. The questionnaires were personally distributed to all the selected categories by the researcher. Two hundred and four (204) copies of the questionnaire were administered to the respondents, out of which 200 were duly completed and returned. Four of the completed questionnaires were not properly filled and were not included in the analysis. The response rate achieved was 98%.

3.7.1 Questionnaire Design

A structured questionnaire was designed to reflect the objectives of the study. The questionnaire was categorized into five sections, numbering sections A to E. Section 'A' covered the demographic characteristics of respondents. There were five (5) items consisting of the gender, age, highest academic qualification type of work done by company and area of specialization. Section 'B' also used a five-point Likert scale to measure services contractors' quality control management practices. They were asked to indicate their levels of agreement with thirteen (13) statements.

Section 'C' contained thirteen 13) statements on a 5-point Likert scale and was used to measure the impact of main contractor quality management on services contractors' quality performance. Section 'D' covered fifteen (15) statements measuring the challenges faced by services contractors in an attempt to ensure quality management. The last section, 'E' had fifteen (15) questions on the strategies to improve quality management by services contractors. Items on the questionnaire were presented on a 5-point Likert scale for respondents to rank statements where 1-1.5=strongly disagree, 1.6 - 2.4 = disagree, 2.5- 3.4 = Not sure, 3.5-4.4 = agree and 4.5- 5.4 = strongly agree.

3.7.2 Pilot Testing

Pilot test was conducted prior to the actual research, where building electrical services contractors working on sites located in the Western North Region were involved. These respondents had a similar characteristic as those in the Bono East, Bono, Ahafo, and Ashanti Regions of Ghana. The pilot study targeted a sample size of 20 respondents in which all of them filled the questionnaires making a response rate of 100%. The researcher used Cronbach's alpha test method to ensure the stability of the tools

and results. Cronbach's alpha indicated that the test designed was accurately measuring the variables of interest. The formula for Cronbach's alpha is:

$$\alpha = \frac{Nc}{v+(N-1)c}$$

Where:

N = the number of items.

c = average covariance between item-pairs.

v = average variance.

The Cronbach alpha reliability co-efficient for the overall instrument was r = 0.83. This was deemed appropriate for the study based on Cohen et al. (2007) recommendation that a reliability co-efficient of 0.70 or above is good enough for research purposes. As a result, the instrument was used in collecting data for the study.

3.7.3 Validity of the Instrument

Content validity of a measuring instrument is the extent to which it provides adequate coverage of the investigative questions guiding the study (Mugenda & Mugenda, 2003). The content validity of the questionnaires that were used in this study was determined by the literature review as well as by the judgment of the supervisor in consultation. Face validity of the instrument was determined by the supervisor. Construct and content validity of the questionnaires was determined by the help of the supervisor. The input and the recommendations by the supervisor were used to improve the instruments and results.

3.7.4 Ethical Consideration

One important component of field research is ethical requirement on the part of the researcher. The participants have the right to decide whether to respond to questionnaire or not. As a result, declaration of the purpose was made, and the consent of the respondents was sought. To ensure confidentiality as well as anonymity of respondents, their names and identity were not disclosed. The researcher tried as much as possible to report every subjective view of the respondents without imposing personal biases in the interpretation of the data. The questionnaire items were simplified in tables to make them so 'friendly' to answer. This was done to ensure that respondents spent less time to respond to them

3.8 Data Analysis

Data gathered from respondents were sorted and categorized in groups like Gender, Age interval, educational background. Quantitative techniques were employed in the data analysis. The quantitative aspect measured data in the form of descriptive statistics such as percentages and mean. The items on the 5-point Likert scale were measured using mean scale. The use of descriptive statistics that concerns the presentation of facts as they are without necessarily going beyond its existence was employed. In view of this, the results that was obtained from the data gathered was presented per the outcome without any other additions or omissions. Moreover, the use of content analysis was quantitatively applied on the reports from the respondents. To ensure effective, accurate, consistency and reliable results, the data was thoroughly checked for possible errors and if any, corrected before making the final presentation of the findings in the

form of tables. The statistics was generated using Statistical Package for Social Sciences (SPSS) version 21.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF RESULTS

4.1 Introduction

The purpose of this study was to explore the quality management practices of building electrical services contractors in selected regions in Ghana. This chapter is based on the data gathered by the researcher dealt with in chapter three. The chapter deals with the presentation of data collected. That is, data on the background of the respondents such as gender, age, educational status and type of firm. The second part deals with the presentation of the main data that relates to the research topic. In presenting the results from the administered questionnaires, references were made to frequency figures, means, charts and tables. The total number of questionnaires administered was 204, out of which 200 were duly completed and returned. Four of the completed questionnaires were not properly filled and were not included in the analysis. The response rate achieved was 73%.

4.2 Demographic Characteristics of Respondents

To position the study in the right frame, it is imperative to understand the personal and background characteristics of respondents in the study area. This builds confidence in the dependability of the data obtained and, ultimately, in the study's conclusions. According to Offei-Nketiah (2019), it is always vital to have a good concept of the respondents in order to contextualize the replies within the context. As a result, the pertinent socio-demographic factors of respondents covered were gender, age, level of education, and years of experience and type of work.

4.2.1 Distribution of Respondents by Gender

The researcher enquired about respondents' age. Responses registered by the selected respondents have been presented in Figure 4.1

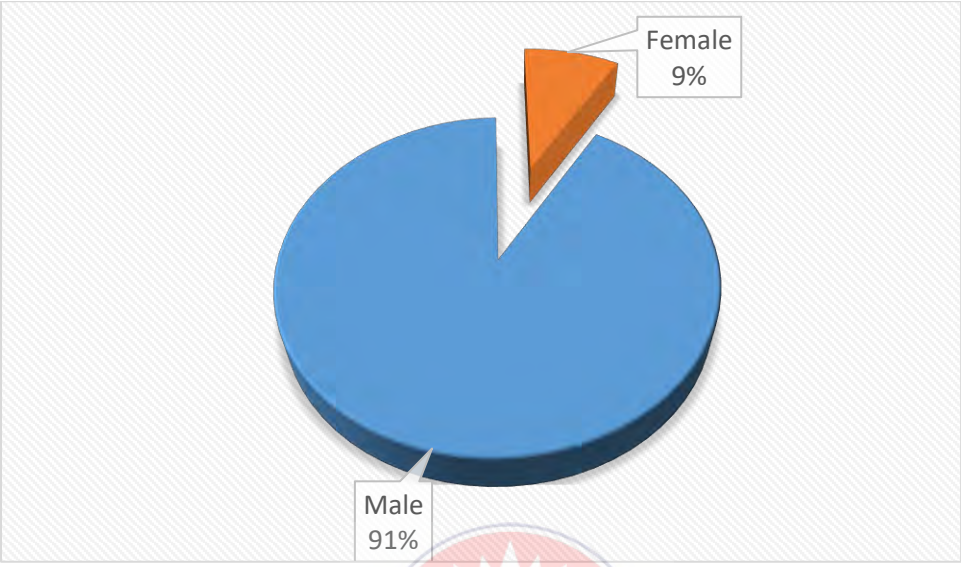

Figure 4.1: Distribution of Respondents by Gender

Source: Researcher's Field Survey, 2021

The total number of respondents were two hundred (200) for the study. Out of this total number of respondents, 182 (91%) contractors were males and 18 (9%) contractors represented that of females as indicated in the Figure 4.1. The gender of the respondents depicts a male dominated environment. This could be attributed to the health hazards associated with the work of a construction work and nature of the cultural systems in Ghana. This is in line with Prah (2008) who discovered a significant degree of pessimism regarding the recruitment of women in the construction business in a survey of large companies, and males dominated the construction sector. He went on to say that women's roles on construction sites were confined to providing employees cheap

food and drink. On the contrary, women made up a sizable proportion of the construction workforce in India.

4.2.2 Distribution of Respondents by Age

The second demographic survey question sought to know the age bracket of the respondents. The age of the respondents was categorized in ten year-intervals in order to isolate the particular age range that produced the majority of the respondents as shown in Table 4.1.

