

**CONSTRUCTION CRAFTSMEN'S AVAILABILITY  
AND PROJECT PERFORMANCE IN SELECTED  
SOUTHWESTERN STATES, NIGERIA**

***BY***

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## **DECLARATION**

I, Asiyanbola Olatomide David, declare that this research work is done by me under the careful supervision of Professor O.I. Fagbenle. This research project has not been presented for any degree elsewhere

All references are duly cited and acknowledged appropriately

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.....

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## CERTIFICATION

I hereby certify that this study was carried out by Asiyanbola Olatomide David (16PCB01330) in partial fulfillment of the requirements for the award of a Master of Science degree in Construction Management from the Department of Building, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria.

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## **DEDICATION**

This work is dedicated to the almighty God for his faithfulness and overwhelming grace upon me to do exploits.

## ACKNOWLEDGEMENT

I want to use this medium to appreciate the wonderful people God used in helping me fulfill this study as a requirement as well as during the course of the main program itself.

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## ABSTRACT

Construction activity plays a vital role economic growth and development of any nation by creating employment opportunities as well as housing for habitation or for conducting other business activities. The construction industry is labour intensive and the efforts of its craftsmen towards an efficient performance cannot be overemphasized. Studies in the past have established the shortage of craftsmen in the industry and lack of adequate resources is said to have compounded performance problem in the Nigerian construction industry. This study therefore investigates the availability of construction craftsmen with a view to examining its effects on construction project performance in the Nigerian construction industry by identifying the construction crafts skill categories common to the Nigerian building industry, examining the patterns of demand for building construction craftsmen, investigating the existence of shortage of skilled construction craftsmen and examining the possible effects of construction craftsmen's availability on construction project performance. The survey study utilized both secondary data from past works and primary data sourced by administering a structured questionnaire to construction professionals of indigenous construction firms located across Oyo, Ogun and Lagos state. A total of 278 questionnaires were distributed in strata and (211) copies of questionnaires in total were filled and returned representing a 75.9% return rate across the three (3) states. The breakdown across the three states showing the numbers of questionnaire distributed and (the quantity filled out) presents; 137(88), 73(65), 68(58) in Lagos, Oyo and Ogun state respectively. A five point likert scale was used to rank factors and collected data were analyzed using Relative Importance Index (RII). The results showed that Plastering/Rendering, masonry, painting, and welding/Iron bending, are the common crafts trade in the Nigerian building construction industry. Results also established series of demand pattern for building craftsmen. In corroboration to previous studies, this study confirmed that shortage of building construction craftsmen still exists, but on a contrary to previous studies about its severity, the shortage is presented to be less severe. The study also established a directly proportional relationship between the availability of building construction craftsmen and building construction project performance indicators of time, cost, quality and productivity.

**Key Words:** Building Construction, Craftsmen, Project Performance.

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 BACKGROUND OF THE STUDY**

It is common knowledge that construction activities and its products such as building structures and other infrastructures are important to the economic development of any nation. The industry provides diverse employment opportunities during and after construction process (Jha, 2002). Due to the industry-relative large investment requirement, construction is viewed as a convenient tool for regulating the economy in most countries (Ojo & Dada, 2005). The construction industry occupies an important role in the economic development of any nation. A nation's economic growth rate is sometimes rated by the amount of physical infrastructures available in such nation. Those infrastructures include roads, buildings, bridges and so on. Moreover, different stages, numerous phases, diverse processes, different professionals and a lot of individual effort are engaged and involved in successfully executing a construction project.

The amount of labour engaged in the construction industry is high, making the industry labour intensive. This intensiveness of labour is exaggerated in developing countries, though in developed countries where mechanization is widely embraced and less labour is required, there is still a need for competent and skilled operatives for efficiency. Labour is essential for effective execution of processes in the construction industry irrespective of several technological developments. So it can be generalized that the construction industry is labour intensive. Quite a large percentage of the total construction cost is spent on labour, ranging between 30 – 50%. The work done by construction labour determines the quality of the project; same also is the productivity as labour's productivity is directly proportional to the productivity of the project. Skilled labor deficiency could be a worldwide problem

influencing construction sectors in many nations and the impact is obvious within the Nigerian construction industry

Although, Nigeria is endowed with substantial manpower, authors however presented the situation in the country's construction industry as banter, which is an ironic remark. Fagbenle *et al.*, (2004) confirmed that the sector higher the largest number of labour in the country, which is only rivaled by the agricultural sector. This aside, the construction sector is still confirmed to be facing labour shortages affecting project performance, (Ruchi, 2012; Kuroshi & Lawal, 2014; Durdyev and Mbachu, 2011).

