ASSESSMENT OF STRATEGY FOR EFFECTIVE IMPLEMENTATION OF QUALITY MANAGEMENT (QM) PRACTICE IN NIGERIA CONSTRUCTION PROJECT

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A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER DEGREE IN BUILDING (FACILITIES MANAGEMENT)

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ABSTRACT

The adoption Quality Management has become vital strategy in a construction industry, to improve financial performance, higher customer satisfaction, and higher product quality The aim of the study is to assess the strategies for effective implementation of QM practice in Nigeria construction project. The study gave insight on the extent of QM implemented in the construction sector, and also explore the challenges faced in the implementation of QM in construction activities. In order to obtain the pertinent information of the study a survey and case study research was adopted with mixed methods of data collection (Quantitative and qualitative approach) through the administration of questionnaire and interviewing the professional at site among small, and medium construction company in Abuja metropolis. A total of three hundred and seventy (370) questionnaires were administered to architect, engineer, builder and quantity surveyor, out of which total of one hundred and fourth-six (146) and 10 professionals are interviewed. Information gathered were analyzed using descriptive statistics percentage, means score, Relative Importance Index (RII) and content analysis. The findings of the study revealed that there is partial implementation of QM among construction firm during execution of projects. Findings of the study also unveiled that lack of commitment of management toward the implementation, misinterpretation for QMs requirements amongst involved staff among others are the challenges facing QM implementation in construction processes in Nigeria. The findings also disclosed the measures set in place by most of the construction are revealed not to be effective enough for QM implementation among these are provision of resources for quality management implementation, ensuring procedures and maintenance adopted suit to standard of quality services, overseeing the adequate QM implementation in all sites of operations, ensuring efficient communication link between the various department of the construction firm. It could be concluded that there is poor implementation of QM among construction firm during execution of projects and lack commitment of management toward the implementation, misinterpretation for QMs requirements amongst involved staff, inadequate quality production and support planning. The study thereby recommended that stakeholders in construction industry should be enlighten on importance of effective implementation of QM in all section of construction project execution. Training and retraining of professionals and staff in the construction industries should be made available for effective implementation of QM in all section of construction project execution. and also adequate provision of resources should be made available for an of effective implementation of QM in all section of construction project execution.

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Abbreviation

QM- Quality Management

TQM- Total Quality Management

<center>**CHAPTER ONE**</center>

1.0   **INTRODUCTION**

1.1 Background to the study

Globally the growth and development of a country depends on the quality of its infrastructure and construction projects (Kamal, Yusof and Iranmanesh, 2016). This implies that a quality project is not a coincidence but also an essential ingredient put in place to meet stipulated standards which will ensure not only its aesthetics but also their appropriateness for intended uses including structural stability, safety and health, and life span of the finished product (Shreyas, Ramesh, Sachidananda and Shashi, 2015). Processes and procedures put in place by quality management (QM) policies, helps to improve an organisations ability to deliver quality to its customers, on a consistent and constantly improving basis (Mane, 2015).

Quality management is critically required for a construction company to sustain in current construction market which is highly challenging and competitive. Abdullahi, Bustani, Hassan and Rotimi (2019) explained that quality management has to provide the environment within which related tools, techniques and procedures can be deployed effectively leading to operational success for a company. The role of quality management for a construction company is not an isolated activity, but intertwined with all the operational and managerial processes of the company.

According to Kamal *et al.* (2016), within the service and manufacture industries, implementation of QM by many highly competitive organization worldwide has improved performance and productivity in the industry. Abdulrahim (2016), observes that QM adoption has become vital strategy within an organization to improve financial performance, higher customer satisfaction, and higher product quality. Further, Okuntade (2015) opined that with effective implementation of QM, enhance improved company

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moral, spirit of teamwork, company's ability to discover potential failures before they turn into disaster and also will bring about enlightenment and empowerment of subordinates to ease communication with organization leadership.

In construction industry, quality is all about meeting the requirements of the designer, constructor and regulatory agencies as well as the owner. These requirements include a wide scope of activities including use of adequate and approved building materials, public health and safety, environmental considerations, protection of public property, and conformity with applicable laws and regulations pertaining to design and structure (Sylvia and Chaminda, 2015). Employing QM by construction companies would increasingly tackle quality issues and meet the requirements of the client and also provide various benefits to builders and their subcontractors, such as; minimizing issues of poor communication, decreasing mistakes, minimizing rework and wastage of materials, and exercising better control of sub-contractors and suppliers (Tan and Syazwan, 2016). However, most developing countries had setbacks in evolving to adequate implementation QM to ensure construction quality (Mallawaarachchi, 2015).

In developing countries, implementation of QM is a major problem in construction (Jimoh, Oyewobi, Waziri and Isa, 2016). Sylvia and Chaminda (2015), pointed out that in implementing QM in Nigeria construction, many of the programs and operations will not be effective, if the regulator bodies are not willing to implement the positive change in the operation of the country. According to Lukumon, Babatunde, Kabir, Samuel, Iyabo and Rafiu (2015), most of the quality personnel appointed are not from construction background and do not fully understand the terminologies used in the system. Mohammed, Vaughan, and Bo (2017), revealed that managerial, organizational, communicational, financial, cultural, educational, and auditing are obstacles hindering the successful implementation of quality management in the construction industry.

Barriers of quality management in the construction industry are summarize as follows; Lack of top management support, Difficulties in taking corrective and preventive actions, inadequate knowledge of project, poor material quality and poor quality of professionals and workmanship are factors affecting QM in construction firms in Nigeria (Abdulrahim, 2016; Okuntade, 2015).

These challenges listed above are contributing negatively to the decline on construction productivity and therefore need to be addressed properly. To ensure uniformity in Nigerian building construction project delivery by firms a framework needs to be developed for effective QM, certifying of materials before use on site, ensure that Employees in charge of supervision on site are adequately qualified for such positions, and comply to lay down industry standards (Abdulrahim, 2016).

Jimoh *et al.,* (2016) and Okuntade (2015) in their study, recommends that providing strategies for implementation of Total Quality Management TQM in the Nigeria construction and also new reforms towards quality policies should be adopted by project players as well as government in order to fully benefit from the implementation of total QM in the construction industry. Therefore, this study intends to contribute to the literature by providing an insight for a need for assessing the strategies for successful implementation of QM in Nigeria construction activities.

1.2 Statement of the Research Problem

Quality of work has become a serious issue for consideration in Nigeria construction industry. Both human and materials are also wasted every year (Pravin and Patil, 2015). Time and resources play a very essential role in determining the cost factor of every project, likewise defects and failures in constructed facility can result in delays, cost increase, personal injuries or fatalities (Anas and Gözde, 2017). According to Ng and Jee (2016), the Malaysian construction industry was losing ground due to inferior quality of

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construction materials, building defects, construction delays, high accident rates, and environmental impact. Because of these incidents, public's confidence towards the image of the construction industry was greatly reduced.

In Nigeria construction industry, project executions are mainly attributed to; poor quality of materials delivered to site, low level of skill and labour experience, poor inspection and testing, poor site installation procedure, and lack of quality assurance, are some of the problems arising from poor construction quality due to lack of QM in the construction process (Lukumon *et al.,* 2015). Lepak and Scott (2015) found that there were political, geographical, social, economic, and tribal constraints that negatively affect the performance of Nigeria construction, which indicate the lack of QM implementation in sustainability of programs, organizational structure and operation of Nigeria construction industry. Premised on non-implementation of QM in the industry, many projects have been abandoned; some have collapsed and some are already dilapidating.

QM is a continuing process of improvement, involving all aspects of the business aimed at prevent mistakes before they occur with the key of commitment and teamwork (Pravin and Patil*,* 2015). Shreyas, Ramesh, Sachidananda and Shashi (2015), claimed that by employing an international standard organization(ISO) 9000-certified QM system, work repetition, project delays and failure to meet specifications can be minimized. Other advantages are that the success factor of most projects can be increased whilst the project cost is decreased because of the use of an appropriate framework for controlling the processes required when constructing the project. This is a critical issue that needs to be addressed by all organizations that wish to adopt strategies in overcoming and minimizing problems (Tan and Syazwan*,* 2016). The primary benefit of operating an effective, appropriate and transparent quality management system is that a construction firm will

recognised of its standard and chosen to bid in both local and global market contracts (Mane, 2015).

Based on all these clarifications on importance of QM implement as well setback in the implement among construction firm in Nigeria, this study intends to answer the following research question;

1. To what extent is QM implemented in the small and medium construction sector?

2. What are the challenges or issues faced in the implementation of QM in construction activities?

3. What are the current measures taken by construction firms to overcome such challenges?

4. What strategies will ensure an effective implementation of QM in the construction process?

1.3 Aim and Objectives of the Study

1.3.1 Aim of the study

The aim of this research is to assess strategies for effective implementation of QM practice in Nigeria construction project. With the view of finding out the level of QM implementation, exploring the issues faced in the effective implementation by finding out strategies that can be adopted by the construction firms for effective QM implementation.

1.3.2 Objectives of the study

Objectives of the study are: -

1. To investigate the extent of QM implementation in small and medium construction sector.

2. To find out the challenges faced in the effective implementation of QM in construction activities.

3.   To explore the current measures taken by construction firms to overcome such challenges

4.   To find out strategies that can be adopted by the construction firms for effective implementation of QM in the construction project.

1.4 Justifications for the Study

The need for QM in the construction sector has not been given the required attention in spite of major benefits in many other organization or industries (Lukumon *et al.*, 2015). It is very difficult to correct nonconforming work in a construction project, especially if it is at the later phases of the project (Ann *et al.,* 2016). Hence, Implementation of QM in Nigeria construction industry will be of great importance as it has been tested and used in many countries around the world likewise proved to be very effective at optimizing the total cost of a project life cycle (Mohammed *et al.*, 2017). Abdulrahim (2016) recommends a framework needs to be developed for quality management practices that suits building construction projects in Nigeria. Thus if QM are such indispensable pills in construction sector, attempt must be made to have an effective framework for successful implementation of QM in construction sector. However, such frameworks have not been marginally developed. It is hoped that the recommendations in this study will be used by stakeholders in the building construction industry in addressing the ugly menace of construction projects such as building collapse that has bedeviled our dear country, Nigeria. This research will hence focus on exploring problems in construction sector for successful implementation of QM and providing some strategies for effective QM implementation during construction process.

1.5 Scope and Limitation of the Study

This study will focus on assessing the strategies for successful implementation of QM practice in Nigeria construction industry. This research work will be limited to small, and

medium size construction firms in Abuja. This location was selected because dominant construction firms are small, and medium sized operating locally and executing mostly residential projects.