Table 4.1: Age of Respondents

Age (years)	Frequency	Percentage (%)
21-30	18	9
31-40	94	47
41-50	71	36
51-60	15	8
Above 60	2	1
Total	**200**	**100**

Source: Researcher's Field work, 2021

Based on their responses as shown in Table 4.1, out of the 200 respondents, the largest percentage of contractors (47%) fell within the 31 to 40-year age range, and the second highest percentage (36%) fell within the 41 to 50 age brackets. 18 (9%) respondents fell within the ages of 21 and 30 years, 15 (8%) respondents were within 51 and 60 years whilst 2 (1%) respondents were above 60 years. The 60 years and above age group had the least respondents. Table 4.1 revealed that, out of the 200 contractors who took part in the survey, majority (56%) were forty years and below, indicating youthful population in the Ghanaian construction industry. This contradicts postulations of

Ampadu-Asiamah (2017) that there is lack of interest in the construction trades by the country's rapidly increasing youthful population who were more interested in white-collar jobs than physical/skilled labor.

4.2.3 Educational Status of Respondents

The educational status describes the educational background of contractors of the sampled construction firms. This represents the highest level of education attained by the respondents. The outcome of the analysis of the respondents' educational attainment is presented in Figure 4.2.

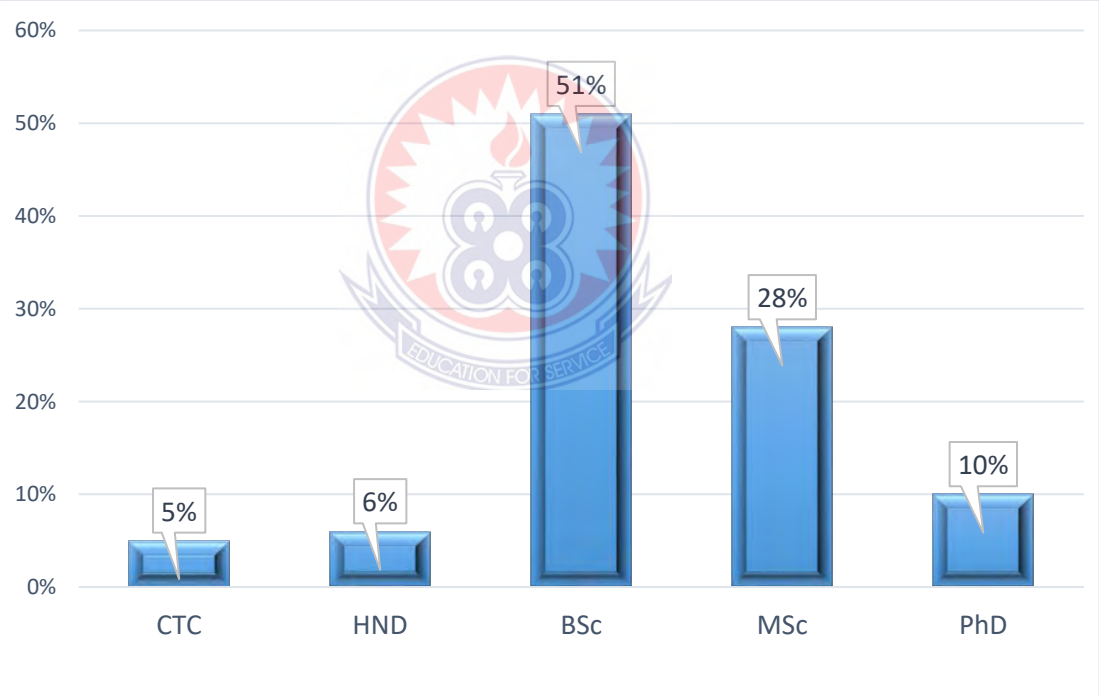

Figure 4.2: Educational Status of Respondents

Source: Researcher's Field Survey, 2021

The results in Figure 4.2 shows that 102 (51%) of the respondents had attained a Bachelor degree as their highest level of education, while 56 (28%) of the respondents

had attained Master's degree qualification as their highest level of education. 20 (10%) respondents were Doctorate degree holders, 12 (6%) respondents were Diploma holders while 10 (5%) respondents were Technician certificate holders. This shows that the respondents are highly educated and knowledgeable with 89% having a degree.

4.2.4 Respondents' Years of Experience

Experience plays an important role in a contractor's construction operational excellence. Without well trained and experienced artisans, it would be difficult to produce quality workmanship. Consequently, the respondents were asked to indicate their work experience as building electrical services contractors since graduating from formal and apprenticeship training.

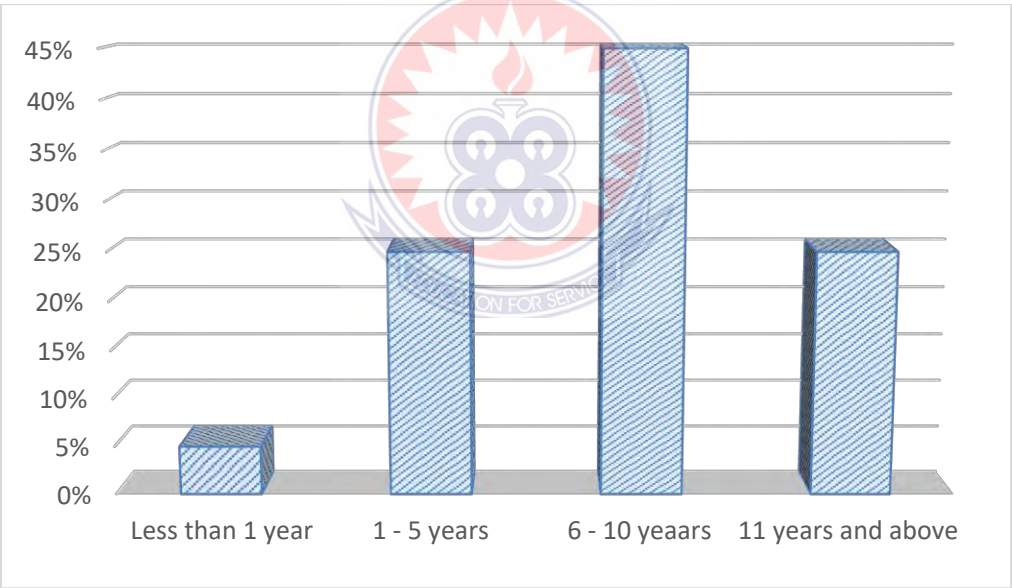

Figure 4.3: Respondents' Years of Experience

Source: Researcher's Field work, 2021

With regards to years of experience in Figure 4.3, 10 (5%) contractors had been in service for less than a year, 50 (25%) respondents had been in service for 1 to 5 years, 90 (45%) respondents were in service for 6 to 10 years and finally 50 (25%) respondents

had been in service for 11 years and above. This shows that the respondents have an extensive number of years as construction firm contractors.

4.3 Quality Management Practices of Building Electrical Services Contractors

This was the first research question of the study. Here, the researcher sought to present data on the level of implementation of quality management practices of building electrical services contractors. Table 4.3 presents the results of this section of the study.

Table 4.3: Level of Implementation of Quality Management Practices

Statement	Response (N)					Mean	SD	Rank
	5	4	3	2	1			
My company uses quality construction materials	124	68	4	4	-	4.56	.671	1
Encouraging the use of standard materials for construction work	128	47	17	8	-	4.48	.721	2
Good attitude towards quality management practices is always maintain	104	77	15	4	-	4.41	.728	3
My company has respect for effective communication with the project team members for clarification	105	76	9	10	-	4.38	.814	4
Effective and efficient team work are always ensured	90	94	16	-	-	4.37	.556	5
Commitment to quality is a hallmark	85	102	-	-	13	4.23	.553	6
My company rely on adequate /completeness of the design documentation for a project	61	110	29	-	-	4.16	.549	7
My company works efficiently towards its reputation	70	96	19	15	-	4.11	.725	8
Realistic design is always ensured	86	72	18	24	-	4.10	.796	9
Engaging qualified persons for construction work	45	131	-	24	-	3.99	.753	10
My company relies on experienced supervisors for supervision of works	45	91	30	11	23	3.62	.888	11
My company works in conformity with Environmental Protection Agency standards	34	87	38	32	9	3.53	.889	12
Adhering strictly contract clauses bordering on quality of works	34	68	62	18	-	3.32	.854	13
Aggregate mean	**4.10**							

Source: Researcher's Field work, 2021

Table 4.3 displays the responses of contractors on the implementation of quality management practices of building electrical services contractors in Ghana and how each scaled was ranked. On a five-point Likert-type scale, the results indicate that the respondents strongly agreed to the statement "my company uses of quality construction materials" which had the highest mean score of 4.56 with a moderate standard deviation value that indicated the variations in the responses from the mean. This was ranked which was ranked as the number one factor, indicating that contractors perceived a very high level of quality management implementation from the conformance to requirements and standard of construction materials practice. This was followed by the statements "encouraging the use of standard materials for construction work" and "good attitude towards quality management practices is always maintain". These statements had mean scores of 4.48 and 4.41 respectively which were considerably above the average mean score and had standard deviation values pointing that there was clear convergence in the responses. The statements were also ranked second and third respectively, showing that the respondents agreed to the implementation of these practices in their daily operation.