According to Odediran & Babalola (2013), the sort of labour required in massive construction projects worldwide are craftsmen and labour. The importance of experienced, efficient and skilled man power cannot be overemphasized in order for efficient economic impact of the construction industry. Lerman (2013) additionally contributed that skills set is very important for a highly productive performance.

Construction project Performance explains whether a certain construction task is succeeding or failing as well as considered a success or has failed based on certain set objectives for the project. This means that a project performance illustrate whether an on-going project is progressing as planned or not or if it meets the objectives for which they are being implemented. The subject of project performance in the construction sector is to be a big issue to different countries at different socio-economic development levels bringing about the need to boost performance in their various construction sectors (Ofori, 2000; Beatham *et al.*, 2004). The construction industry is a labour driven sector, requiring the input of various skilled craftsmen. Despite the mechanization of site operations and advancement in construction technology, the continuous availability of competent and skilled craftsmen is inevitable to project performance. Construction craftsmen are major assets of construction firms.

Construction firms are expected to maintain and continuously train these artisans for improved performance. Poor project performance in the Nigerian construction industry can be attributed to the availability, skill level and quality of indigenous craftsmen.

According to Datong (2007), craftsmen in the construction industry are the work forces that skilfully contribute manually with their hands in practically actualizing the blue-print of a construction project. The Nigerian construction industry requires the services of competent craftsmen to provide qualitative construction product. These craftsmen who carry out various trade activities include carpenters/joiners, masons, plumbers and electricians, iron mongers, painters, tilers (Dantong, Lekjeb & Dassah, 2011). With increased output predicted for the Nigerian construction industry in subsequent years, the question is whether the construction industry has a competent workforce to meet its rising skills demand for construction works and services. Nigeria has the fifth largest infrastructural stock in Africa, the average growth rate of capital stock has been at about 12% per annum since year 2000 (World Bank, 2012). However, the infrastructural deficit cuts per capita growth rate by 2% annually. In Nigeria, the Gross Capital Formation (GCF) in 2010 was N204,665.57 and declined by 8.91% in 2011 to N186,439.63 million and further declined to N121,900.86 million in 2012 (National Bureau of Statistics, 2015). Consequently, the demand profile presented by the infrastructural stock in Nigeria creates not just an important construction sector but also, an attractive construction sector. Although, World Bank (2012) argued that due to lack of scale economies and limited competition in Africa, infrastructure services cost twice as much as in other developing economies. The anticipated growth of the construction industry between 2013 and 2015 (CIOB, 2013) and the increasing demand for structures that require technologically advanced methods in their procurement presents major concerns for the competitiveness and growth of the industry. The capacity for skilled workers to provide efficient services to the construction industry is further threatened by looming skills shortages affecting the

productivity of construction companies (CITB, 2011). Erkelens and Van Egmond (2007) identified factors contributing to the skill needs of the construction industry among which are low compensations, low interest of youths in taking up construction trades, poor supervisor/artisan relationship, and technological advancement. Some other factors which add to skill shortages in the Nigerian construction industry include poor public perception of construction artisanship and high cost of training and poor support from the government. The present situation of the construction sector in Nigeria witnesses the migration of skilled construction craftsmen from neighbouring West African countries and beyond to provide services to the Nigerian construction industry. It becomes necessary that research probes into the causes of skill shortages despite the high population of unemployed youths in Nigeria and the high demand for construction services.

The success of construction projects depend on some project parameters, one of which is good workmanship. The construction firms in Nigeria exist as small, medium and large organisations. All the various categories construction firms are involved in housing production and therefore need competent craftsmen or operatives for successful project performance.