<div align="center">**CHAPTER TWO**</div>

2.0   **LITERATURE REVIEW**

2.1 The Construction Industry

The construction industry has many characteristics that set it apart from other production environments, especially when compared with other sectors such as manufacturing (Kamal *et al.,* 2016). The characteristics that make construction project a complex undertaking include: its fragmented nature, uniqueness, dynamism, non-standardization, communication difficulties and the lack of customer focus of the construction industry (Lakshmi, 2015; Leong, Zakuan and Saman, 2016). A typical project has a combination of persons and organizations including architects, engineers, quantity surveyors, planners, contractors, suppliers and other associated persons and organizations (such as the local council, building control agencies) (Kamal *et al.,* 2016). These large numbers of project participants with differing quality objectives are expected to work together towards a common goal of project success.

According to Qaiser and Rizwana. (2015), was noted that the complexity of construction projects is as a result of the resources employed, the environment in which construction takes place, the level of scientific knowledge required, and the number and interaction of different workflows. This sometimes leads to difficulties in quality achievement throughout the supply chain (Ann *et al.,* 2016; Oyedele *et al.,* 2015). Firas (2015) pointed out that the construction industry is also characterized by its non-standardization, where production processes are, to some extent, different from one another. Hence, no universal standard or specification can be applied to the product. According to Ann *et al* (2016), both the internal and the external environment of construction projects are dynamic and relatively unstable. Therefore, such environments could hinder the smooth application of quality management practice (Ann *et al.,* 2016). Within the context of the current study,

some of these characteristics impacts on quality management practice hence affect the ability to meet quality objectives desired by project owners, users and compliance authorities. Very often, these characteristics make successful project outcomes ambiguous (Lepak and Scott, 2015).

One of the most significant current discussions among building owners, governments, approving authorities and professional bodies is the increasing incidence of building collapse in Nigeria. Mbambali and Okotie (2012) pointed out that the frequency of building failures and in extreme cases, building collapse in Nigeria has become alarming and worrisome. Several other studies have reported the continuous increase in building collapse in Nigeria, with the most affected areas being urban areas because of their population growth rate. For example, Nashwan and Awad (2012) study on 61 cases of building collapse between 1974 and 2006 found that the highest incidents of building collapse occurred in Lagos State. Of the study cases, 40% were residential buildings (Nashwan and Awad, 2012). Another analysis by Nwakoby and Ofobruku (2015) shows that between 1975 and 1995, of 26 incidences of building collapse recorded, 14 between 1982 and 1996, and ten occurrences were recorded between 2004 and 2006 in Lagos State alone.

Aina and Wahab (2010) investigated 47 cases of building collapse in Abuja, Lagos and Port Harcourt between the periods of 2000 to 2010. The study also found Lagos State to have the highest incidences of building collapse. These findings are unanimous about Lagos State having the highest rates of building collapse. In summary, building collapse is significant in the construction industry in Nigeria. These result in significant casualties and loss of lives that could be avoided.

The implementation of efficient and effective quality management principles in construction organization could bring an end to the needless loss of lives (Oyedele *et al.,*

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2015). There are suggestions for the construction industry to examine the competency and effectiveness of construction site workers as well as the standards of the materials and components used in building construction. Coupled with this is the establishment and implementation of sound quality management systems that would improve process performance across all construction activities (Valmohammadi and Roshanzamir, 2015).

2.2 Quality Management Systems in Construction

Quality management systems have become the focal points in businesses within the construction industry (Neyestani, 2016). Quality management system according to the ISO 8402, (1994), refers to all management functions that determines quality policy, objectives and responsibilities, and implements them by means such as quality planning, quality control, quality assurance, and quality implementation within any quality system. The quality management system establishes a framework of reference points that ensure that every time a process is performed, the same information, methods, skills and controls are used and applied in a consistent manner (Zwain, Lim and Othman, 2017).

Essentially a quality management system standardizes organizations processes, helps to minimize waste and reworks, and increase organisations profit margin (Hesham *et al.,* 2016). This management discipline is concerned with preventing problems from occurring by creating the attitudes and controls that could make prevention possible.

According to Zwain *et al.* (2017), a good quality management system is crucial in ensuring compliance with the quality criteria of projects. In other words, the quality management system is the criteria by which organizations quality performance are measured and for which quality management standards were developed. It is now used by many in the construction industry to ensure that the right things are done right the first time. Shafiq, Lasrado and Hafeez (2017) suggest that minimizing errors/mistakes during

the delivery of goods and services is possible with the introduction of formal quality management systems to plan, monitor and control production processes.

Toward this end, a series of international quality management standards have gained wide acceptance in the construction industry. The International Organization for Standardization (ISO) for example, emerged during the last two decades as a system that can be applied to different types of organizations in order to obtain improvements in quality procedures and products. The ISO's initial sets of standards have been progressively developed to be relevant to construction due to its generic nature (Zeng, Phan and Matsui, 2015).

The ISO creates an assurance regime that provides confidence that an organization has a quality process installed and that the organization provides consistent products that will meet its customers' needs and other regulatory requirements. Lee and Ooi (2015) state that such implementation leads to third party certification that a product / service performs to requirements and provides evidence that an optimal level of quality is achieved. Quality is about meeting standards and end user requirements.

A quality management standard like the ISO has a customer focus in all its requirements (Abdulrahim, 2016). The probability of meeting customers' needs is higher when such a standard, guides quality management performance. ISO 9000 sets the minimum standard for quality management systems and many organizations have become ISO 9000 compliant as a result of pressure from their customers (Lepak and Scott, 2015); although these clients tend to be public sector based that build one-off projects.

In Nigeria, the Standards Organization of Nigeria (SON) has formally adopted the ISO 9000 for quality management in the country (Abdullahi *et al.,* 2019). Although there is anecdotal evidence, which suggest that its implementation is not clearly evident in the Nigerian construction industry.

Quality is concerned with the totality of the attributes of a building which enables it to satisfy needs. According to Abdulrahim (2016), any client would want to construct a facility of the highest quality and it is the goal of the design team to maximize quality while minimizing cost and time. There is a need for structural and formal systems of construction management to address the aspect of performance, workmanship and quality. Construction projects have the involvement of many participants including the owner, designer, contractor and many other professionals from construction-related industries. Each of these participants is involved in implementing quality in construction projects. These participants are both influenced by and depend on each other in addition to other players. (Neyestani, 2016).

Neyestani (2016) also assert that it has been estimated that as many as one in four workers produce nothing at all because they spend their entire day rectifying the mistakes made by others. 6-15% of construction cost is found to be wasted due to rework of defective components detected late during construction and 5% of construction cost is wasted due to rework of defective components detected during maintenance (Mallawaarachchi and Senaratne, 2015). Laird (2016) stressed that defects in construction projects are a persistently worrying problem despite continually improving technology and education.

The construction industry has too often in the past been discredited by bad publicity resulting from sometimes dramatic features of both the design and the construction of its products.

According to Fung and Ramasamy (2015), the major problems identified in their research are inadequate budgetary allocation for quality control, non-conformance to quality control clauses by authorized agencies, insufficient quality control laboratory and personnel.

Mehralian

Nazari, Nooriparto and Rasekh (2017) asserts that quality concepts, principles, methods and processes, along with quality systems, environmental systems and health and safety provisions are integrated to create a new quality concept known as the integrated quality management systems.

As reported by Mane & Patil (2015) the Quality is one of the critical factors in the success of construction projects. Quality of construction projects, as well as project success, can be regarded as the fulfilment of expectations of the project participants. Zwain *et al.,* (2017), opined that in order to achieve quality in construction, the construction project must be contained as a set of activities that start with the requirements of the customers and end with satisfaction and contentment of the customers.

The ISO 9000 series, developed by the International Standards Organisation (ISO) is a standard related to implementing better QM, control and assurance in companies (Altayeb and Alhasanat*.,* 2015), and is already widely accepted in many manufacturing, production and services industries because it focuses on customer focus, leadership, people involvement, process approach, systems approach, continual improvement, and promotes a factual approach to decision making (Fung and Ramasamy, 2015). The standard is actually a generic one and because of this is not confined to those industries mentioned but can also be used successfully by construction companies on their projects, even though every project is unique and involves different sub-contractors and suppliers. Effectively implementing a QM system requires an ISO 9000 quality management system, or by applying a total QM approach, potentially provides benefits that are needed by any construction company (Laird, 2016).

Banna, Ahmad and Koh (2018), claim that by employing an ISO 9000-certified QM system, work repetition, project delays and failure to meet specifications can be minimized. Other advantages are that the buildability factor of most projects can be

increased whilst the project cost is decreased because of the use of an appropriate framework for controlling the processes required when constructing the project.

Neyestani (2016) point out that lessons learned from implementing a QM system ensure that a construction company can be more efficient in its subsequent projects in using material resources, developing better internal communications and increasing productivity as well as improving its standard operating procedures. The primary benefit of operating an effective, appropriate and transparent quality system is that a construction firm will be admired and chosen to bid in both local and global market contracts (Mehralian *et al.,* 2017). All this evidence leads to a conclusion supporting and that a QM system needs to be developed and fully implemented in any construction company that wishes to be a sector leader.

Similarly, Kamal *et al.,* (2016) observed that previous researches indicated that total quality management has been in use since the 1980s in Nigeria, despite its potential benefits to the industry, there is little usage of Total Quality Management (TQM).

It is evident that researches in the construction industry has proved that utilization of quality management concept has a great influence on the cost-effectiveness results of construction projects and achieving successful project performance (Banna *et al.*, 2018).

Abdullahi *et al.,* (2019) indicated that most of the firms are aware of the benefits of total quality management and the factors enhancing its implementation, however the level of adopting the total quality management principles are very low in Nigeria. The analysis further showed that there is no prevalence of total quality management principle among indigenous construction firms in Nigeria while there is a high correlation between the implementation of total quality management principles and organizational performances. The achievement of an acceptable standard in building is a combination of quality of design and quality of construction. In the former, quality is determined by the engineer

or architect in terms of their skills and by promoters in what they are prepared to pay. In the latter, quality is determined by the management and operative capabilities of the constructor, and by the supervision capabilities provided by the designer with regards to the standards required.

Building clients often want the best possible quality but are not prepared to pay for it. Cornick 1991 cited in Shafiq *et al.* (2017) stressed that the need to manage quality in briefing, designing and specification phases of a building projects, rather than trying to merely control quality in the construction phase, stems from the preposition that prevention is better than cure.

It is now recognized that in the construction industry, that the lowest price can cost more in the long run. According to Pravin and Patil (2015), there is often poor management and supervision and that study in U.K. indicated that about:

a) 50% of faults originate in the design in office.

b) 30% on site.

c) 20% in the manufacture of materials and components.

Zeng *et al.* (2015) observed that price is no longer the determinant factor, building clients are becoming more conscious and are insisting on quality construction from the contractors. Abdulrahim (2016) also stressed that project quality is the most important yardstick for patronage by clients, it is an indication that delays in project delivery and increases in project final costs are not as important as project quality to clients.