To find out the level of implementation of quality management practices of building electrical services contractors, the results show that most respondents agreed that their company has respect for effective communication with the project team members for clarification and effective and efficient team work are always ensured. These statements had mean scores of 4.38 and 4.37 respectively which is considerably above the average mean score and had standard deviation values pointing that there were outliers and clear disparity in the responses. The statements were also ranked fourth and fifth respectively. According to Table 4.3, the statements "commitment to quality is a

hallmark" and "my company rely on adequate /completeness of the design" ranked as sixth and seventh with the mean scores of 4.23 and 4.16 respectively. Again, Table 4.3 reveals that the respondents agreed to the statement "my company works efficiently towards its reputation". It had a mean score of 4.11 which is considerably above the average score and had a high standard deviation value pointing that there was clear divergence in the responses. This was closely followed by the statement "realistic design is always ensured" scored above the average mean (4.10) and was ranked ninth in Table 4.3, showing that respondents believe that ensuring realistic design is a quality management practice.

Data on the level of implementation of quality management practices of building electrical services contractors showed that, the respondents also showed a high level of quality management with statements like "engaging qualified persons for construction work" (3.99), "my company relies on experienced supervisors for supervision of works" (3.62), "my company works in conformity with Environmental Protection Agency standards" (3.53) and "adhering strictly contract clauses bordering on quality of works" (3.32). However, these statements were ranked the least on the table but their mean values scored slightly above average, indicating that the respondents agreed to them. The researcher also calculated the aggregate mean of the items presented to the respondents. The aggregate mean was found to be 4.10 which showed that, the respondents mostly agreed to the items presented in Table 4.3. This result suggests that all the statements had mean ratings exceeding the average (theoretical) mean of 3.00. This therefore suggests that there is high level of implementation of quality management practices of building electrical services contractors at the sampled construction firms.

4.4 The Roles of Main Contractors in Building electrical services Contractors' Quality Performance

This section sought to present the results of the second research question. Here, the researcher sought to identify the role of main contractors in building electrical services contractors' quality performance. The descriptive in Table 4.4 represents the responses to statements on this part of the study.

Table 4.4: Roles of Main Contractors in Building electrical services Contractors' Quality Performance

Statement	Response (N)					Mean	SD	Rank
	5	4	3	2	1			
Proper and more effective planning	92	89	5	14	-	4.30	.721	1
Training services contractors' personnel on quality	83	97	14	6	-	4.23	.700	2
Enhance reputation of the project team members/client	38	135	27	-	-	4.06	.653	3
Improved quality of construction product/result	94	68	9	12	17	4.05	.828	4
Effective/efficient site management	71	76	35	18	-	4.00	.724	5
Ensuring general and special attendance for services contractors meets their needs.	28	146	16	10	-	3.96	.751	6
Production of a better and efficient design	66	98	8	12	16	3.93	.835	7
Certifying that works carried out by services contractors meet the required quality standards.	89	66	15	-	30	3.92	.789	8
Reducing inefficiencies in resources management by services contractor	85	35	47	18	15	3.79	.949	9
Minimizing waste relating to services contractors works	54	86	12	43	5	3.71	1.018	10
Main contractor stipulates the quality of works and workmanship of works to be carried out by services contractor in contract clauses	29	93	58	20	-	3.66	.856	11
Ordering re-work when works carried out by services contractors falls below required standard of quality.	24	68	31	34	43	2.98	1.121	12
Increase worker morale (laborers/artisans)	31	40	44	60	25	2.96	1.11-	13
Aggregate mean	**3.81**							

Source: Researcher's Field work, 2021

From Table 4.4, the mean rating of the 200 respondents on their views about the roles of main contractors in building electrical services contractors' quality performance ranged from 2.96 (SD = 1.115) to 4.30 (SD = 0.721). The results indicate that the respondents agreed to the statement "proper and more effective planning" which had the highest mean score of 4.30 with a standard deviation value that indicated the variations in the responses from the mean. This was placed first, suggesting that the most important role of primary contractors in building electrical services contractors' quality performance is ensuring adequate and more effective planning. The statements "train services contractors' personnel on quality" and "enhance reputation of the project team members/client" were ranked second and third, respectively, with mean scores of 4.23 and 4.06, as respondents agreed that these were key roles main contractors play in improving quality performance of building electrical services contractors

As indicated in Table 4.4, these statements were closely followed by "improved quality of construction product/result", "effective/efficient site management", "ensuring general and special attendance for services contractors meets their needs" and "production of a better and efficient design" which were scored above the average mean value indicating that the respondents agreed to these roles played by main contractors and were ranked fourth (4.05), fifth (4.00), sixth (3.96) and seventh (3.93) respectively. These statements also had standard deviation values pointing that there were outliers and clear disparity in the responses. The succeeding data from Table 4.4 on the role of main contractors in building electrical services contractors' quality performance presented that, the respondents also showed support to these ranked assertions with statements like "certifying that works carried out by services contractors meet the required quality standards" (3.92), "reducing inefficiencies in resources management

by services contractor" (3.79), "minimizing waste relating to services contractors works" (3.71) and "main contract stipulates the quality of works and workmanship of works to be carried out by services contractor in contract clauses" (3.66). These statements were ranked eighth, ninth, tenth and eleventh in that order among the presented roles of main contractors in building electrical services contractors' quality performance.

Moreover, from Table 4.4, the statements "ordering re-work when works carried out by services contractors' falls below required standard of quality" and "increase worker morale (laborers/artisans)" were scored slightly below average with mean scores of 2.98 and 2.96 respectively. This shows that the respondents disagreed to the statements and had a strong standard deviation value pointing that there was clear convergence in the responses. The researcher also calculated the aggregate mean of the statements presented to the respondents. The aggregate mean was found to be 3.81 which showed that, the respondents mostly agreed to the statements presented in Table 4.4.

4.5 Major Challenges to the Implementation of Quality Management Practices by Services Contractors

This was the third research question of the study. Here, the researcher sought to present data on the key challenges to the implementation of quality management practices by services contractors. Table 4.5, provides an insight into how the respondents rated their major challenges to the implementation of quality management practices by services contractors.

Table 4.5: Major Challenges to the Implementation of Quality Management Practices by Services Contractors

Statement	Response (N)					Mean	SD	Rank
	5	4	3	2	1			
Companies lack regular and intermittent training and workshop for capacity building	158	27	15	-	-	4.72	.502	1
Setting unrealistic deadlines	93	71	19	17	-	4.20	.617	2
Lack of proper and effective monitoring of job execution	90	42	51	5	12	3.97	.741	3
Lack of effective communication among team members	100	46	-	45	9	3.92	.805	4
Some companies do not observe certain basic safety rules	34	130	28	-	8	3.91	.646	5
Some companies do not buy from the reliable source	98	74	14	8	6	3.88	.770	6
Use of inferior gadgets and materials has been a major challenge	87	54	22	10	27	3.82	.702	7
Lack of a quality management team to lead the process	68	69	29	18	16	3.78	.768	8
Personnel unable to thoroughly read and interpret contract document (designs and specification)	72	59	30	11	28	3.68	.814	9
Some companies rely largely on semi - formal expertises	27	85	58	15	15	3.47	.865	10
Complex designs (unable to interpret complex designs	28	46	47	49	30	2.97	1.121	11
Lack of management commitment to quality	14	80	23	28	55	2.85	1.103	12
Aggregate mean	**3.76**							

Source: Researcher's Field work, 2021

From Table 4.5, the statement "company's lack regular and intermittent training and workshop for capacity building" scored the highest on a five-point Likert-type scale, with a mean score of 4.72 and a weak standard deviation, indicating that respondents strongly agreed with the statement. This suggesting that lack of regular and intermittent training and workshop for capacity building is a key challenge to the implementation of quality management practices by services contractors. Next came "setting unrealistic

deadlines" and “lack of proper and effective monitoring of job execution" which were also ranked second and third, indicating that respondents agreed to these challenges faced by contractors. According to the standard deviation values, these statements had mean scores of 4.20 and 3.97, which are significantly higher than the average mean score.