## **1.2 STATEMENT OF PROBLEM**

Quite a lot of construction projects in the country fail as a result of non-availability of construction craftsmen or poor skill amongst the ones that are available. Financial profits have been the focus of most construction firms neglecting the people that execute the construction work. Datong (2007) identified the problem of the construction sector as the issue of harmonizing the need for providing labour that is adept in being productive in executing the simplified step by step operations and also conserving their numbers that are able to execute highly skilled work. To effectively service the Nigerian economy, the sector must ensure to always employ the services of competent, credible, and skilled craftsmen.



According to Eneh (2010), there has been quite a number of issues affecting the availability of construction craftsmen; some of the thing he drew our attention to was the decrease in technical training in different construction crafts trades. He confirmed that the existing craftsmen are rapidly aging and the problem of posterity already exists as younger ones are not taking control. The construction sector just like other industrial development sectors are experiencing shortage in terms of man power and invariably posing economic risks. (COOA, 2005; Connor, 2006; McCausland, 2006).

For an effective construction project performance, in a field that is labour intensive, the availability of the construction craftsmen if an important factor, and with the continuous reduction in the availability of these craftsmen, let alone the very skilled ones, there is set to be a continuous dip in construction project performance in the country.

### **1.3 RESEARCH QUESTIONS**

In relation to the aim and objectives of this study, the ensuing research questions were formulated for the purpose of proper analysis and proffering solution to the research problem.

- What are the constructions crafts skill categories common to the Nigerian building industry and their pattern of demands in south-western Nigeria?
- Does the shortage of skilled construction craftsmen really exist and to what extent?
- What effects does construction craftsmen availability have on construction project performance?

### **1.4 AIM AND OBJECTIVES**

This study attempts to investigate the availability of construction craftsmen with a view to examining its effects on construction project performance in the Nigerian construction industry.

To achieve the aim of this study, the following objectives were formulated:

- To identify the construction crafts skill categories common to the Nigerian building industry and to also examine their pattern of demands.
- To investigate the existence of shortage of skilled construction craftsmen and the severity of such shortages in the study area.
- To examine the effects of construction craftsmen's availability on construction project performance.

## **1.5 JUSTIFICATION OF STUDY**

Decline in the number of craftsmen over the years is a worrisome phenomenon. The Nigerian Bureau of Statistics (2015) posited that over six million people have been employed annually in the formal sector of the Nigerian construction industry between years 2010 and 2012. Over 2% of construction workers in the formal sector are foreigners. Although the captured data did not present an overview of skilled trade occupation or construction craftsmen population in the formal sector, this makes it difficult to deduce sufficient information on the demography of craftsmen in the Nigerian construction industry. The informal sector of the Nigerian construction industry also participates in providing substantial volume of construction product.

With the construction industry a labour intensive industry, it is evident that labour is supposed to be an important factor to be considered for the success of any project, that is, a project performance. Although a few literatures have been written on the availability and the skill sets of construction craftsmen but the problem is said to still be lingering. How the availability of these construction craftsmen affects the performance of construction project is yet to be seen, hence the justification of this research survey.

This study therefore attempts to investigate the existence of construction craftsmen on building sites and how their availability or non-availability affects the performance of a construction project in the Nigerian construction industry.

## **1.6 RESEARCH METHODOLOGY**

This study adopted a survey research method and it is quantitative in nature as data that was utilized for this research work was sourced by using structured questionnaire. Structured questionnaires were self-administered by hand as well as electronically through the internet to construction professionals from selected construction companies located across Nigerian south-western states. Also, the research adopted purposive and stratified random sampling techniques for the choice of individual selected for the questionnaires distribution. The target population comprised of construction professionals and contractors working as top management staff of selected construction firms operating across south-west Nigeria.

Data obtained from the different sources was analysed using: using simple statistical tools such as mean item score, percentage and frequency for better presentation of result. However, the data analysis was aided by a computer based software package - SPSS Statistic.

## **1.7 SCOPE AND DELIMITATION OF THE STUDY**

This study like any other was limited in its conduct, scope and boundaries. This study surveys the availability of craftsmen in the building construction industry and investigates how it affects construction project performance in Nigeria. The study was narrowed down to the list of common crafts available in the Nigerian building construction industry. A reasonable section of the country posed as the study site; this will be the south-western part of the country. The choice was made with the understanding that it harbours more workers in the construction industry, these includes both skilled and unskilled. Therefore for the purpose of

sampling, the site would be limited to three (3) south-western states out of the six (6) available in the region. Selected states would include Lagos State, Oyo State, and Ogun State. The choice is due to the sheer volume of construction projects in the region. The respondents therefore were drawn from all the randomly selected indigenous construction companies located across the study area, the respondents were construction practitioners involved in the management process such as projects managers, site managers and contractors, gotten by purposive sampling technique to select the respondent that can divulge the best information as pertaining to the objective of the study.