Despite the significance of quality in the construction industry, there are some factors that affect quality which to Pravin and Patil (2015) classified as "M" factors affecting quality:

a. Market: Compatibility between standards provided by different firms.

b. Men: This is perhaps the single most important factor in achieving quality, having the right people to do the job which is required.

c. Money: Quality costs money. If an inadequate amount of money is included in a budget, then the required quality will be difficult to obtain.

d. Management: It is the function of management to set a company's quality policy, and this will in turn form the basis of the company's reputation in this respect.

e. Materials: These must have been specified correctly, properly delivered to and checked on site and then stored in accordance with the manufacturer's instructions.

f. Methods: The methods specified must be capable of being executed in practice to the tolerance and finishes required. Specifications which do not take into account these factors are likely not to achieve their desired objectives.

g. Machines: The correct machines for the work being carried out must be carefully selected, and to work efficiently it must be properly maintained.

2.3 Quality management process

According to Valmohammadi and Roshanzamir (2015), the quality management process commences with the production of a quality management plan which needs to be submitted along with tender documents during the initial stages of a construction project. There are three major processes involved in the management of quality in construction projects (Valmohammadi and Roshanzamir, 2015; PMI, 1996 cited in Zwain *et al.*, 2017). These are quality planning, quality assurance and quality control. Each of these processes is briefly described in the following sub-headings.

2.3.1 Quality Planning (QP)

QP is essentially a process that guides future quality activities. It sets the requirements and standards to be met as well as the actions necessary to meet those requirements and standards. The quality of a project is assessed by conformity to a quality plan designed to meet customer needs. According to Lakshmi (2015), quality planning provides the confidence that all steps necessary to ensure quality have been thought through. It

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involves identifying which quality standards are relevant to the project and determining how to satisfy them (PMI, 1996 cited in Zwain *et al.*, 2017).

The quality plan specifies the requirements to be met in each project phase, getting approvals before continuing to the next phase. For example, it specifies at what stage formal design reviews could be held, how quality assurance would be managed for work done by subcontractors, as well as when and how deliverables will be inspected (Mehralian *et al.*, 2017). The quality plan could also indicate the quality techniques that would be used and when. Checklists are usually incorporated as part of the quality planning process to verify that a set of required steps have been performed (PMI, 1996 cited in Zwain *et al.*, 2017). Organisations in more developed economies have a standardized checklist for ensuring consistency in activities performed frequently.

2.3.2 Quality Control (QC)

Quality control (QC) describes an ongoing process of monitoring and appraising work, and taking corrective action so that quality outcomes that are planned for could be achieved (Zeng *et al.*, 2015). QC is essentially the activities and techniques employed to achieve and maintain the quality of a product, process, or service by monitoring activities, finding and eliminating causes of quality problems so that the requirements of the customer are continually met. QC is thus, primarily concerned with defect detection. The main QC techniques are related to inspection and statistical quality control (statistical sampling). The results of these processes are used in taking corrective actions and to inform the quality assurance (QA) process, so steps can be taken to prevent similar errors and defects. Other QC techniques are control charts and flowcharts. Inspections involve checking that what is produced is what was required (Kamal *et al.*, 2016).

The inspection takes two forms in construction works: that which is quantifiable for example lines, levels, verticality and dimensions; and that which is open to inspectors'

interpretation such as fitness, tolerance, cleanliness and visual checks (Kamal *et al.,* 2016). Quality checks for construction performance are undertaken by work supervisors to ensure they comply with specifications. Inspections do not of themselves prevent or correct mistakes unless appropriate corrective measures are taken subsequently.

On the other hand, statistical sampling involves choosing a part of a population of interest and subjecting them to checks, tests or inspections (PMI, 1996 cited in Zwain *et al.*, 2017). The result of tests on a small sample helps to establish the acceptability of an entire lot or batch of materials or work products (Mane and Patil, 2015). Each lot tested, determines whether they satisfy a minimum acceptable quality level (AQL). Testing the cube strength of concrete is a typical example of statistical sampling in construction. Appropriate sampling can often reduce the cost of quality control (PMI, 1996 cited in Mehralian *et al.*, 2017).

2.3.3 Quality Assurance (QA)

Quality Assurance is a more modern approach to quality achievement in production. It is a shift from the old inspection and quality control systems where a lasting and continuous improvement in quality is achieved by directing organizational efforts towards planning and preventing problems occurring at the source (that is a shift from detection towards the prevention of non-conformance) (Bouranta, Psomas and Pantouvakis, 2017). Thus quality assurance (QA) seeks to eliminate errors and mistakes that will give rise to wastes and defects and subsequently avoid reworks through replacement and making good the defects.

QA is broadly the prevention of quality problems through planned and systematic activities. These include the establishment of sound quality management systems, the assessment of its adequacy, the audit of the operation of the system and the review of the system itself (Kamal *et al.,* 2016). The PMI (1996 cited in Mehralian *et al.*, 2017)

describes QA as all the planned and systematic activities implemented within a quality system to provide confidence that projects will satisfy relevant quality standards. 'Fitness for purpose' and 'right first time' are the basic principles of QA to ensure that specifications are consistently met (Mehralian *et al.*, 2017).

Quality planning tools and quality audits are the basic techniques used for providing QA. Quality audit is simply a structured review of other quality management activities (Bouranta *et al.*, 2017). A quality audit examines the elements of a quality system to evaluate how well these elements comply with quality system requirements. The elements of a quality system identified by (Sylvia and Chaminda, 2015) include responsibilities, authorities, relationships, functions, procedures, processes and resources. The main objective of any quality audit is to identify lessons learnt that could improve the performance of the project or other projects within an organisation, Construction Industry Development Board (CIDB,2016). It helps to establish how well a system is working (Sylvia and Chaminda, 2015).

2.4 Practices of Quality Management

Quality management (TQM) is often defined as a complete management philosophy that permeates every aspect of a company and place quality as a strategic issue. It is accomplished through an integrated effort between all levels of a company to increase customers' satisfaction by continuously improving current performance (Zwain *et al.*, 2017). The adoption of TQM in construction industry has been promoted in some literatures (Tan and Syazwan, 2016). ISO certification is nowadays a trend in most industries including construction industry. The ISO 9001 standard is now on its year 2000 revision.

The five clauses for its implementation are quality management system, management responsibility, resource management, product realization, and measurement, analysis, and

improvement. The application of ISO standards has received much attention from researchers Sylvia and Chaminda (2015) argued that the ISO 9000 standards series can form and have formed the basis for an efficient and advantageous quality management system in the construction industry. Leong *et al.* (2016) stressed that the motivators behind the implementation of ISO 9000-certified quality systems for Hong Kong constructors appear to be to qualify for public works tenders, to meet clients'/customers' expectations and to improve the quality of work done.

Love and Faniran (2012) commented that ISO 9000 certification is not an option but rather a reality for construction companies that wish to retain and sustain their competitiveness in today's highly competitive markets. And also stated that, it is indicative that ISO 9000 has an impact on the contractors' attitude towards quality.

As for the implementation of quality management in project management, the concepts of quality planning (identification of quality standards), quality assurance (evaluation of overall project performance) and quality control (monitoring of specific project results) in the quality management processes were defined by Project Management Institute (Sylvia and Chaminda, 2015). Several tools and techniques were identified as part of the implementation process, there are, benefit/cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts, pareto diagrams, statistical sampling, flow-charting and trend analysis.

Lakshmi (2015) divided quality tools and techniques that are in support of quality programs into three main types, i.e., hard quality tools, mixing methods and soft methods. Hard quality tools are formal quality systems, documented quality systems, quality costs, control charts, and statistical sampling standards. Mixing methods are strategy and action plans review, flexibility of organization structure, control charts, quality circles, and quality planning tools. Soft methods are training, customer satisfaction surveys, regular

contact with vendors and external organizations, actions to optimize environment impact, empowerment, self-assessment, and benchmarking.

Management Commitment in Quality Management Implementation Longtau, Justina, Majidadi and Gillian (2016) concluded that senior managers' involvement, understanding and customer focus are essential antecedents of TQM success. Shreyas *et al.* (2015) described that leadership and human resources management are among strong predictors of performance TQM practices. On construction related research, Firas (2015) commented that top management commitment as one of the elements that would reflect TQM performance measures in construction firms.

Banna *et al.* (2018) argued that high levels of management actions would lead to reduced prevalence of the problems as TQM is deployed on construction sites. The author emphasized that management commitment to quality and to continuous quality improvement is very important in each phase of the building process. Ann and Susan (2016) recommended that management must fully understand and support the TQM process and actively participate in its implementation rather than delegate it.

One of the issues arises in discussing the management commitment is the conceptualization of the term. Different authors have defined it in their own ways although some similarities are observed, and the details are shown in Table 2.1

Table 2.1 Conceptual Definition for Management Commitment

Author (Year)	Element(s) in conceptual definition for management commitment.
Shreyas *et al.* (2015)	Goal setting, feedback, participation.
Banna *et al.* (2018)	Top priority.
Neyestani (2016)	Leadership
Majidadi and Gillian (2016)	Common goal setting, management review and continuous improvement, management involvement & leadership, management attitude to change.
Longtau *et al.* (2016)	Allocation of budget, planning for change, providing methods for monitoring progress of construction works.
Majidadi and Gillian (2016)	Initiative for successful implementation, support.

Adapted from Abdullahi *et al.,* (2019)

2.5 Importance and Purpose of Quality in Building Construction

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. The need for "Quality Assurance procedures" cannot be over emphasized, as quality is as much of importance to client as cost and construction duration (Fung and Ramasamy, 2015). Quality control in a building construction project is of utmost importance to;

a) Upgrade the architectural appearance.

b) Improve safety and durability of the building (reduce faults).

c) Ensure user compatibility.

d) Fulfill the needs and aspirations of the user to occupy the building without any difficulty.

This objective can be achieved by continuous quality control in all the stages of the project. (Chandrasena, 2015). The essence of value for money" is the hallmark of quality in construction and thus enhances the image of the design team.

2.5.1 Why Standards?

A standard is simply a definition of how something should be. (Mane, 2015). According to Mane (2015), standards are documents used to define acceptable conditions or behaviors and to provide a baseline for assuring that conditions or behaviors meet the acceptable criteria. In most cases, Standard defines minimum criteria.

Standard are used to ensure that building work and service measures up to its specification and is safe for use, they are the key to any conformity assessment activity. (Mane, 2015). The international organization for standardization (ISO) has given the importance of standards as follows:

a) Ensures environmental fitness.

b) Ensures safety

c) Ensures reliability

d) Ensures efficiency and

e) Ensures interchangeability. (Mane, 2015).

Anas and Gözde (2017) stressed that British standards are technical documents which, if properly used, it saves time, money, materials and energy in the production and exchange of goods and services.

2.5.1 ISO 9000 Standards in Construction Industry

A quality system is a framework for quality management, it embraces the organizational structure, procedure and processes needed to implement quality management. The adequacy of the quality system, and the quality of products, services and processes are judged by their compliance to specified/relevant standards. (Mane, 2015).

ISO 9000 series is a framework for improving quality in construction industry. According to Mantri (2015), ISO 9000 facilitates the implementation of standards, activities, systems, responsibilities, etc. it also improves quality image of the company, it gives marketing advantage, it improves efficiency, reduces wastages and redoing of work, it also ensures customers satisfaction.