Most respondents stated that their firms lack effective communication among team members and the firms do not observe certain basic safety rules. While both of these assertions scored significantly higher (3.92 and 3.91 respectively) than the average mean value, their standard deviation values indicated that there were several outliers and a wide range of responses. In addition, the remarks came in at number four and number five on the items presented on Table 4.5. Once again, the table indicates that most respondents agreed with the issue "companies do not buy from the reliable source" with a mean score of 3.88. It was ranked sixth as it was well above the average mean score and had a high standard deviation value, indicating that the responses were clearly divergent. This was closely followed by the statement “the use of inferior gadgets and materials has been a major challenge” scored above the average mean (3.82) and was ranked seventh, showing that respondents believe that the use of inferior gadgets and materials has been a major challenge at the construction firms.

To identify the key challenges to the implementation of quality management practices by services contractors, the results show that most respondents agreed that there is lack of a quality management team to lead the process and personnel unable to thoroughly read and interpret contract document (designs and specification). These statements had mean scores of 3.78 and 3.68 respectively which is significantly above the average mean score and had standard deviation values pointing that there were outliers and clear

disparity in the responses. The statements were also ranked eighth and ninth respectively. The statement "some companies rely largely on semi-formal expertises" had a mean score of 3.47 which is slightly above average and a strong standard deviation pointing that there were outliers and clear disparity in the responses, indicating that respondents agreed that some companies rely largely on semi-formal expertises.

Moreover, from Table 4.5, the low-ranking statements "complex designs (unable to interpret complex designs" and "lack of management commitment to quality" scored slightly below average with mean scores of 2.97 and 2.85 respectively. This shows that the respondents disagreed to the statements and according to the standard deviations, there were extremes as well as a noticeable discrepancy in the replies. In addition, the estimated aggregate mean of the challenges that were provided to respondents in the questionnaire indicated that the respondents agreed with the majority of the issues provided in Table 4.5, as shown by a mean score of 3.76.

4.6 Strategies for Improving Quality Performance of Services Contractors

The purpose of this part was to provide the findings of the last research question. The researcher attempted to identify measures for achieving improved quality performance of building electrical services contractors in this study. Table 4.6, provides an insight into how the respondents rated their major strategies for improving quality performance of construction services contractors.

Table 4.6: Strategies for Improving Quality Performance of Services Contractors

Statement	Response (N)					Mean	SD	Rank
	5	4	3	2	1			
There should be proper communication between team members for effective work execution	115	85	-	-	-	4.58	.583	1
Regular inspection and audit of quality report must be place	109	91	-	-	-	4.55	.567	2
Well-defined roles and regulations of project must be adhered	85	115	-	-	-	4.43	.591	3
There should be an appraisal for good job performance.	83	117	-	-	-	4.42	.602	4
Engaging qualified persons for construction work	84	84	32	-	-	4.26	.619	5
High Management Commitment	49	151	-	-	-	4.25	.588	6
Adherence to statutory regulations and environmental safety issues	81	81	38	-	-	4.23	.620	7
Companies practice should be driven by client satisfaction	35	165	-	-	-	4.18	.587	8
Training and seminar on regular basis on quality management practices must be ensured	68	99	33	-	-	4.17	.631	9
Review/analysis used to improve performance	40	131	14	25	-	4.08	.732	10
Regular meeting of project participants.	72	84	29	15	-	4.07	.741	11
Effective and efficient construction method has to be employed	87	66	19	18	-	3.96	.726	12
Companies practice should be driven by innovation	32	114	29	25	-	3.77	.776	13
Companies practice should be driven by cost effective solutions	30	88	33	14	35	3.32	.810	14
Companies practice should be driven by technology	28	89	14	40	27	3.23	.822	15
Aggregate mean	**4.10**							

Source: Researcher's Field work, 2021

From the table, the respondents strongly agreed that there should be proper communication between team members for effective work execution. This strategy was rated the highest by respondents with a mean score of 4.58 which implies that it is the

most important recommendation needed to promote quality performance of construction service contractors. The statement “regular inspection and audit of quality report must be place” scored the above the average mean value on the five-point Likert-type scale, with a mean score of 4.55 and a weak standard deviation, indicating that respondents strongly agreed with the statement. This suggesting that there is a critical need for regular inspection and audit of quality report in the sampled construction firms among the construction services contractors

Table 4.6 showed that, the respondents agreed that well-defined roles and regulations of project must be adhered. This strategy for improving quality performance of services contractors was the third most important measure with a mean score of 4.43. This was closely followed by “there should be an appraisal for good job performance”, “engaging qualified persons for construction work”, “high management commitment” and “adherence to statutory regulations and environmental safety issues” which were scored above the average mean value indicating that the respondents agreed to these strategies for improving quality performance of services contractors and were ranked fourth (4.42), fifth (4.26), sixth (3.25) and seventh (3.23) respectively.

According to Table 4.6, the respondents agreed to the statements that companies practice should be driven by client satisfaction (4.18) and training and seminar on regular basis on quality management practices must be ensured (4.17) which were the eighth and ninth most important measure except that the standard deviation values depicted that there was a great similarity in the responses of the respondents. The statements “review/analysis should be used to improve performance " and “regular meeting of project participants” scored above average on the five-point Likert-type scale, with mean scores of 4.08 and 4.07 respectively, indicating that respondents

agreed with the statements as strategies for improving quality performance of services contractors.

The succeeding data from Table 4.6 on the strategies for achieving improved quality performance of construction service contractors presented that, the respondents also showed support to these ranked measures with statements like “effective and efficient construction method has to be employed” (3.96), “companies practice should be driven by innovation” (3.77), “companies practice should be driven by cost effective solutions” (3.32) and “companies practice should be driven by technology” (3.23). These statements were ranked twelfth, thirteenth, and fourteenth and fifteenth in that order among the presented strategies for achieving improved quality performance of construction service contractors. The aggregate mean (4.10) of the statements presented to the respondents in Table 4.6, showed that the respondents mostly agreed to the statements presented to the contractors.

4.7 Regression Analysis

In this section of the study, the researcher presents the linear regression analysis based on the second objective of the study. The regression analysis was performed on quality management practice of building electrical services contractors and construction project delivery. This was conducted to test the hypotheses in this study. Tables 4.7, 4.8 and 4.9 were presented to show the data on this part of the study.

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.799[a]	.638	.634	3.45147

a. Predictors: (Constant), Quality Management Practice

The R value represents the linear correlation coefficient of the variables whiles R^2 value indicates how much of the total variation in the dependent variable (construction project delivery) can be explained by the independent variables (quality management practice). Table 4.7 revealed that correlation of the independent variable against the dependent variable is 0.799 with R square of 0.638. The adjusted R^2 is 0.634 and this indicates that 63% variance in building electrical services contractors' project delivery can be predicted from quality management practice but the remaining 37% of the total variation in their construction project delivery is unexplained because it may be predicted by unknown factors.

Table 4.8: ANOVA[a]

Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	2576.914	1	2576.914	132.373	.000[b]
	Residual	3854.466	198	19.467		
	Total	6431.380	199			

a. Dependent Variable: Construction Project Delivery

b. Predictors: (Constant), Quality Management Practice

The ANOVA table tests whether the overall regression model is a good fit for the data. Table 4.8 shows that the independent variable (quality management practice) statistically significantly predict the dependent variable (building electrical services contractors' project delivery), $F = 132.373$, $p < .000$ (i.e., the regression model is a good

fit of the data). This indicates that quality management practice of building electrical services contractors impacts their construction project delivery.