## **1.8 DEFINITION OF TERMS**

**Building Construction Craftsmen:** these are artisans, or skilled manual construction workers who makes or creates things by hand that may be functional or strictly decorative components of a building. Examples include; bricklayers, plumbers, carpenters, tilers etc to mention a few

**Availability:** according to the English dictionary refers to the ease of access of a resources or how readily such resources can be gotten

**Construction Project Performance:** windapo & Martins, 2008, described construction project performance as the ability of a project to be delivered at the right time, cost, and quality as well as achieving a high level of client satisfaction.

**Construction Industry:** the construction industry in this context would be limited to the building construction industry which is usually further divided into residential and non-residential (commercial/institutional).

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 PREAMBLE**

The ample importance of labour or manpower in the construction industry cannot be overemphasized; this is why numerous construction labour related studies have been carried out to harness its effectiveness. Some of these studies involved discovering effective methods of labour management and effective management techniques to achieve greater success in the construction process. Labour in the building construction industry could be categorized as skilled and manual labour. Craftsmen also known as artisans are skilled labour, are therefore the major employee of the construction industry since most of the work are done manually by hand. The availability of construction craftsmen is considered a very critical factor for effectiveness and construction output productivity. Project performance is the measure of the ability of a project to be delivered at the right time, cost, and quality as well as achieving a high level of client satisfaction. Management of labour has been a very useful means employed by project managers in managing construction projects. Effective, productive and efficient use of labour should however be the driving force for a good construction project management for a successful performance.

Studies in the past have confirmed shortage of construction craftsmen while some have investigated the causes of the shortage. Later studies have investigated the existence of shortage and how to buffer the effects. Due to improvements in technology, hence the need to investigate news skill craft categories and the common ones, the lingering shortage prompts continuous investigation and how contractors and project managers have been ensuring a positive construction project performance amidst availability or non availability of construction craftsmen.

The review of literature is of crucial importance to this study; this chapter includes a review of past works or studies on the chosen subject, pointing to the knowledge gap as well as justifying this study. It also includes concise explanations of the variables, constructs and concepts related to the subject of study.

## **2.2 PREVIOUS STUDIES**

Nasiru I. M. *et al.*, (2011) published an article in The IUP journal of infrastructure. The research was aimed at examining the availability as well as the quality of some crafts skill in the Nigerian construction industry. The study was a pilot survey research study that examined the view of construction consultants and contractors on research issue. The perception of the contractors and consultants was gotten by means of a structured questionnaire. The findings from that study revealed that 91.77% of the respondents agreed to the existence of skilled craftsmen shortage in the Nigerian construction industry, with 50.6% of them describing the existence of the shortage as fairly severe, with 31.8% describing it as severe. The result however corroborated the assertions made by Obiegbu (2002) and Njoku (2007) that shortage of skilled craftsmen exist in the Nigerian construction industry. Nasiru I. M. *et al.*, (2011) however believed that the shortage has a negative impact on the quality of work in the Nigerian building construction industry, although no light was shed as to how it affects the quality of work as this wasn't covered in the research study. According to the results of the study, tilers, interior decorators, glaziers and electricians were perceived as the most affected trades in terms of availability in the industry, while painters, welders, plasterers and masons were adjudged to be relatively available compared to the other trades. Even is such trades were available, their skill rating was adjudged to be poor mainly due to inappropriate/poor training and therefore, require closer and constant supervision with its attendant cost implications. The study however concluded by affirming that the issue of crafts-skill shortage is a challenge in the construction sector requiring concerted efforts from all stakeholders

which includes continuous study to review the availability of skilled craftsmen in the Nigerian building Construction industry.