Hesham *et al.* (2016) asserts that when applied correctly these standards will help organizations develop the capacity to create and retain satisfied customers in a manner that satisfies all the other stakeholders.

However, the primary purpose of these standards is to give confidence to customers that products and services meet the needs and expectations of customers and other stakeholders and improve the capability of organization to do this.

Abdulrahim (2016) opined that construction companies are increasingly adopting total quality management as an initiative to solve quality problems in the construction industry and to meet the needs of the client and end-user.

ISO 9000 standards aim to enhance customers' satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements (Fung and Ramasamy, 2015).

The ISO 9000 is primarily concerned with "quality management" this means what the organization does to fulfil;

• The customer's quality requirements

• Applicable regulatory requirements, while aiming to enhance customer satisfaction.

• Achieve continued improvement of its performance in pursuit of the objectives. (Mane, 2015).

• Customers need confidence that their suppliers can must their quality, cost and delivery requirements and have a choice as to how they acquire this confidence. They can select their suppliers;

a. Purely on the basis of best performance, reputation or recommendation

b. By assessing the quality of potential suppliers themselves

c. On the basis of an assessment of capability performance by a third party.

2.5.2 ISO Quality Principle

A quality management principle is defined by ISO/TCV 176 as a comprehensive and fundamental rule or belief, for leading and operating an organization, aimed at continually improving performance over the long term by focusing on customers while addressing the needs of all other interested parties According to Firas (2015) over the last 20 years a number of principles have been developed that appear to represent the factors upon which the achievement of quality depends:

a) Understanding customer needs and expectations i.e. a customer focus

b) Creating a unity of purpose and a quality culture i.e. leadership

c) Developing and motivating the people i.e. involvement of people

d) Managing process effectively i.e. process approach

e) Understanding interactions and interdependency i.e. System approach

f) Continually seeking better ways of doing things i.e. continual improvement

g) Basing decisions on facts i.e. the factual approach

h) Realizing that you need others to guide i.e. mutual beneficial relationships

2.5.2 The National Building Code

The need to evolve a National Building Code arose from the following existing conditions of the cities and the built environment:

a) Poor planning of our towns and cities.

b) Incessant collapse of building, fire infernos, built environment abuses and other disasters.

c) Dearth of referenced design standards for professionals.

d) Use of non-professionals

e) Use of untested products and materials.

f) Lack of adequate regulations and sanctions against offenders. (National Building Code, 2011 cited in Abdullahi *et al.*, 2019)

The aim of the National Building Code is to set minimum standards on building pre-design, design, construction and post-construction stages with a view to ensuring quality, safety and proficiency in the building industry.

The scope of this code shall be subject to its adoption by the states, apply to and control. All matters concerning the design and specification, costing, construction, alteration, addition to; moving, demolition, location, repair and use of any building or structure, for existing or proposed building works within the federal Republic of Nigeria.

Jimoh *et al.* (2016) stressed that it is hope that this National Building Code will open a new vista in the building industry and eliminate or reduce to the bare minimum the incidents of collapsed building syndrome in Nigeria, promote safety and qualitative housing for every Nigerian.

2.6 Factors affecting the application of quality management practice

Quality management practices have fallen short of expectations in the construction industry. Banna *et al.* (2018) affirm that the lack of attention to quality assurances within the construction industry has resulted in quality failures becoming endemic features of the industry. Poor quality management is profound in developing countries. For example, Kamal *et al.* (2016) found that a disregard of quality management implementation exists within the South African construction industry.

In Nigeria, poor quality management within its construction industry has led to many years of poor customer satisfaction and service delivery (Lukumon *et al.,* 2016). Some of the factors affecting the practice of quality management highlighted by Lakshmi (2015) include lack of commitments to quality, inadequate support from management, poor attention to quality issues and poor planning for quality. There is no doubt that there is a current and indeed pressing need to examine the implementation of quality management in many construction industries. Considering the situation in Nigeria is relevant with particular emphasis on the level of implementation and factors that impact on the implementation of quality management practices.

2.6.1 Challenges faced in the implementation of QM during construction activities

Most construction company in Nigeria is faced with major problem on how to adopt a strategy for high quality building that will satisfy the needs of the owner at a reduced and effective price and still ensure that they remain in business without any involvement in debt (Okuntade, 2015).

According to Nwakoby and Ofobruku (2015), it is crucial to observe that in the QM process, certain factors inhibit successful implementation. The task of implementing quality management is not an easy one, as it requires a shift of responsibilities to the management and continuous participation of all members of the organisation in the process of improving quality (Qaiser and Rizwana, 2015). Pravin and Patil (2015), explain that QM implementation is a difficult and complex process that requires huge effort from organisations.

Altayeb and Alhasanat (2015) categorises the challenges experienced during the implementation of quality management into five groups:

a) Structural Challenges: these deal with the physical resources and structures present during the implementation of QM. They include: inappropriate organisational culture,

lack of financial resources, non-existence of information systems and lack of physical resources.

b) Contextual Challenges: these obstacles arise as a result of the culture of the organisation itself militating against successful QM implementation. They include poor organisational culture, lack of teamwork, poor and ineffective communication networks, lack of innovation and lack of co-ordination amongst employees.

c) Strategic Challenges: these challenges are related to organisational leadership. They are significant barriers and are a strong impediment to the success of quality management programmes. They include lack of clear vision, poor leadership, lack of support from top management, poor planning, inconsistent objectives and lack of adequate quality management programmes.

d) Procedural challenges: these challenges arise from the difficulty and complications of the processes themselves. They include inadequate process management, lack of customer focus, lack of proper supplier relationship, lack of framework for review and self-evaluation, ineffective corrective procedure and bureaucracy.

e) Human resources Challenges: these barriers are caused by human related factors such as employee resistance to change and lack of employee involvement. They include lack of employee involvement and commitment, employee resistance to change, lack of education and training of employees, lack of employee recognition and rewards, lack of employee motivation and satisfaction and poor human resource management.

Qaiser and Rizwana (2015), revealed that a number of challenges were faced in implementing QM, these challenges were poor and ineffective leadership, lack of funding and resources, insubordination of workforce, lack of management commitment, poor and ineffective planning.

Commented [AB4]: Not referenced.

2.6.2 Existing strategy for effective implementation of QM in the construction process

QM is often taken for granted and inadequate attention has been given to this parameter. Subsequently, in the absence of effective quality management procedures, considerable time, and resources are wasted every year (Pravin and Patil, 2015)**.** It is very difficult to correct nonconforming work in a construction project, especially if it is at the later phases of the project (Ann and Susan, 2016). Which gives rise to the need to investigate into the strategies needed for effective QM implementation.

As QM implementation is a critical issue that needs to be addressed by all organizations that wish to adopt strategies in overcoming and minimizing problems, the following strategies are identified for its effective implementations are training, High participation of top management, Internal and external audit, Strict supervision on site, Establish feedback system, Frequent steering committee meeting, Team-working approach, involvement of all employee in documentation process and launch quality campaign (Tan and Syazwan, 2016). Having the right human resource capacity positively influences effective implementation of QM in construction which helps to prevent mistakes before they happen. Another important strategy by which QM can be implemented in construction process is adoption of PDCA (Plan Do Check Act) a complete and efficient tool most well known and used methods for developing strategic planning efficiently in companies (siteware.com.br). as shown in Figure 2.1a and 2.1b

Figure 2.1a Image of Plan Do Check Act

Figure 2.1b Image of Plan Do Check Act

Plan; This is the starting point. Select a process for improvement. It may be a process that suggest the greatest payback, or the process that suggest the greatest opportunity for success. It is better to select a process that shows the greatest potential for successful improvement. After selecting the process, analyze it and plan a change that will have beneficial effect (Neyestani and Juanzon, 2016).

Do; in the Do phase of the PDCA cycle, everything that was analyzed by planning is put into practice. It is important that the plan has been created carefully and in detail so that

there are no shortcomings in the rest of the process. The DO phase is the execution of the plan, and it is also where the team is trained for the method to work (siteware.com.br).

Check: in the check phase, it is where the analysis of what was performed happens. The project team must fully understand the effect of the change, why they occurred, and how they might affect other process (Neyestani and Juanzon, 2016).

Act; finally, in the ACT phase, corrective actions are taken to solve the problems that were verified during the process. If the results are as expected (if they slow the intended beneficial effect), implement the change system wide. If the results are not as expected, more forward in the cycle to the plan step and remote the process to analyze it again and prepare new plan (Neyestani and Juanzon, 2016).

QM is one of the important elements of any construction project as cost and time, the role of it for any construction company is not an isolated activity, but intertwined with all the operational and managerial processes of the company as it attracts customer's satisfaction which would bring long term competitiveness and business survival for the companies (Laird, 2016). It is required critically for any construction company to sustain in current construction market which is highly challenging and competitive, has to provide the environment within which related tools, techniques and procedures can be deployed effectively leading to operational success for a company (Bouranta *et al.,* 2017).

For the implementation of QM in construction projects, the concepts of quality planning (identification of quality standards), quality assurance (evaluation of overall project performance) and quality control (monitoring of specific project results) in the quality management processes were defined by Project Management Institute (2000) cited in (Mohammed *et al.*, 2017).

The quality control procedure in construction projects is based on tender documents, specifications, working drawings among others therefore, the pre tender stage quality and

standards of the work should be properly maintained. Therefore, it is important to maintain quality control of the building projects from the inception of its design stage up to the completion of construction including the maintenance period (Chandrasena, 2015). Effective quality control reduces the possibility of changes, mistakes and omissions, which in turn result in fewer conflicts and disputes (Longtau *et al.*, 2016). Several tools and techniques were identified as part of the implementation process, like benefit-cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts, pareto diagrams, statistical sampling, flow-charting and trend analysis (Pravin and Patil, 2015)

QM is a continuing process of improvement, involving all aspects of the business aimed at prevent mistakes before they happen with the key of commitment and teamwork (Pravin and Patil, 2015). Qaiser and Rizwana (2015), revealed that a number of challenges were faced in implementing QM, these challenges were poor and ineffective leadership, lack of funding and resources, insubordination of workforce, lack of management commitment, poor and ineffective planning. Firas (2015), claim that by employing an ISO 9000-certified QM system, work repetition, project delays and failure to meet specifications can be minimized. It is required critically for any construction company to sustain in current construction market which is highly challenging and competitive, has to provide the environment within which related tools, techniques and procedures can be deployed effectively leading to operational success for a company (Banna *et al.,* 2018).

2.7 Research Trend on Effective QM Implement in Construction Industry

Pravin and Jalindar (2015) conducted research based the development of quality management system in all aspects of construction work. Their study describes the analysis of data collected during interviews & questionnaires with builder / contractor. The survey suggests that customer's satisfaction is always important provided that satisfaction of all

other participants of project is also important. It was also reveals that importance of total quality management at construction projects. After study of all above points the researcher reached the following concluding remarks as below: Satisfaction of all stakeholders in the industry; Better understanding on quality control procedure; Satisfaction of Client; Suitable quality control method for the project; Development of the quality of strength in construction; Quality Management at construction projects.