Table 4.9: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.981	1.946		1.018	.312
	Quality Management Practice	1.402	.122	.799	11.505	.000

a. Dependent Variable: Construction Project Delivery

Beta value in the table is used to determine how important and dominant quality management practice is in explaining the variance in building electrical services contractors' project delivery. As the result presented in the Table 4.9 indicates that quality management practice exerted the strongest impact on building electrical services contractors' project delivery with the higher p-value, (r=.799), which is significant at the (p=.000) level and the null hypothesis (H_0) rejected.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

In this chapter of the study, discussions of the results of the study were done by putting them against results of previous studies. This chapter was divided according to the various research questions in the study.

5.2 Implementation of Quality Management Practices by Building Electrical Services Contractors

The result in Table 4.3 shows the mean value of each of the identified practices as well as their standard deviation. From the table, it is evident that all the assessed quality management practices have a mean value of above average of 3.0. This implies that to a considerable extent all the identified practices are being adopted in the operation of construction project by building electrical services contractors in the study area. It is, however, important to note that while the mean values of these variables are high enough to indicate considerable adoption; the standard deviation reveals a significant level of disparity in their rating. This indicates that there exists some inconsistency in the way the respondents rated the level of adoption of these 13 practices.

The results from the study (Table 4.3) indicate that contractors perceived a very high level of quality management implementation from the conformance to requirements and standard of construction materials practice. The use of quality construction materials could be considered as the primary tool for measuring quality, hence, the implementation of quality management. This is supported by the finding of Agbenyega (2014) that quality material usage is used to track the effectiveness of the quality

management process, select quality improvement projects, and provide cost justification to doubters. It could be deduced that building material has its own advantages and disadvantages. It is evident that some of the problems with material usage are their poor use of environmental resources, poor quality control of the finished product and consequently a significant variation in durability. Hence, based on those facts it is necessary to identify that in order to select a quality construction material, the features related to these materials must be given a consideration. As reported in Table 4.3, the results portray a good attitude of building electrical services contractors towards the use of quality materials for construction work. This finding is well-supported by the study of Sirbadhoo, Hoyana and Othman (2010) on quality management for delivering sustainable construction projects in South Africa, who concluded that good attitude towards adherence to the required standard for quality when carrying out construction works was the principal practice of South African construction practitioners concerning quality management implementation.

The results of the study showed that, effective communication with the project team was a major significant factor that signifies quality management implementation by building electrical services contractors in their daily construction work. This finding is in line with the study of Bala, Keftin and Adamu. (2012) on imperatives of project quality management plan and health and safety plan as pre-contract documents that the contribution of the construction project team to quality management implementation can be identified by the interdependence arising from the interconnections between construction workers and construction enterprises. This has been reinforced by Yeboah (2018) that effective communication create opportunity for contractors to converse with subcontractors, deliberate on health and safety issues, share ideas with construction

project team and ask questions on the quality management practices. He concluded that construction companies identifying this reality is the first step toward adopting quality management practices in construction project life.

The study also revealed that, the level of commitment of building electrical services contractors in the implementation of quality management was relatively high among the sampled construction business firms with total quality management adoption. Services contractors' commitment to a very large extent influences the successful implementation of quality management. This result supports earlier study by Barker and Cagwin (2015) that for most construction firms, commitment of employees to participate and support quality initiative was dominant in their responses which have resulted in high product quality and reduction of defect. It could be deduced that the influence of top management in the adoption of quality management as part of the daily activities within an organisation has been noted to be a significant factor. This result is backed by the findings of Akinlolu, Ndihokubwayo and Simpeh (2017) that almost all of the 109 valid responses to the questionnaire survey regarded as important the commitment and involvement of their management in the TQM process for its successful implementation. This outcome is in consonance with the view of Ahmad & Elhuni (2014) who conducted a research and concluded only with the support of top management and their commitment, can quality management be a primary objective of an organisation.

Other significant factors which signify quality management implementation by building electrical services contractors in their daily construction work includes adequacy/completeness of design and documentation, effective/efficient construction work, realistic design, engaging qualified persons for construction work and

supervision of construction workers. It is interesting to note that out of these 13 practices, conformity with Environmental Protection Agency standards and adhering strictly to contract clauses bordering on quality of works were ranked lowest. It could be deduced that though respondents agreed to the adherence of these regulations, their effective application is constrained by some factors. In general, the aggregate mean (m = 4.10) of the items presented to the respondents suggests that there is high level of implementation of quality management practices of building electrical services contractors at the sampled construction firms. The results support the study of Orji, Obodoh and Onoh (2017) on assessment of quality management practices in construction revealed that, there is high level of quality management implementation among building construction professionals from the various professional bodies in Enugu State of Nigeria. These findings contradict earlier studies reviewed from literature by Mensah et al. (2012) that, quality management implementation among indigenous Ghanaian firms is very low.

5.3 The Roles of Main Contractors in Building Electrical Services Contractors' Quality Performance

Evidence from the analysis on the role of main contractors in building electrical services contractors' quality performance indicated that, the major key role of main contractors was through proper and more effective planning. Planning which incorporates a plan of vision of purpose, quality policy, utilisation of quality control and other administration tools are fashioned by way of considering the best idea. It can be said that main contractors positively influence the quality performance of building electrical services contractors through their careful, strategic and effective planning. This finding affirms

the study by Cheung and to (2010) on management commitment to service quality and organisational outcomes that suitable ways of main contractor's strategic quality planning would enhance the quality performance of subcontractors and consequently client fulfilment. The significant role of main contractors in training services contractors' personnel on quality has been noted in Table 4.4. This means that training of services contractors' personnel is one of the best means main contractors demonstrate their obligation to quality performance. However, critical analysis and observation suggest that, training has been limited to general induction and health and safety. It can be said that when main contractors facilitate and instruct services contractors' personnel in their daily operations, it denotes that management is responsible in keeping the employees safe and healthy. Training on quality performance issues are dealt with to some extent but the amount and frequency of training cannot be considered to match the level of training advocated under quality management

It can thus be inferred that the role of main contractors in building electrical services contractors' quality performance come along with enhanced reputation of the project team members/client. It is clear that, by being part of quality teams subcontractors and suppliers will be more responsive to the needs of the general contractor, becoming more cooperative and displaying a better performance record (Wong & Fung, 1999). This will eventually enhance the reputation of the project team members as well as increase the quality performance of building electrical services contractors. Company reputation is improved as clients/consultant recommends such firms for future referrals and increased clients' satisfaction among other benefits. These results are backed by the findings of Kanji and Wong (1998) that the role of general contractors that positively influence quality performance of subcontractors and suppliers in building construction

are quality of construction results and improved reputation of the project team members/client. The researchers further suggested that subcontractors should be treated as partners and as such they must be provided with all the information and support to enable them to carry out their work. It is however not surprising that majority of the respondents agreed to statements like effective/efficient site management, general and special attendance for services contractors meets their needs, production of a better and efficient design, certifying that works carried out by services contractors meet the required quality standards and ordering re-work when works carried out by services contractors falls below required standard of quality. Kale and Arditi, (2001) point out that, for the main contractor to be successful must consider the subcontractors and suppliers on the project as a strategic asset critical to the project, and the ultimate perceived performance of the main contractor by the client.

The study descriptive statistics showed that main contractors positively influence the minimizing of waste relating to services contractors works. It is evident that the building industry is using a considerable amount of resources, but if the life cycle of the material on site is closely examined, it is generally known that there is a relatively large portion of the materials being wasted because of poor material control on building sites. Therefore, it could be said that Ghanaian main contractors play a significant role by way of controlling waste relating to services contractors works. Waste can be minimized by implementing inexpensive preventative methods related to managerial improvements. The results obtained confirm that in literature in which purchasing raw materials that are just sufficient, using materials before expiry date, supply of materials for right quantities and volumes and using of more efficient construction equipment among others are considered as measures by which building electrical services

contractors minimize the wastage of materials on construction sites (Adewuyi & Odesola, 2015).

The results of the study showed that, respondents disagreed to ordering re-work when works carried out by services contractors falls below required standard of quality. The main contractor's role has been highlighted as crucial to influencing the level of quality standard planned, implemented and adhered to throughout the lifecycle of any construction project. However, the result implies that building electrical services contractors refuse the order of main contractors to re-work when works falls below required standard of quality. This simply means that construction artisans are not always impressed by the quality of any building project, they are only concerned with what they are being paid. It could also be deduced that main contractors do not sternly order services contractors to re-work when works falls below required standard of quality.