In a publication made in the journal of Environment and Earth Science, Ade Abdulquadri B., *et al.*, (2015) published an article titled “Review of Shortage of skilled Craftsmen in small and medium Construction Firms in Nigeria”. The aim of the study was to carry out a detailed review of archival documents i.e. a study utilizing secondary data sources aimed at examining the shortage of skilled craftsmen in the construction industry, particularly in small and medium construction firms in Nigeria. According to the studies from reviewing past literature, different variables that are related to the skilled craftsmen which could as well aid the growth of small and medium scale construction firms were highlighted. Some of those variables that were highlighted include; the possession of the ability of skilled craftsmen to avoid rework as a result of bad craftsmanship, which may as well results into cost overrun and late project delivery. Another thing is that skilled craftsmen increase productivity in the construction industry and lastly, the effects of engaging skilled craftsmen on cost reduction and timely project delivery enables a lot of contractors to engage their services.

These studies also presented some of the reasons for shortages of building construction craftsmen which were highlighted as; reduction in the amount of new entrants coupled with the aging of the skilled craftsmen in the sector, low funding of training in construction craftsmanship in the country. Other reasons identified includes government and the industry showing little or no commitment towards skill training, the poor perception of the public towards construction labour as engaged by less privileged or less intelligent individuals, another is the innovation and introduction of new technologies such as materials, machinery and methodology compelling improved skills from craftsmen (Darren et al., 2012; Bokinni, 2005).

That study however pointed out the possible implications of having shortage of craftsmen on productivity cost, time, quality, which are all key project performance and project success indicators. Those implications which are interrelated as pointed out by the study are; poor workmanship which may lead to rework and rework leading to cost overrun and time overrun. The various concept of skill shortage in the construction industry as presented by this study doesn't present the shortage of workers but of skilled, well trained and efficient workers accessible for construction projects. So much emphasis was laid on improving training methods to boost the numbers of skilled craftsmen available in the field.

Takim and Akintoye (2002), in a publication on "Performance Indicators for Successful Construction Project Performance", a literature – review based study, highlighted three (3) phases of evolution in which project performance can be measured. The phases identified included; the project procurement phase, the process phase and the completion phase. The report cited Cooke-Davies (2002) explaining that performance predicts success and success factors affects performance, however highlighting the importance of the stakeholders in relation to the construction project performance. The paper also highlighted that performance can be seen in perspective of the key players involved in a building construction project as they possess different interest, so what one may see as successful, may not be to the other. It went further highlighting manpower and technical abilities amongst others as a performance indicator under the procurement phase and craftsmen performance standard and efficiency under the project phase for contractors. The paper cited the UK working group on Key Performance Indicator (KPIs) who identified the major parameters for benchmarking projects, in order to achieve a good performance as; construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service.



With several studies in the past claiming an existence of shortage of craftsmen in the construction industry, Ayegba & Adakole (2014), gave an insight on construction craftsmen turnover in the construction industry in a publication titled; “Assessment of Craftsmen Turnover in the Construction industry”. Reib (2008) defined craftsmen turnover as the degree of replacement of craftsmen within and outside the organization, while Sigma (2005), explained that employee turnover is the most difficult challenge faced by an organization and that the causes of employee turnover is beyond the control of the employing organization. The study stated the significance of understanding the problems associated with craftsmen turnover as well as measuring their factors towards the success of the construction industry. The main objectives of the paper were to determine the factors responsible for craftsmen turnover, to determine the effects of craftsmen turnover on contractors’ performance and also to proffer solutions in tackling the challenges of craftsmen turnover in the Nigerian construction industry. The study utilized quantitative research design with the use of questionnaire and oral interview to seek information from respondents. The population for the study was the craftsmen in the construction industry. However the study was restricted to Ilokoja, the Kogi state capital. The result of the study showed that poor remuneration, unfair treatment of the workers with no promotion or advancement opportunities were the major reasons identified for turnover of construction craftsmen, the paper also identified differences in religion and tribes and cultural diversity as other factors causing turnover.

The study observed that craftsmen turnover has both direct cost and indirect cost effect on the performance of construction companies. Cost of hiring new employees, training of new workers and replacing old workers was shown to be the main direct cost effect on the performance of a contractor while indirect cost such as Project overtime, additional workload on remaining workers and reduction of project performance are the main effect of indirect cost. The study also showed that the problem of craftsmen turnover can be reduced by paying

competitive compensation and benefit packages, fair treatment of workers and reward for dedicated workers are some of the best ways of reducing turnover while fairness, equal opportunity and respect for all and conducive workplace and cultural relation balance are ways of reducing turnover resulting from the cultural diversity of workers. The study also identified that motivation of craftsmen by increasing wages and salaries, promoting committed workers and training of craftsmen can be used to reduce the effect of craftsmen turnover.