Ann and Susan (2016), also investigated the Drivers of Effective Project Quality Management. In The Construction Industry in Nairobi County, Kenya: A Case of EPCO Builders Limited. The findings of this study revealed that quality planning influences project quality management positively. The study also established that human resource capacity is a critical factor that influences project quality management. Having the right human resource capacity positively influences project quality management. The study revealed that good quality construction materials positively influences project quality. In addition, the study concluded that finances are an important factor with positive influence in project quality management. The study thus recommends, amongst others that top managements commit themselves in providing leadership and key resources needed in project quality management.

Neyestani (2016), investigated on the Effectiveness of Quality Management (QM) on Construction Projects in Philippines. Quality management system (QMS) provides generic guidance and requirements for establishing an appropriate quality management procedure. Finally, the analysis of data was accomplished by descriptive statistics to find the results and conclusion. The findings have shown that the implementation of QMS can be affected mostly on customer's satisfaction, followed by cost, and time respectively, while minimum effectiveness of QMS was on scope (quality) through QMS implementation in construction projects in Metro Manila.

Jimoh *et al.,* (2016) also conducted a study on Total Quality Management Practices in the Nigerian Construction Industry. The findings from the survey revealed that there are six areas of quality practices within the organizations studied: Top Management Commitment, Customer Focus, Supplier Relationship, Employee Involvement and Empowerment, Work Environment and Benchmarking which were found to be statistically significant to TQM practices in their various organizational performance levels. The findings further indicate that construction companies implement QM to a high extent in their various organizational levels which implies that QM practices have high influence on organizational performance in construction companies. The findings from Africa on practices of QM in the construction industry especially from the Nigerian construction industry perspective should arise the interest of researchers globally who are keen in using comparable paradigm for continuous business improvement. Limited research on this subject in the study area attests to its originality. However, the findings presented here are of invaluable benefits to the management of construction companies as well as major stakeholders in construction in Nigeria and other developing countries to achieve excellence in organizational performance.

Abdullahi *et al.,* (2019) conducted a study on Assessing Quality Management Practice in Nigerian Construction Industry. Findings from the study show that inspections and statistical quality control techniques are the most widely used quality management tools by construction firms in Nigeria. However, the study found that the preparation of quality management plans (QMP) and quality auditing (a measure of quality assurance in building production), is not popular among Nigerian construction firms. Inadequate planning arrangements for quality, poor communication of quality requirements and lack of awareness of the benefits of quality management were identified as the most significant issues affecting quality management practice. Therefore, there is a low uptake of quality

management practice principles within construction organizations in Nigeria. Hence, the need to create awareness for implementing quality management principles and concepts in its construction industry.

<center>**CHAPTER THREE**</center>

3.0   **RESEARCH METHODOLOGY**

3.1 Research Design

Research design refers to a plan which shows the strategy of an inquiry thought appropriate to the research (Cooper and Schindler, 2014). Research design can either be descriptive design, experimental design, exploratory design, survey design, action research design, case study design or combination of two or three different research designs (Fellows and Liu, 2013). In this study, both survey and case study research designs were adopted as they enabled a robust data to be obtained from different sources and a wide population (Cooper and Schindler, 2014).

Survey as a research design is form of research that involves undertaken purposely to afford the researcher with statistical information, either on particular subjects/challenges that require improvement or to test the robustness of an existing theory (Fischler, 2010). Survey research is perhaps the best available method for collecting data from a study population that is too large to observe directly (Babbie, 2015). While a case study as a research design is refers to units of investigation that are studied at different levels as individuals within a community, group of people, an organization or phenomenon (Babbie, 2014). According to Hartley 1994 reviewed in Berg and Lune (2017), a case study is a detailed investigation often with data collected over a period of time, of one or more organizations, or groups within organizations, with a view to providing an analysis of the context and processes involved in the phenomena under study.

3.2 Research Methods

Research methods are the approaches adopted by a researcher to obtain the necessary information in a study. It can be qualitative, quantitative or mixed methods. For the purpose of the study both mixed research methods was adopted; Clark and Cresswell

(2015) defined quantitative research as research techniques that seek to quantify data and typically apply some form of statistical analysis. Therefore, quantitative research is a systematic scientific investigation of the research phenomena and their relations (Cooper and Schindler, 2014). Data collected by questionnaire are classified in three ways: face-to-face, self-completion and telephone interview (Cooper and Schindler, 2014).

Fink (2016) defined qualitative data as protocols of unstructured interviews and notes from observations [which] tend to be less easily summarized in numerical form. Qualitative research does not just rely on statistics or numbers, but gives more focus on gaining insights into people attitudes, understanding specific phenomena, content and culture by analyzing structured and unstructured data, figures, feedback forms, photos and videos (Hamed, 2018). Quantitative research uses numeric data such as scores while qualitative research uses non-numeric data such as interviews and observations (Berg and Lune, 2017).

3.3 Study Population

Population is the number of people, objects or occurrences that have similar observable features (Fink, 2016). In other word, it is the totality of the objects, individuals, and/or events; that meet the set criteria for inclusion in a research for the aim to be met (Oladun, 2013). The targeted population for this research was the registered construction firms in Abuja Metropolis. The study focused on experts and professionals working in the small and medium construction sector.

3.4 Sampling Techniques

Morenikeji (2006) stated that sampling technique helps a researcher in the selection of element that forms part of population. This denotes that sampling techniques is a process of picking elements that are included in the population. Some of the common methods for sampling are:

a) Probability Sampling

b) Non Probability Sampling

Probability sampling means that every item in the population has an equal chance of being included in sample. One way to undertake random sampling would be if researcher was to construct a sampling frame first and then used a random number generation computer program to pick a sample from the sampling frame (Fink, 2016).

Non probability sampling is often associated with case study research design and qualitative research. With regards to the latter, case studies tend to focus on small samples and are intended to examine a real life phenomenon, not to make statistical inferences in relation to the wider population (Fink, 2016). In this research the non probability sampling was adopted.

3.4.1 Sampling Frame

The sampling frame is a register/list of individuals, group, location, or other units which will form part of the study and from which data will be collected (Cooper and Schindler, 2014). For the section requiring the use of questionnaire, the population of the respondents were drawn from the register of the following bodies in Abuja; Nigerian Institute of Quantity Surveyors (NIQS), Nigerian Institute of Building (NIOB), Nigerian Society of Engineer (NSE) and Nigerian Institute of Architects (NIA). The element in Table 3.1 below shows the list of the professionals.

Table 3.1: Sample frame of respondents

S/n	Respondent	Population
1	Architects (NIA)	600
2	Builders (NIOB)	606
3	Engineers (NSE)	7875
4	Quantity surveyors (NIQS)	1267
	Total	**10,348**

(Source: National professional bodies).

3.4.2 Sample size

In order to determine the sample size for this research, Abuja the nation's capital provided an enabling ground for achieving the objectives of this research because of the concentration of construction activities in the city. Therefore, the study concentrated on Abuja Metropolis.

The sample size has a relation with the population; and therefore, is a part of the population from which data will be collected for analysis (Cooper and Schindler, 2014). The sample size for the study was obtained using the formula from Krejcie and Morgan (1970) cited in (Berg and Lune, 2017) at 95% confidence level, and it is 370

$$s = X^2 \, NP \, (1 - P) \div d^2 \, (N - 1) + X^2 \, P \, (1 - P) \tag{3.1}$$

Where;

s = sample size from finite population

X = based on confidence level 1.96 for 95% confidence was used for this study

d = Precision desired, expressed as a decimal (i.e. 0.05 for 5% used for this study)

P = Estimated variance in Population as a decimal (i.e. 0.5 for this study)

N= total number of population, 10,348

$$s = \frac{1.96^2 \text{ x } 10,348 \text{ x } 0.5 \text{ x } (1 - 0.5)}{(0.05^2 \text{ x } (10,348 - 1)) + (1.96^2 \text{ x } 0.5 \text{ x } (1 - 0.5))}$$

$$= \frac{9938.2192}{(25.867 + 0.9604)}$$

$$= \frac{9938.2192}{(26.8279)}$$

$s = 370.4062 \approx 370$

Therefore, the sample size equals Three hundred and seventy (370).

3.5 Procedures for Data Collection

3.5.1 Interview

Interviews are a tool mainly for the collection of qualitative data and are popular as a data collection tool because of their flexibility (Berg and Lune, 2017). It is an active interaction between two or more people (Cooper and Schindler, 2014). Such interaction could lead to a negotiated contextually based result. There are different forms of interview to include face-to-face and focused interviews (Babbie, 2015). Face-to-face interview was used in this study, and the interview guide prepared for the exercise had a total of twelve (12) structured questions. The professional were randomly selected and visited for the purpose of the research. The participants of the interview study included, architect, engineer, builder and quantity surveyor across construction companies. These participants were randomly selected by the researcher. Each of the interviews conducted was approximately 35 minutes in duration. All the interviews were recorded and transcribed accordingly. It is essential to know that notes were also taken during the interviews to support the interviews transcription.

3.5.2 Questionnaire

The questionnaire is a tool designed for the collection of quantitative data and is widely used in construction research (Hamed, 2018). It is a good research instrument for collecting standardized data and making generalizations. In this study, a self-structured questionnaire was used, as these simplify the statistic process). The questionnaire was developed for the purpose of gathering information from respondents. Which comprised of sections designed to be answered by respondents. It is the vehicle used to offer the conversation starters that the analyst needs respondents to reply (Clark and Creswell, 2014).

Table 3.2 Cronbach's Alpha Test for Reliability and validity

No	Variables Tested	Cronbach's Alpha	No. of Items
1	Level of Implementation of QM in the Construction process	0.82	12
2	Challenges Faced in the Implementation of QM in Construction Activities	0.78	12
3	Current measures taken by the firms to Overcome such Challenge	0.81	10
4	Strategies for effective Implementation of Quality Management in Construction process	0.86	7
	Average	**0.80**	

Source: Authors' Field Survey (2020)

The result shown on Table 3.1 reveals the level of reliability and validity of instrument questions target to answer each of the study research questions. The variables; understanding on quality management in construction process, level of Implementation of QM in the Construction process, factor Affecting adequate implementation of QM in the Construction process and strategies for effective Implementation of Quality Management in Construction process all had Cronbach's Alpha values of 0.82, 0.78, 0.81 and 0.86 respectively. The average Cronbach's Alpha value of 0.80 made it obvious that the research instrument is suitable, reliable and valid for providing answers to the research questions of the study.

3.6 Data Analysis

The information obtained through the questionnaire was analysed through descriptive statistical method of data analysis which included percentages, mean scores and relative importance index. Collected data was edited for accuracy, consistency and completeness. Raw data was keyed on a worksheet in Microsoft Excel and computer software known as Statistical Package for Social Sciences (SPSS) version 23.0. Raw data was analysed quantitatively and statistically.