The presentation of results according to Table 4.4 reveals that the respondents disagreed that main contractors motivate workers. This means building electrical services contractors and their personnel do not receive additional payments above their basic pay like duty overload and overtime tokens and profit-oriented pays during construction works which psychologically influence their behavior and attitude toward their work, colleagues and the organization. The study implies that, the level of motivation of employees in the implementation of quality management was relatively low among construction firms with quality management adoption. It could be deduced that laborers/artisans felt unappreciated by top supervisors informing them that they are doing a good job. Such practices definitely do not inspire and motivate the workforce and other subordinates to give out their best. This finding is consistent with a previous

study by Orji, Obodoh and Onoh (2017) that incentives do not exist in most construction firms and their inadequacy has created frequent absenteeism, reluctance in completing work and failure to adopt good safety attitude, which have also affected their actual quality performances.

5.4 Challenges in Quality Management by Building Electrical Services Contractors

The study highlighted twelve major challenges to the implementation of quality management practices by services contractors and measured the level of agreement of respondents. The study revealed that lack of regular and intermittent training and workshop for capacity building is the major challenge to the implementation of quality management practices by services contractors. The findings indicate that building electrical services contractors are not encouraged to undertake education and training, resources are not adequate for employee education and training and most employees are not trained on how to use quality management methods (tools). Critical analysis and observation suggest that, training and education have more or less been limited to the general induction, safety, environment and health trainings and job specific training. Training on quality issues are dealt with to some extent but the amount and frequency of training cannot be considered to match the level of training advocated under total quality management. Almost all the local Ghanaian firms relied on the few sensitization training programmes organized by regulatory bodies on quality awareness. It can be mention that this practice however, is the reverse among multinational firms which have well-structured quality programmes for management and employees.

Also, another challenged that was highly ranked was setting unrealistic deadlines by services contractors. This implies that most of the building service contractors

underestimate the duration of a project. It can be gathered that adjustment for myriad factor are not made and similarly, the basis of any cost estimate is to determine to project scope, design and specifications. This finding corroborates a study by Al-Ani and Al-Adhmawi (2011) that a major barrier to quality management practices that are experienced by the responding organizations during construction project execution is underestimation of project duration where improper planning and unclear definition of project-scope and specifications were ranked highest among the leading causes. Most respondents stated that their firms lack proper and effective monitoring of job execution. This implies that ineffective supervision and monitoring by building electrical services contractors is a serious challenge to the successful implementation of quality management on construction sites. This result is in agreement with the observation of Mensah et al. (2012) that managers in the construction industry do not monitor quality practices at the workshops and assume that a new worker, young or old, experienced or inexperienced, knows how to do the job as required. The next major factor hindering the smooth implementation of quality management by building electrical services contractors is lack of effective communication among team members. It can be emphasized that ensuring quality in project delivery is firmly dependent upon clients knowing and communicating their specific needs to the consultant/designer who accurately represent it on paper to form part of the document, while the constructor faithfully reproduce the requirement on site. When this network is broken it becomes a major blow in the face of quality management adoption (Adenuga, 2013). The findings confirm the findings of Agbenyega (2014) that the most important barrier inhibiting the application of quality management is lack of effective communication and further concluded that cross-functional communication that in the

case of construction must include subcontractors and suppliers is necessary to solve quality problems.

Again, as illustrated in Table 4.4, the results indicate that the respondents agreed that many construction companies do not observe certain basic safety rules. The results agree with the study by Chmutina and Rose (2018) who found that construction workers generally lack objective and rational safety knowledge which makes the application of safety rules difficult, and the judgment of the degree of danger is mainly based on personal intuitive experience and past experience. This negatively affect the implementation of quality management and hinders it full adoption as a routine practice. Orji, Enebe and Onoh (2016), revealed that construction labourers contributes 50% to construction accidents while the artisans contributes 31.67%. These group of people are either engaged on a daily pay basis or as causal workers. They are always hasty and impatiently carrying out their responsibilities to be able to move to another site. Other significant challenges to the implementation of quality management practices by services contractors includes buying from unreliable source, the use of inferior gadgets and materials, lack of a quality management team to lead the process, personnel unable to thoroughly read and interpret contract document (designs and specification) and some companies relying largely on semi - formal expertises.

However, respondents disagreed that building electrical services contractors are unable to interpret complex designs and there is lack of management commitment to quality. This implies that building electrical services contractors are able to interpret complex designs and are committed to quality construction work. This disagree with the research of Jay and Bruce (2009) who found that difficulty in interpretation of complex designs shrink the level of commitment of subcontractors and suppliers to quality workmanship.

They concluded that the selection of a good constructor is obviously very important; however, selecting a third party to perform construction quality management early on the project will have a very significant impact on the project outcome. A clear commissioning strategy underpinned with a good construction program, established at the pre-construction stage of a project can help translate good engineering design into field execution/construction and help alleviate many of the problems encountered at the back end of the project.

5.5 Strategies for Improving Quality Performance of Building Electrical Services Contractors

In order to encourage the implementation of quality performance of services contractors in Ghana, the possible strategies needed to be in place were also assessed. In achieving this, certain possible measures were identified from the review of existing literature. From Table 4.6, it is evident that all the assessed measures have a mean value of above average of 3.0. This implies that the respondents believe that if put in place these identified strategies can help increase the implementation of quality management on building electrical services contractors' project delivery in the study area. The key significant measure identified is proper communication between team members for effective work execution. This implies that a good construction professional will spend much of his/her time communicating in one form or the other. Therefore, good communication skills are arguably the most important skill a construction professional should possess. It fosters an open and trusting environment for proper and quality construction work. Regular inspection and audit of quality report must be adopted by services contractors in Ghana to help assess their day to day operations. This would certainly help alleviate many of the problems encountered at the back end of the project

as most of the building electrical services contractors refuse to rework when their works fall below required standard of quality.

Table 4.6 showed that, the respondents strongly agreed that well-defined roles and regulations of project must be adhered. The results agree with Oakland (2000) that to promote or execute work efficiently and effectiveness, quality management must be truly organized. It must start at the top with the chief executive or equivalent. The most senior directors and management must all demonstrate that they are serious about quality. The middle management have a particular important role to play. They must not only grasp the principles of quality management, they must go on to explain them to the people for when they are responsible, and ensure that their own commitment is communicated. One of the important strategies identified is that there should be an appraisal for good job performance. It is evident that performance appraisal shows whether employees are working towards the goals and objectives set by the organization. This helps to outline the strengths and weaknesses of every contractor and guides top management for carting the path for future improvement. Performance appraisal is a very important human resource activity that can enhance the efficient evaluation of the human resource of the organization thus very instrumental to the success of the organization. This finding is in agreement with the finding of Khan (2007) who mentioned that the fundamental essence of performance appraisal is to assist managers in the organization to perform their day-to-day administrative work particularly increments in payment system, hiring and firing of staff, and other administrative decisions as stated in the company policy guidelines.

There must also be qualified persons for construction work. This is in agreement with the view of Tan and Abdul-Rahman (2011) that in selecting contractors, the clients

(government) have to make sure that the contractors are not selected based on firm popularity and financial standard. The selected contractor must have sufficient knowledge, experience, competent staff, financial competence and adequate skills to carry out the project. Politicians and top management of the project should not interfere frequently during the execution of project. This can cause indirect cost of project thereby leaving the contractor not to adhere to quality. Another significant strategy identified is high management commitment. There is no form of doubt that for quality work to be a success, a greater amount of management commitment is required. It is worth mentioning that the building electrical services contractors are in a hypercompetitive environment, there is the need to be highly committed in order to achieve client satisfaction and continuously improve to meet international regulatory standards. These reasons or driving forces are similar to those identified by previous researchers. This similar to earlier findings by Mellahi and Eyuboglu (2001) on how firms in Turkey decided to be highly committed to implement quality management practices as a result of volatile and uncertain operating environment they found themselves after the period of trade liberalization in the 1980s. Turker (2008) also found that severe foreign competition and difficulties in achieving client satisfaction by local firms coupled with the entry into the European Common Market in 1989 had been important drives. Therefore, building electrical services contractors should be able to satisfy the client or the top management ethically to regulate the project.