### **2.3 BUILDING CONSTRUCTION CRAFTS AND CATEGORIES**

According to Pao-Chi Chang & Alfred Swenson (2017), building construction is an ancient human activity which began with the pure functional need for a controlled environment to moderate the effect of the climate. They further explained that constructed shelters were one means by which humans were able to adapt themselves to a wide variety of climates in becoming global species. They described the first human shelters as simple as it only took few days to erect, which then evolved over time as more durable structures began to appear particularly after the advent of agriculture when humans were staying in one place for longer periods. They described the first form of shelter as dwellings, which later evolved into other forms and usage as in the use for the storage of food and ceremony.

Building in time past is characterized by different trends, they include; the improvement on the materials used for building construction as there are more durable materials now like, stones, wood or timber, clay etc. compared to the perishable ones in the past such as hides, branches and leaves. Materials such as stones, wood or timber, clay eventually evolved into the use of composite materials like bricks, plastics as well as metals. Another trend brought about the quest for building structures to have greater heights and larger spans, hence the development of stronger materials as well as knowledge of how materials behave in order to

exploit them to greater advantage. While the third major trend involves the degree of control exercised over the interior environment of buildings, which includes; air regulation, temperature regulation, light and speed levels, humidity, and other factors that affect human comfort as much as possible. The change in energy available to the construction process is yet another trend as construction process has evolved from human muscle power to powerful machinery used today. The present state of building construction is complex as there is a wide range of building product and systems which are aimed at groups of building types and markets. The design processes for buildings are highly organized as in involves the manufacturers of building products and systems, the craftsmen who assemble them on the building site, the contractors who employ and coordinate the work of the craftsmen.

Max J.E. & David M.M. (2002), defined a building as an edifice and as a structure with a roof and walls standing more or less permanently in one place, such as house of factory. Buildings come in a variety of sizes, shapes and functions and have been adapted throughout history for a wide number of factor ranging from the type of building materials available, condition of the weather, prices of land, ground conditions, and specific uses and aesthetic reasons. However irrespective of the function, size, type of materials used, and type of a biding, every building system can be categorized into various common elements and components. Building components are generally classified into substructure, that is, the part of the building that is constructed below the ground level and the super structure; part of the building structure constructed above the ground level. Those components include the foundation, walls, columns, beams, slabs, stairs, and roof. Building components are more of structural than functional, as they give the building structure its shape and its strength. As for building elements, they are the more functional parts of a building as they help the building structure to be able to meet its functional requirement. They include doors, windows, installations, finishes etc.

A building being a complex structure, which is then categorized into components and elements means a lot of aggregation needs to be done to complete a unit structure. This aggregation is completed by division of work. Division of work refers to the division of a large task, contract, or project into smaller tasks and different or separate schedule all within the overall project schedule. These smaller tasks present different crafts available in a building construction process. Merriam Webster dictionary described craft as a trade or occupation that requires manual dexterity. According to NIOB (2005), in a Nigerian building craftsmen summit, classified building construction crafts men into three categories, namely; structural crafts consisting of masons, carpenters steel fixers and metal fabricators; finishing craftsmen which consists plasterers, tilers, glazers, painters and so on. The last category been services craftsmen and examples are electricians and plumbers. Therefore, crafts related to building construction can be categorized based on the sub-divisions of building components and building elements. The various crafts in building construction will be categorized under the following; building structure, building services, building fittings and building finishes. These categorizations are further explained in the following sub headings.