The procedure for using relative importance index (RII), according to Shafiq *et al.* (2016) posit that when the score given by the target respondents are summed up, the relative

importance index (RII) can be calculated using the Relative Important Index formula; written as

Relative Important Index (RII) $= \frac{\sum Pi\,Ui}{A\,x\,N}$ (3.2)

The information obtained through interview was analyzed through content analysis. The responses were extracted from the data collected and written.

Where;

Pi = respondent rating of variables,

Ui = Number of respondents placing identical weighting/rating on variables

A = highest weighting (i.e. 5 used in this study)

N = Sample size

This study adopted the following cut-off point for the establishing the level of importance, satisfaction, significance and / or severity of factors using relative frequency (or percentage) index;

1   (0-20%) - Very Low   (0 -35%) – Not implemented

2   (21-40%) – Low   (36 -59%) – Partially implemented

3   (41-60%) - Average   (60 - 75%) – Moderately implemented

4   (61-80%) – High, and   (86 -100%) – Fully implemented

5   (81-100%) - Very High

For the purpose of this study, interview response is gathered and analyses using content analysis approach. Each information was rigorously scrutinised while insights meanings of respondent responses were unveiled. The responses were compare and contrast and further interpretations that best disclosed the opinion of the response were given.

CHAPTER FOUR

4.0   **RESULTS AND DISCUSSION**

4.1 Response Rate

This section discloses the level of respondent interest on both questionnaire administration and interview and also gives the general information of the respondent such as the cadre, job tenure, experience, qualification among others. Adapted from the result of the analysis of responses of the respondents' reveals the background information the respondent as shown in Table 4.1, 4.2 and 4.3.

Table 4.1 Questionnaire Response Rate

Questionnaire	Frequency	Percentage (%)
Administered	370	100.0
Retrieved	146	39.5
Discarded	9	2.4
Completed	137	37.0

Source: Authors' Field Survey (2020)

Table 4.1 Out of the 370(100.0) questionnaires that were distributed in the course of this study, 146(39.5) were retrieved, out of which 9 were discarded as a result of incomplete response. Only 137 (37.0) which represent an effective response rate. This response rate in backed with (Akintoye, 2000; Kado, 2011) had stated in their study that for an unbiased construction survey, the response rate of 20-30% and above is ideal. This implies that the repose rates of 37.0% was adjudged adequate and subsequently use for analyses.

The 4.2 also gives the overview response rate of interview conducted.

Table 4.2 Interviewees Response Rate

Category	Frequency	Frequency	Percentage (%)
Cadre of	Architect	2	20.0
Interviewees	Engineer	3	30.0

Builder		3	30.0
Quantity Surveyor		2	20.0
Total		10	100.0

The result displayed on Table 4.2 shows that out of 10 (100.0%) interviewees 2(20.0%) are architect, 3(30.0%) are Engineer, 3(30.0%) are Builder and finally 2(20.0%) are Quantity Survey. This implies that responses of ten (10) across professional in small and medium construction firm in Abuja were incorporated in the study.

The background information's of the respondents are then revealed in Table 4.3

Table 4.3: Demographics Characteristics of the Respondents

Items	Description	Frequency	Percentage (%)
Gender	Male	145	92.4
	Female	12	7.6
	Total	157	100.0
Age	<25 years	4	2.5
	26-35 years	43	27.4
	36-45 years	53	33.8
	46-55 years	56	35.7
	>55 years	1	0.6
	Total	157	100.0
Cadre	Architect	19	12.1
	Engineer	43	27.4
	Builder	64	40.8
	Quantity Surveyor	31	19.7
	Total	157	100.0

Job Tenure	Permanent	112	71.3
	Contract	34	21.7
	Casual workers	11	7.0
	Total	157	100.0
Qualification	OND	11	7.0
	HND	25	15.9
	PGD	20	12.7
	BSc/BTech	53	33.8
	Master degree	45	28.7
	Doctorate degree	3	1.9
	Total	157	100.0
Duration of Work	1 – 23 month	33	21.0
	2-5 years	52	33.1
	6-10 years	49	31.2
	11- 15 years	21	13.4
	> 15 years	2	1.3
	Total	157	100.0

Source: Authors' Field Survey (2020)

Table 4.3 reveals that 145(92.4%) of the respondent are male while 12(7.6%) are female, also shows the age distribution of the respondent, with 4(2.5%) within<25 years, 43(27.4%) are within 26-35 years, 53(33.8%) are within 36-45 years, 56(35.7%) are also within the age range 46-55 years and finally 1 (0.6%) are >55 years.

Furthermore, 19(12.1%) of the respondent are Architect, 43(27.4%) are Engineer, 64(40.8%) are Builder and finally 31(19.7%) Quantity Surveyor. More so, 112(71.3%) are Permanent staff of the construction firm, 34(21.7%) are on contract basis, and finally 11(7.0%) are casual workers

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The analysis of distribution of academic qualification of the respondent revealed that 11(7.0%) had OND, 25(15.9%) had HND, also 20(12.7%) had PGD, 53(33.8%) had BSc/BTech, 45(28.7%) had Master degree and finally 3(1.9%) Doctorate degree. Furthermore 33(21.0%) had 1 – 23-month year of experience, 52(33.1%) had 2-5 years of experience, 49(31.2) had 6-10 years of experience, 21(13.4%) had 11- 15 years of experience and finally 2(1.3%) had > 15 years of experience.

Before exploring the responses of the respondent to achieve the broad objectives of the study there is need to evaluate the reliability and validity of the variables target to gives verdict on the objectives of the study. Hence the Cronbach's Alpha Test for Reliability and Validity was carried out on the collected data and the result is shown on Table 4.4.

4.2 Determining the Extent of QM Implemented in the Construction Sector

The Table 4.4 reveals the outcome of the analysis of response of questionnaire administered and interview conducted with the professional/staff of construction firm in Abuja metropolis on their understanding and view on the extent of Quality Management implemented in the construction sector.

Table 4.4 Extent of QM Implemented in the Construction Sector

Implementation of QM	Mean	RII	Rank
The management ensures adequate implementation of QM by staff	2.62	0.60	7th
There are well designed reward system for both staff and client	2.51	0.48	11th
There are adequate interaction between production departments and quality control department	2.69	0.63	4th
There are adequate provisions of requirement on QM implementation	2.89	0.67	2nd

All the staff are aware and activated to ensure quality services delivery	2.54	0.52	10th
Standard equipment and quality materials are made available for proper execution of job	2.45	0.41	12th
The firm ensures adequate supervision of staff on sites	2.67	0.61	6th
Analysis of daily, weekly and monthly on project progress	2.77	0.64	3rd
Subcontractor are giving adequate information and time to execute their job	2.56	0.54	9th
Audits are adequately conducted on very project executed	2.58	0.59	8th
quality services are utmost in the firm operations	2.92	0.68	1st
Assessment of customers satisfactory on project execution is done on every project	2.66	0.62	5th
Average	2.66	0.58	

Source: Authors' Field Survey (2020)

The result shows the ranking level base on the level of implementation of each item listed on the Table 4.4. The 11th item 'quality services are utmost in the firm operations' was ranked 1st with Relative Importance Index RII=0.79, followed by the adequate provisions of requirement on QM implementation with RII = 0.72. The analysis of daily, weekly and monthly on project progress was ranked 3rd with RII=0.64, adequate interaction between production departments and quality control department was ranked 4th with RII= 0.69, the assessment of customers satisfactory on project execution is done on every project was ranked 5th with RII= 0.62, also that firm ensures adequate supervision of staff on sites was ranked 6th with RII=0.61, furthermore the management ensures adequate implementation of QM by staff, adequately conducted on very project executed,

subcontractor are giving adequate information and time to execute their job, staff are aware and activated to ensure quality services delivery, well designed reward system for both staff and client and lastly the availability of standard equipment and quality materials are made available for proper execution of job were ranked 7th, 8th , 9th, 10th, 11th and 12th with RII of 0.60, 0.59, 0.54, 0.52, 0.48 and 0.41 respectively. The average RII value 0f 0.60 indicate that there is moderate implementation of QM in the overall construction process of the construct firm in Abuja metropolis. The interviews with profession also give detailed information on understanding the level of implementation of QM in their various construction firms.

In summary of the interview responses of the Architect, said:

"It is believed that quality management is about quality control in construction process, also that the QM is main about meeting requirement of the designer, constructor and regulatory agency as well as the owner. It is further stated that QM is yet to be adequately implemented in construction processes by construction firm". The Engineers interviewed also said:

"Quality management serve as a standard in which the quality of a construction project can be measured, it importance cannot be overemphasized as it plays a major role in reliable construction outcomes, but most construction firm are yet to implement QMin all their construction activities, this as directly affect the standard of building and infrastructural development of our nation". The response of the Builder does not differ to that of the Engineers as they disclosed that:

"Quality management is the only measure for standard in construction project, no firm as its rank placed high if not for its adequate implementation of QM in all their construction processes, the great challenged faced by Nigeria construction industry is their inability to adequately implement QM is all their construction activities, hence no small and medium

construction firm has its 100% implemented in Nigeria". Finally, the Quantity Surveyor responded that:

"The beauty of any construction project lies in its level of implementation of QM, as its bring about meeting the requirement of the client and also provide various benefit to main contractors and subcontractor as it is the process of overseeing all activities and tasks needed to maintain a desired level of excellence, despite its importance, construction firms are yet to adequately implemented".

The implication of these results is that QM implementation is fair as such; need drastic attention/measure so as to improve the standard of construction projects, buildings and infrastructural development. The findings are found similar to that of (Pravin & Jalindar, 2015), the authors revealed the lack of QM management practices among construction firm and sought to investigate into the ways of bring back Quality Management System at Construction Projects. In Nairobi County, Kenya (Ann and Susan, 2016), reveals the inadequacy of QM implementation among construction, which as greatly influenced the durability of construction projects most especially those executed by small and medium firms.

4.3 Exploring the Challenges Faced in the Implementation of QM in Construction Activities

The Table 4.5 disclose the respondents' responses on the challenges encountered in the implement of QM in construction activities.