According to Table 4.6, the respondents agreed to the statement that training and seminar on regular basis on quality management practices must be ensured. Despite all the efforts, stakeholders in the construction industry must sensitize and train the construction practitioners on the need to strictly adhere to the required standard for

quality when carrying out their construction works. According to Jimoh. (2012), education and training are the grounding factor that improves on quality performance. This finding agrees with the findings of Chmutina and Rose (2018) that adequate training should be provided to construction contractors. These outcomes are in consonance with the view of Shofolume, Ofori-Boadu, Waller, Bock-Hyeng (2013) that training of services contractors and their team is the best means a construction company can demonstrate its commitment to quality management practices. For this reason, Shofolume, Ofori-Boadu, Waller, Bock-Hyeng (2013) recommended that training must not be a one-off incident, quality performance training should be a constant effort to help strengthen best quality management practices among construction firms. The respondents also agreed that review/analysis should be used to improve performance management and management should encourage project participants to attend regular meetings. This result is backed by the findings of Orji, Obodoh and Onoh (2017) that construction companies should involve their employees in reviewing and updating the company's quality performance program, creating jobsite-specific quality performance and safety plans during the preconstruction phase of each project and helping identify potential hazards and safety concerns. In the study by Orji, Obodoh and Onoh (2017), it was endorsed that employers should create a corrective action plan with input from project participants and make sure all workers are aware of the plan to ensure it is properly executed and enforced.

The lowest ranking significant strategies identified are companies' practice should be driven by innovation, cost effective solutions and technology. In this era of technological advancement, building electrical services contractors should be well driven by technology to increase effectiveness and efficiency of construction

operations. This could lessen time and resources and increase skills and abilities. This finding is consistent with that of Fotopoulos, Psomas and Vouzas (2010) who noted that innovation is essential in quality management, therefore, organisations that have implemented quality management has to be on the watch for innovation to improve their process management.

5.6 The Effect of Quality Management Practices of Building Electrical Services Contractors on Construction Project Delivery in Ghana

The study hypothesized (H_1) that there will be a statistically significant effect of quality management practice of building electrical services contractors on construction project delivery in Ghana and the results of the study confirmed and supported the prediction made in the chapter one. The findings of the study disclosed that there is a statistically significant and positive correlation between quality management practice of building electrical services contractors and construction project delivery. The result of the regression analysis revealed that quality management practice was found to impact significantly to building electrical services contractors' project delivery ($r = .799$, $p<.01$). The implication is that the more building electrical services contractors adopt quality management practices on how to perform their jobs effectively and efficiently the more effective and efficient, they become, and this increase their work performance and achieving acceptable levels of quality in their project delivery endeavors. The finding was consistent and in support of following recent past studies. The findings agree with the findings of Agbenyega (2014) that significant and positive influence of quality management practices of building electrical services contractors on construction project delivery, thus supporting the stated hypothesis. The significant positive

relationship confirms the study conducted by Cheung and To (2010) who found that quality management was strongly correlated with construction project success. Finally, an empirical study conducted by Sirbadhoo, Hoyana and Othman (2010) on the impact of quality management on delivering sustainable construction projects in South African rural areas revealed that quality management not only increases employees' performance but also positively affects the sustainability of construction projects.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter draws the curtain on the research work by presenting the summary, conclusion and makes recommendations on the study. The chapter finally ends with suggestions for further studies.

6.2 Summary of Findings

The aim of the study was to assess the quality management practices of building electrical services contractors in selected regions in Ghana. The study was guided by five objectives namely: to examine the extent of implementation of quality management practices of building electrical services contractors, to assess the extent to which quality management practices of building electrical services contractors affect the delivery of construction project, to identify the role of main contractors in building electrical services contractors' quality performance, to find out challenges to the implementation of quality management practices by services contractors and to identify strategies for achieving improved quality performance of construction service contractors. Literature was reviewed along the lines of the concept of quality management practice, the extent to which contractors are committed to quality management plan during, the challenges encountered by contractors while implementing quality assurance and so on. The descriptive survey design was used for the study. The study focused on building electrical services contractors and main contractors working with building construction firms across the regions of Ghana. Purposive sampling technique was used to select 200 respondents for the study. Data was gathered through questionnaires formulated based

on the research questions. The findings have been presented based on the research objectives.

6.2.1 Implementation of Quality Management Practices by Building Electrical Services Contractors

Concerning the question that sought to examine the extent of implementation of quality management practices of building electrical services contractors, the study found that the level of implementation of quality management practices among building electrical services contractors to attaining excellence in Ghana was high. This revealed that the general awareness of building electrical services contractors towards quality management practices adopted by responding contracting organizations implemented during construction project in Ghana was relatively high. The study brought to light the commonly adopted quality management practices of building electrical services contractors in construction projects. These were; the use of quality construction materials, encouraging the use of standard methods and materials for construction work, continually maintaining good attitude towards quality management, communicating with the project team members effectively for clarification, ensuring effective and efficient team work and relying on adequate /completeness of the design documentation for a project.

6.2.2 The Roles of Main Contractors in Building Electrical Services Contractors' Quality Performance

On the question which seeks to identify the role of main contractors in building electrical services contractors' quality performance, the findings revealed that the most significant role of main contractors in building electrical services contractors' quality

performance is proper and more effective planning. This was followed by training services contractors' personnel on quality, enhance reputation of the project team members/client, improve quality of construction product/result, effective/efficient site management, ensure general and special attendance for services contractors meets their needs, producing a better and efficient design and certifying that works carried out by services contractors meet the required quality standards. These were the top seven positive significant influences of main contractors on the quality performance of building electrical services contractors among the construction firms in Ghana. However, the study found that main contractor's control to ordering re-work when works carried out by building electrical services contractors falls below required standard of quality and also failed to motivate building electrical services contractors and their personnel.

6.2.3 Major Challenges to the Implementation of Quality Management Practices by Building Electrical Services Contractors

With respect to the question that sought to identify the key challenges to the implementation of quality management practices by services contractors, the study revealed that the most significant barrier inhibiting the application of quality management was lack of regular and intermittent training and workshop for capacity building. The other major issues challenging the smooth implementation of quality management practices by services contractors that followed were lack of regular and intermittent training and workshop for capacity building, setting unrealistic deadlines, lack of proper and effective monitoring of job execution, lack of effective communication among team members, breaking certain basic safety rules, buying from the unreliable source, followed by the use of inferior gadgets and materials, lack of a

quality management team to lead the process, personnel unable to thoroughly read and interpret contract document and reliance largely on semi - formal expertises. The study brought to light that applying effective quality management is constrained by the above listed factors excluding unable to interpret complex designs and lack of management commitment to quality.

6.2.4 Strategies for Improving Quality Performance of Building Electrical Services Contractors

Lastly, concerning the question that sought to identify strategies for achieving improved quality performance of building electrical services contractors, the results further showed that, the nine most significant strategies to improve quality performance of building electrical services contractors are; there should be proper communication between team members for effective work execution, followed by the regular inspection and audit of quality report must be place. Then, well-defined roles and regulations of project must be adhered, here should be an appraisal for good job performance, engaging qualified persons for construction work, high management commitment and adherence to statutory regulations and environmental safety issues. The respondents also recommended that company's practice should be driven by client satisfaction and training and seminar on regular basis on quality management practices must be ensured. This suggest that these strategies are recommendable and constructive enough for effectively achieving improved quality performance of building electrical services contractors in Ghana.

6.3 Conclusions of the Study

Based on the significant findings on the extent to which quality management practices is been implemented by building electrical services contractors in Ghana, it can be

concluded that the level of implementation of quality management practices among building electrical services contractors to attaining excellence in Ghana is high. This empirical evidence from the study denotes that, general awareness of quality management practice by responding contracting organizations in Ghana is relatively present. However, the application of quality management among building electrical services contractors in Ghana cannot be describe as a total approach. This study also concludes from the analysis that, there is a positive significant influence of main contractors on the quality performance of building electrical services contractors. It can thus be inferred that quality management practices come along with numerous benefits the construction projects and the construction companies' experiences. This establishes that control procedures of quality as a quality management practice has become essential to ensure quality is not compromised during construction activities. Based on the finding that main contractors do not motivate building electrical services contractors and their personnel, it can be concluded that the low level of motivation disempower the workers to fully embrace quality project delivery. Their motivation is a pillar of their satisfaction in their trade, which also has a positive implication on their daily operations.

6.4 Contribution to Knowledge

It can be drawn from the study that, there are critical issues challenging the smooth implementation of quality management by building electrical services contractors. This establishes that building electrical services contractors' quality performance is one of the issues which if neglected could significantly affect the operational completeness of construction project delivery. The findings of the study identified strategies to improve quality performance of building electrical services contractors. It is apparent that if

quality management is to be implemented successfully on construction sites, the inhibitive issues that have been identified from the contractor survey need to be addressed on a comprehensive and integrative basis. It can also be concluded that these research results can help understand the current situation regarding quality management practices in Ghana and can therefore help construction firms and participants in the delivery of quality projects through the adoption of quality management practices.

6.5 Recommendations

Based on the findings of the study, the following recommendations are worth considering:

- Given that the application of quality management among building electrical services contractors cannot be described as a total approach, the study therefore advocates that, efforts should be made by the top management of the construction firms to create a quality and quality management culture throughout the entire organization. This can be achieved by changing the quality strategies and policies of the organization. They need to bind all parties together including subcontractors by mutually set and internalised goals. There should be a quality policy that stipulates the quality vision and provides strategies to achieve this vision.
- Based on the findings that there is low level of motivation among building electrical services contractors, the policies and strategies should be able to motivate and encourage the subordinates or employees to be committed to the change process. Properly documented quality management policy manuals provide control system in the entire project life cycle and also create quality

awareness in the entire organization. This manual in the long run, determines the processes needed for quality management system to ensure effective operation and control within the project delivery process.

- The study revealed that, education and training was the most challenging critical factor in the implementation of quality management. Top management must therefore establish and deploy experience and qualified workhands, providing the needed resources, providing problem-oriented training and stimulating improvement. Education and training have also been found to be most important elements in a successful implementation of quality management. There is therefore the need to equip employees with the needed skills and knowledge to handle their various roles. It is therefore necessary that the firms should create an internal quality awareness programme aimed at training and educating employees within.
- Construction professionals should be engaged early in the design/documentation stage of any project for effective and efficient planning. The approach to construction quality plan should be fully established in a construction quality management plan at the pre-construction stage of any project and which must be understood by all parties.
- The study recommends that all the professional bodies involved in building construction work should step up their surveillance, so as to eject the imposters and eradicate quackery in the construction industry.

6.6 Limitations of the Study

The major limitation of the study was that some of the respondents were a bit reluctant to accept and fill the questionnaire in an attempt to solicit the needed information from

them due to work overload. The information required were also difficult to acquire since some of the building electrical services contractors were hesitant to share their true opinions. It is possible that some contractors may have felt their personal leadership capabilities and skills were being questioned. The researcher also encountered difficulty getting superiors of the various firms on time to solicit information from them. This was due to the COVID-19 pandemic that hit the country and the rest of the world and the consequent restrictions that were imposed on movements into the various regions. The study was limited to only questionnaire data collection instrument, mainly made up of five-point Likert-type scale. This type of questionnaire did not allow respondents to explain further than the limits of the question items as they were closed in nature. These limitations, notwithstanding, the researcher was able to collect the necessary data for the study to achieve the objectives of the study.

6.7 Suggestions for Further Studies

It is suggested that more investigations should be undertaken to reveal the impact of quality management practice on construction firms in Ghana. This study was in a longitudinal direction, that is, it collected data across different points in time. Further studies can take a cross sectional study by collecting data at only one point in time to confirm or refute the findings of this study. The researcher suggests that further research should add actual observation as part of the data collection instrument and procedures. This would help provide actual information concerning the application of quality management among building electrical services contractors as observed by the researcher. A frame work could be developed for quality management practices that suits building construction projects in Ghana.

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APPENDIX

UNIVERSITY OF EDUCATION, WINNEBA

QUESTIONNAIRE FOR MAIN CONTRACTORS AND SERVICES CONTRACTORS

This study is for academic purpose that seeks to assess the quality management practices of building electrical services contractors in selected Regions in Ghana. The researcher is a Master of philosophy in Construction Management student of the above-mentioned university and would appreciate very much if could take some time to complete this questionnaire for me. Your responses would be treated confidentially. Thank you.

SECTION A: RESPONDENTS' PROFILE

Please tick (√) the responses that best describe you.

1. Please indicate your gender. (*Please tick)*

Male	☐
Female	☐

2. What is your age category? (*Please tick)*

21 – 30years	☐
31 – 40years	☐
41 – 50years	☐
51 – 60years	☐
Above 60years	☐

3. What is your highest academic qualification? (*Please tick)*

J.H. S	☐	No Formal Education	☐
Senior High/O'Level	☐	Vocational/Technician	☐
Diploma (HND/ODT)	☐	Master's degree	☐
Bachelor's degree	☐	Doctorate degree	☐
Others, please state			☐

4. How many years have you worked as a building electrical services professional? (*Please tick)*

0 – 10 years	☐
11 – 20years	☐
21– 30years	☐
31 years and above	☐

SECTION "B"

To what extent do you agree or disagree with the following statements toward the implementation of quality management practices of services contractor?

Key: 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree

Item	**Response**				
	1	2	3	4	5
1. My company rely on adequate/completeness of the design documentation for a project					
2. My company has respect for effective communication with the project team members for clarification					
3. Effective and efficient team work are always ensuring is always ensured					
4. Commitment to quality is a hallmark of my company					
5. Good attitude towards quality management practices is always maintained					
6. My company relies on experienced supervisors for supervision of works					
7. My company works efficiently towards its reputation					
8. My company works in conformity with Environmental protection agency standards					
9. Unrealistic design					
10. Encouraging the use of Sub-standard material for Construction work					
11. Adhering strictly contract clauses bordering on quality of works					
12. My company uses of quality construction materials					
13. Engaging qualified persons for construction work					

Others specify:

SECTION "C"

To what extent do you agree or disagree with the following statements below on the role of main contractors in building electrical services contractors' quality performance?

Key: 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree

Role of main contractor regarding quality performance of services contractors	**Response to**				
	1	2	3	4	5
1. Minimizing waste relating to services contractors works					
2. Ensuring general and special attendance for services contractors meets their needs.					
3. Ordering re-work when works carried out by services contractors falls below required standard of quality.					
4. Training services contractors' personnel on quality					
5. Reducing inefficiencies in resources management by services contractor					
6. Increase worker morale (Laborers/artisans)					
7. Production of a better and efficient design					
8. Proper and more effective planning					
9. Main contract stipulates the quality of works and workmanship of works to be carried out by services contractor in contract clauses					
10. Enhance reputation of the project team members/client					
11. Improved quality of construction product/result					
12. Certifying that works carried out by services contractors meet the required quality standards.					
13. Effective/efficient site management					

Others specify:					

SECTION "D"

To what extent do you agree or disagree with the following statements constitute the key challenges to the implementation of quality management practices by services contractors?

Key: 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree

Item	**Response to**				
	1	2	3	4	5
1. Lack of proper and effective monitoring of job execution					
2. Lack of effective communication among team members					
3. Lack of management commitment of quality					
4. Lack of a quality management team to lead the process					
5. Personnel unable to thoroughly read and interpret contract document (designs and specification) the					
6. Setting unrealistic deadlines					
7. Some companies rely largely on semi - formal expertises					
8. Use of inferior gadgets and materials has been a major challenge					
9. Complex designs (unable to interpret complex designs					
10. Some companies do not observe certain basic safety rules					
11. Some companies do not buy from the reliable source					

12. Companies lack regular and intermittent training and workshop for capacity building					
Others specify:					

SECTION "E"

To what extent do you agree or disagree with the following statements as the effective strategies quality management practices of services contractor?

Key: 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree

Item	**Response to**				
	1	2	3	4	5
Effective and efficient construction method has to be employed					
Engaging qualified persons for construction work					
Training and seminar on regular basis on quality management practices must be ensured					
Companies practice should be is driven by technology					
Companies practice should be is driven by innovation					
Companies practice should be is driven by client satisfaction					
Companies practice should be is driven by cost effective solutions					
Adherence to statutory regulations and environmental safely issues is necessary					
Management Commitment					
There should be proper communication between team members for effective work execution					

Regular inspection and audit of quality report must be place					
Review/analysis used to improve performance					
Well-defined roles and regulations of project must be adhered					
There should be an appraisal for good job performance.					
Regular meeting of project participants.					
Others specify:					