Table 4.5: Challenges Faced in the Implementation of QM in Construction Activities

Variables	Mean	RII	Rank

Inadequate of commitment of management toward the implementation	3.26	0.87	2nd
Inadequate quality production and support planning	2.89	0.79	5th
Poor documentation problem	2.62	0.61	10th
Misinterpretation for QMS requirements amongst involved staff	3.05	0.81	4th
Difficult to measure results	3.22	0.86	3rd
Required cost and time	2.56	0.53	12th
Insufficient motivation of workforce	2.69	0.63	9th
Problem in controlling subcontractors	2.75	0.67	8th
Inadequate human resources	3.99	0.91	1st
Lack of experience and knowledge	2.83	0.72	6th
Various cultures of workforce	2.59	0.58	11th
Reluctant staff to accept quality systems	2.80	0.71	7th
	2.94	0.72	

Source: Authors' Field Survey (2020)

Table 4.5 reveal that inadequate human resources was ranked 1st among challenges faced in the implementation of QM with RII=0.91, followed by inadequate of commitment of management toward the implementation with RII=0.87,difficult to measure results was ranked 3rd with RII=0.86, misinterpretation for QMs requirements amongst involved staff was ranked 4th with 0.81, inadequate quality production and support planning was ranked 5th with RII= 0.79.lack of experience and knowledge was ranked 6th with RII= 0.72, reluctant of staff to accept quality systems was ranked 7thwith RII=0.71, problem in controlling subcontractors, insufficient motivation of workforce,

poor documentation problem, various cultures of workforce and required cost and time are ranked 8th – 12th with RII of 0.67, 0.63, 0.61, 0.58 and 0.53 respectively.

The response of interviewees does not differ from one another; the architects were of the view that:

"Factors influencing adequate implementation on QM in construction could be traced back to lack of management support; in most cases management does not give optimum concern to quality management in the execution of project. Lack of expert and adequate staff on field also impedes the QM implementation, lack of support planning unit in task execution, which leads to inadequate quality production". In summary of the response of the Engineers interviewed, they are of the opinion that:

"The key challenges faced in QM implementation are low commitment of management, lack of basis QMs requirements amongst involved staff, insufficient motivation of workforce, and problem in controlling subcontractors. All these factors are believed to greatly influence the level of QM implementation among construction firm in Nigeria, although need measure has been set in place to adequate implementation, yet as not been adequately implemented".

Among the Builders interviewed there are no disparities in their view on challenges affecting QM implementation. It is said that:

"Most of challenges faced by the construction firm in the implementation of QM is just two; management commitment as well as motivation of workforce. It is believed that if this two are thoroughly worked on their will be nothing less than perfect outcome in all construction project", the Quantity Surveyor also support that:

"The leading challenge of QM implementation is inadequate management support, inadequate staff knowledge on QM, its purpose and how it works and finally revealed that there is need to set standard measure of efficient implement of QM".

So far the results on the sections revealed the reality on the fact that QM is lacking in our construction project across the nation. The finding is in vein with that of (Ann and Susan, 2016) the authors disclosed that top managements commit themselves in providing leadership, lack of staff motivation workforce, problem of quality production and support planning, lack of experience and knowledge are main factors contributing to partial implementation of QM in construction process. Neyestani (2016), also support the findings of the study, in the study, reluctant of staff to accept quality systems, problem in controlling subcontractors, poor auditing, inadequate resource are revealed to greatly influence QM implementation among construction firms. Longtau *et al.* (2016), their study also stated that small and medium construction firm in Nigeria major contributed to low standard of building and collapse rate due to lack of commitment of top management to adopt QM in their construction processes.

4.4 Determining the Current Measures taken by the firms to overcome such Challenges

The result on Table 4.6 unveiled the current measures taken by the firms to overcome the challenges encountered on QM implementation.

Table 4.6: Current measures taken by the firms to overcome such Challenges

Variables	Mean	RII	Rank
Availability of adequate resources for quality management implementation	2.87	0.49	8th
Ensures all procedures and maintenance adopted suit to standard of quality services	2.59	0.43	9th
Provision of sufficient reward system for both staff and client	2.51	0.41	10th
There is efficient communication link between the various department of the construction of firm	3.01	0.58	5th

Proper monitoring of QM implementation in all sites of operations	3.23	0.68	3rd
Regular and adequate assessment of Customer requirements & satisfaction	2.89	0.50	7th
Adequate cost and time should allocated for proper implementation of QM	2.94	0.52	6th
Ensuring proper scrutiny of contractors' tender bids	3.84	0.86	1st
Availability of Sufficient motivation of workforce	3.07	0.59	4th
Provision of sufficient training for staff	3.56	0.79	2nd
	3.05	0.59	

Source: Authors' Field Survey (2020)

The result on the table reveals that among the measure considered by the firm to enhance QM implementation in construction process are; Ensuring proper scrutiny of contractors' tender bids was ranked first with RII =0.86, provision of sufficient training for staff was ranked 2nd with RII=0.79, proper monitoring of QM implementation in all sites of operations was ranked 3rd with RII=0.68. Availability of sufficient motivation of workforce was ranked 4th with RII=0.59. Efficient communication link between the various department of the construction of firm was ranked 5th with RII=0.58, adequate cost and time allocation for proper implementation of QM was ranked 6th with RII= 0.52, regular and adequate assessment of Customer requirements & satisfaction was ranked 7th with RII= 0.50. Availability of adequate resources for quality management implementation was ranked 8th with RII=0.49, ensures all procedures and maintenance adopted suit to standard of quality services was ranked 9th with RII=0.43 and finally provision of sufficient reward system for both staff and client was ranked 10th with RII=0.41. Average RII of 0.50 reveals that the measures are not effective.

Interview the professional also reveals their opinion on measure taken by the construction firm. In summary architects said:

"Most construction firms have set their goals to ensure adequate implementation of QM in their construction process, although are not effective among the measures are; regular and adequate assessment of Customer requirements & satisfaction, adequate cost and time should be allocated for proper implementation of QM, ensuring proper scrutiny of contractors' tender bids and so on, will go a long way to bring back quality in projection execution". The Engineers interviewed also disclosed that:

"The construction firms as well as their staff recognised the significance of the QM in construction process as it brings about the quality of job executed, against numerous challenges facing QM implementation, strategies have been laid down by the firms as a countermeasure for adequate QM implementation, examples are ensuring solid communication link between the various department of the construction of firm, monitoring of QM implementation in all sites of operations, as well as regular check back on customer requirements & satisfaction, although it has not been effective, due to preference of which measure are more prior to another". The Builders also lamented that:

"Availability of sufficient motivation of workforce, provision of sufficient training for staff, availability of adequate resources for quality management implementation among others to measure put in place by the construction firm to enhance QM implementation" and finally the Quantity Surveyor also said:

"Measures such as provision of adequate resources for quality management implementation, adoption of suit to standard of quality services, providing of sufficient reward system for both staff and client, creating communication link between the various departments of the construction firm, monitoring of QM implementation in all sites of operations and so on".

From all these measures there is still need to develop a strategy for effective QM implementation in the construction process. This finding is line with of Hesham *et al.*

(2016), it was revealed in their study that firm are now put measure to ensure standard quality practices in construction process among these are allocation sufficient resources for QM are put in place, staff training and enlighten program, quality planning among others. Jimoh *et al.* (2016) also revealed in their study that most of the construction firms in Nigeria are setting measure for QM implementation among these are proper scrutiny of contractors' tender bids, provision of sufficient training for staff, proper monitoring of QM implementation in all sites of operations. sufficient motivation of workforce, efficient communication link between the various department of the construction of firm, adequate cost and time allocation for proper implementation of QM among others.

On the other hand, the findings are in contrast with of Abdullahi *et al.* (2019). The authors showed that most of the small and medium construction firm are not taking QM into consideration and their study further made us believed that a precise measure are in place.

4.5 strategies to ensure an effective Implementation of QM in the Construction Process

Table 4.7 unveils the strategies, its' order of preference as well as ranking, which expected to bring about at optimum QM implementation in constructions process.

Table 4.7 Respondent responses on strategies for an effective Implementation of QM in the Construction Process

Variables	Mean	RII	Rank
Provision of resources for quality management implementation	4.51	0.95	1st
Ensuring procedures and maintenance adopted suit to standard of quality services	4.36	0.93	2nd
Overseeing the adequate QM implementation in all sites of operations	4.31	0.91	3rd
Ensuring efficient communication link between the various department of the construction of firm	4.27	0.89	4th
Ensuring proper auditing	4.15	0.85	5th

Regular and adequate assessment of Customer requirements & satisfaction	4.09	0.82	6th
Provision of sufficient reward system for both staff and client	4.03	0.80	7th

Source: Authors' Field Survey (2020)

Table 4.7 shows the respondent response on strategies for adequate QM implementation in construction industry. These are; provision of resources for quality management implementation, ensuring procedures and maintenance adopted suit to standard of quality services, overseeing the adequate QM implementation in all sites of operations, ensuring efficient communication link between the various department of the construction of firm, ensuring proper auditing, regular and adequate assessment of Customer requirements & satisfaction and lastly provision of sufficient reward system for both staff and client with RII values of 0.95, 0.93, 0.91, 0.89, 0.85, 0.82 and 0.80 respectively, ranked 1st – 7th.

The interviewees are also on the same vein the developed strategies. The architects said: "For effective implementation QM there is need to properly address the following strategies points; provision of resources for quality management implementation, ensuring procedures and maintenance adopted suit to standard of quality services, proper check on the adequate QM implementation in all sites of operations". The Engineers were also of the view that:

"The important strategies that are expected to improve QM implementation are provision of resources for quality management implementation, ensuring procedures and maintenance adopted suit to standard of quality services, overseeing the adequate QM implementation in all sites of operations, ensuring efficient communication link between the various department of the construction of firm and proper auditing". The builder and Quantity Surveyor also share similar view in the strategies needed for effective QM implementation among construction firm, it was stated that:

"The key strategies believed to enhance effective QM implementation are availability of quality resources, overseeing the adequate QM, concrete communication link between the staff, proper auditing, assessment of Customer requirements & satisfaction". The findings are in tone with that of (Abdullahi *et al.*, 2019), it was enlisted in their study that quality management plans and quality auditing, customers and staff assessment among others will bring back QM implementation among construction firm in Nigeria. Jimoh *et al.* (2016) also support the present study on the strategies with was clear revealed in their study that top management support, adequate resources allocation, quality auditing, staff support training, better communication link and so on will bring about QMs adoption. From the result above, the following strategies display in Figure 4.1 is expected to improve effective implementation of QM in the construction process
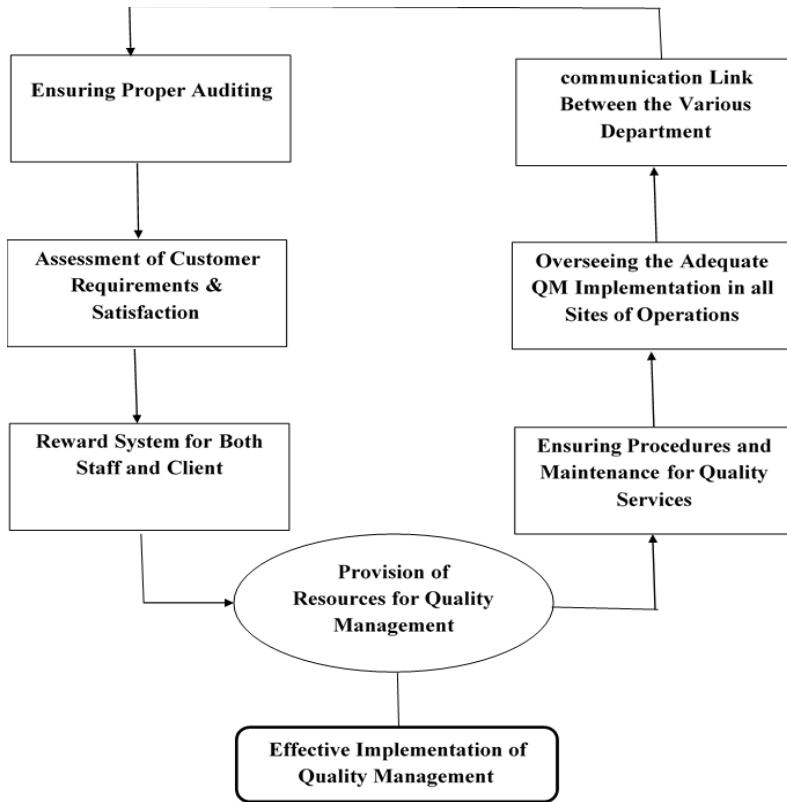
Figure 4.1: Strategies for Effective QM implementation
Source: Authors' Field Survey (2020)

4.6 Summary of Findings

The summary of the findings of the study is thereby summarized in Table 4.9.

Table 4.8 Summary of Findings

S/N	Objectives	Findings
1	Determine the Extent of QM Implemented in the Construction Sector	Extent of QM implemented in the construction sector shows average RII value 0f 0.58 indicate that there is partial implementation of QM in the overall construction process of the among small and medium construction firm in Abuja metropolis.
2	Explore the Challenges Faced in the Implementation of QM in Construction Activities.	Challenges faced in the implementation of QM in construction activities are inadequate human resources, inadequate of commitment of management toward the implementation, difficult to measure results, misinterpretation for QMs requirements amongst involved staff, inadequate quality production and support planning, lack of experience and knowledge .
3	Determine the Current Measures taken by the firms to Overcome such Challenges	Higher costs of Green building construction, ensuring proper scrutiny of contractors' tender bids, provision of sufficient training for staff, proper monitoring of QM implementation in all sites of operations. Availability of sufficient motivation of workforce, efficient communication link between the various section of the construction of firm.
4	Develop strategies to ensure an effective Implementation of QM in the Construction Process	The strategies are; provision of resources for quality management implementation, ensuring procedures and maintenance adopted suit to standard of quality services, overseeing the adequate QM implementation in all sites of operations, ensuring efficient communication link between the various department of the construction of firm, ensuring proper auditing, regular and adequate assessment of Customer requirements & satisfaction and lastly provision of sufficient reward system for both staff and client

Source: Authors' Field Survey (2020)

CHAPTER FIVE

5.0   CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the findings of the study it could be concluded that there is partial implementation of QM among construction firm during execution of projects. From findings of the study we could consider lack commitment of management toward the implementation, difficult to measure results, misinterpretation for QMs requirements amongst involved staff, inadequate quality production and support planning, lack of experience and knowledge and so on as the challenges facing QM implementation in construction processes in Nigeria. The measures set in place by most of the construction are revealed not to be effective enough to for QM implementation. Hence, the following strategies are concluded to be vital for adequate QM implementation in construction project execution, these are; provision of resources for quality management implementation, ensuring procedures and maintenance adopted suit to standard of quality services, overseeing the adequate QM implementation in all sites of operations, ensuring efficient communication link between the various department of the construction of firm, ensuring proper auditing, regular and adequate assessment of Customer requirements and satisfaction and lastly provision of sufficient reward system for both staff and client.

5.2 Recommendations

From the findings and conclusion, the study makes the following recommendations

1. Stakeholders in construction industry should be enlighten on importance of effective implementation of QM in all section of construction project execution.

2. Training and retraining of professionals and staff in the construction industries should be made available for effective implementation of QM in all section of construction project execution.

3. Adequate provision of resources should be made available for an of effective implementation of QM in all section of construction project execution.

4. Incentives packages should be made available for any construction firm with optimum and effective QM implement management practice by regulation bodies.

5. Regulation bodies should, as a matter of seriousness, withdraw the license of any construction firm that is found wanting as regards inappropriateness toward QM implementation in construction process.

5.2.1 Contribution to Knowledge

From the findings, the following are the contribution of the research to knowledge;

1. The study has contributed greatly in the field of Building as it tackles the core concept of project execution aiding decision makers and construction industry key players in ensuring that Quality Management practices are taken into consideration before project execution.

2. Agencies/Organizations/Institutions/Associations will be enlighten and guided on how to come in the picture of campaigning for effective QM implementation among construction firms in Nigeria.

3. The study has also added to the existing body of knowledge available on Quality Management practices by construction firm.

5.2.2 Suggestion for Further Studies

The study recommends the following further research;

1. The study should emphasis on main effect of inadequate QM implementation on contractor, subcontractor, and client as well quality project executed.

2. A study that will investigate into the relationship between the strategic points stated in the study to effective QM implementation.

3.   Similar study is enjoined to consider more case studies across the state in Nigeria in assessing Quality Management System in Construction firm.

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DEPARTMENT OF BUILDING

FEDERAL UNIVERSITY OF TECHNOLOGY

Topic: A FRAMEWORK FOR QUALITY MANAGEMENT
IMPLEMENTATION IN CONSTRUCTION PROJECTS

QUESTIONNAIRE

This questionnaire is designed to facilitate an ongoing data collection exercise on framework for quality management implementation in construction projects Abuja, Nigeria. Information given will be treated with utmost confidence and used strictly for academic purpose.

Thank You

ABDULRAHAMAN, Idris

MTECH/SET/2017
/6970

SECTION A: BACKGROUND INFORMATION OF RESPONDENTS

Please thick as appropriate [√]
3. Cadre

   1. Manager   ( )   2. Engineer/Builder   ( )   Commented [AB5]: Manager

4. Job tenure of the respondent

   1. Permanent ( )   2. Contract ( )   3. Casual workers ( )

5. Duration of work in the Firm

   1. 1 – 23 month ( )   2. 2-5 years ( )   3. 6-10 years ( ) 4. 11- 15 years ( )   5. > 15 years

SECTION B: FIRM PROFILE

6. For how long has this firm been in operation?...

7. How many branches does this construction firm has?...

8. What is the rank of your firm per contract size?..

9. What is the average rate of occupancy?..

SECTION C: Choose from option 5-Strongly Agree, 4 – Agree, 3-Not Sure, 2 – Disagree, 1-Strongly Disagree, to show how much you agree to the following statement.

Question One: What is your Understanding on quality management in construction process?

Variables	5	4	3	2	1
a. Quality management is about quality control of resources					
b. Quality management is the use of quality material in construction process					
c. The act of overseeing all activities and tasks needed to maintain a desired level of excellence					
d. Finally it is understood to serve as a standard against which the quality of a construction project can be measured					

Question Two: Level of Implementation of QM in the Construction process

Variables	5	4	3	2	1
a. Moderately implemented					
b. Partially implemented					
c. Fully implemented					

Question Three: Factor Affecting adequate implementation of QM in the Construction process

Variables	5	4	3	2	1
a. Commitment of management toward the implementation					
b. Inadequate quality production and support planning					
c. Poor documentation problem					
d. Difficult to measure results					
e. Insufficient motivation of workforce					
f. Problem in controlling subcontractors					
g. Inadequate human resources					
h. Lack of experience and knowledge					
i. Various cultures of workforce					
j. Reluctant staff to accept quality systems					

Question Three: Strategies for effective Implementation of Quality Management in Construction process

Variables	5	4	3	2	1
a. Adequate resources for quality management implementation					
b. Ensure all procedures and maintenance adopted suit to standard of quality services					
c. Provision of sufficient reward system for both staff and client					
d. Oversees of QM implementation in all sites of operations					
e. Regular and adequate assessment of Customer requirements & satisfaction					

f. Regular and adequate assessment of Customer requirements & satisfaction					
g. Adequate cost and time should allocated for proper implementation of QM					
h. Ensuring proper scrutiny of contractors' tender bids					
i. Provision of sufficient training for staff					

APPENDIX II69

INTERVIEW GUIDE

1. What do u understand on

QM?...

…………………………………………………………………………………………

………..

2. Do you make use of it in your

firm?..

3. What are the various QM practices that you applied in construction projects?

a)……………………………………………………………………………

b)…………………………………….……………………………………

c)……………………………………………………………………………

d)……………………………………….……………………………………

e)……………………………………………………………………………

4.   Which aspect of work do you normally use them?

a)...

....

5. How often do you apply them and for how long?...

6. What are the issues experienced by your firm in their implementation?

a)…………………………………………………………………………….

b)……………………………………………………………………………

c)…………………………………………………………………………….

d)……………………………………………………………………………

e)…………………………………………………………………………….

7. How often do u normally experience them?..

8. Is your firm management aware of the identified challenges?.....................................

9. What are the measures taken by ur firm management to overcome the challenges?

a)…………………………………………………………………………….

b)……………………………………………………………………………

c)…………………………………………………………………………….

d)……………………………………………………………………………

e)…………………………………………………………………………….

10. What are the weaknesses of the measures taken by your firm management?

a)…………………………………………………………………………….

b)……………………………………………………………………………

c)…………………………………………………………………………….

d)……………………………………………………………………………

e)…………………………………………………………………………….

11. How do you think the weaknesses can be overcome for effective implementation of QM in your firm?...

12. Which better strategy do u think can be adopted for its effective implementation in projects.

a)…………………………………………………………………………

b)…………………………………….……………………………………

c)………………………………………………………………………….

d)…………………………………….……………………………………

e)…………………………………………………………………………

APPPENDIX III

CRONBACH'S ALPHA TEST FOR RELIABILITY

Reliability: OBJECTIVE 1 - DETERMINE THE EXTENT OF QM IMPLEMENTED IN THE CONSTRUCTION SECTOR

Case Processing Summary

		N	%
Cases	Valid	157	100.0
	Excluded[a]	0	.0
	Total	157	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.822	12

OBJECTIVE 1I - CHALLENGES FACED IN THE IMPLEMENTATION OF QM IN CONSTRUCTION ACTIVITIES.

Case Processing Summary

		N	%	Reliability Statistics	
Cases	Valid	157	100.0	Cronbach's Alpha	N of Items
	Excluded[a]	0	.0	.784	12
	Total	157	100.0		

a. Listwise deletion based on all variables in the procedure.

Reliability: OBJECTIVE III- CURRENT MEASURES TAKEN BY THE FIRMS TO OVERCOME SUCH CHALLENGES

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	157	100.0
	Excluded[a]	0	.0
	Total	157	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.813	10

Reliability: OBJECTIVE IV -:STRATEGIES TO ENSURE AN EFFECTIVE IMPLEMENTATION OF QM IN THE CONSTRUCTION PROCESS

Case Processing Summary

		N	%	**Reliability Statistics**	
Cases	Valid	157	100.0	Cronbach's Alpha	N of Items
	Excludedᵃ	0	.0	.861	7
	Total	157	100.0		

. Listwise deletion based on all variables in the procedure.