### **2.3.1 Building Construction Crafts under Building structure**

A structure is a group of element united to support a load with stability. All building structures therefore must be able to withstand the forces and loads for which they are designed. Some building structures are designed to be rigid while some are designed to be flexible to be able to withstand dynamic forces. The various elements of a building structure include building foundation, external walls, columns, beams, floors, and roof, although these components can be constructed using different materials. The various trade crafts available under this category, irrespective of the type of materials used are;

- **Masonry:** is the building of structures (walls, columns, beams, floors) from individual units, these units are then laid in and bound together by mortar. Masonry construction can be done with materials such as bricks, sandcrete blocks, concrete blocks, glass blocks and building stones like granite, marble, cast stone etc. Masonry also involves concrete finishing, that is, the placement, finishing, protecting and repairing of concrete in construction projects (Richard T.K., 2003).
- **Carpentry:** is a skilled craft and trade of cutting, working, joining timber as well as its installation during a building construction as well as concrete formwork. In times past, when buildings were wholly constructed with timber framing, timber served as major structural member (Encyclopedia Britannica, 2015). Carpentry involves working with natural woods for framing, however other processed wooden materials are now been used (Roza & Greg, 2011) and sometimes, finer trades of furniture building and cabinet making are considered as carpentry.
- **Welding and Steel Bending:** welding is a technique involved in joining metallic parts usually through the application of heat. This technique was discovered during efforts to manipulate iron into useful shapes. Steel bending is the process of arching ductile steel stirrups into required shapes for the purpose of proper reinforcement in reinforced concretes. Building construction most times involve the use of reinforcement bars in reinforced concrete for structural members and structural steel sections when building steel structures
- **Scaffolding:** is erecting a temporary structure to support a work crew as well as materials to aid in construction, maintenance and repair of buildings. Scaffolds are used on sites to help workers get access to heights and areas that would be otherwise hard to get to.

- **Roofing:** a roof is a part of a building envelope, and it is the uppermost part of a super-structure or referred to as the covering of a building or shelter serving to protect against snow, rain, sunlight, wind and extremes of temperature. The term roof however encompasses the structure which supports the covering and the covering material (Whitney *et al.*, 1901). Roofs are constructed in a wide range of forms, they include; flat, pitched, domed etc. as dictated by technical, economic or aesthetic considerations.

### 2.3.2 Building Construction Crafts under Building Fittings

Building fitting here refers to building installations that is bolted to the wall or to the floor. It however excludes loose furniture and furnishings. These installations elements combine aesthetics and functionality. These fittings include doors, windows, shelves, counters or worktops, wardrobes, cupboards, kitchen units etc. the trades associated to these fitting are:

- **Unit installations:** the fittings described above are manufactured in modules by the manufacturer off site and brought to site for installation. These installations however require expertise as is important for which ever unit is been installed, therefore making the installation process a trade or craft that is sort after.
- **Glazing:** includes the installation as well as repair of all types of glass and like materials, including aluminum and metal framing, casement windows, sliding or glass doors, sliding windows, storefronts, shower cubicles, mirrors and other glass installations in residential and commercial buildings.
- **Carpentry.**

### 2.3.3 Building Construction Crafts under Building Services

The term building services refers to the systems put together in a building space ensuring comfortability, efficiency and safety. Those services includes energy (electricity, gas, and

renewable sources such as solar, wind etc.) supply and distribution within the building, lighting systems, Heating, Ventilation and Air Conditioning (HVAC) systems, water supply, drainage and plumbing systems and fire safety (detection and protection) to mention the common ones. The trades associated with building services include:

- **Plumbing:** Muscroft Steve (2007) described plumbing as any system that conveys fluids for a wide range of applications with the use of pipes, valves, tanks plumbing fixtures and other apertures and apparatuses to convey fluids. The common ranges of applications are waste removal, portable water supply as well as heating and cooling (HVAC) systems. However, it is not limited to these applications (Blankenbaker E.K., 2015).
- **Electrical installation:** this deals with the assembly of associated electrical wiring and equipment for the purpose of distribution and utilization of electrical energy. Electrical installation involves safe and efficient assemblage and putting in place of cables, distribution boards, switches, sockets, lighting units for proper utilization of electricity energy in a building structure.
- **Mechanical installations:** has to do with any building services using machine, such as pumps in plumbing, elevators, escalators as well as heating, and air conditioning systems.
  - **Heating:** heating in building may be necessary to create comfortable condition for occupants in extremely cold regions, to prevent condensation, for activities such as drying and cooking as well as for industrial processes. The processes involve generation of heat and distribution and control as the purpose requires.
  - **Air conditioning:** this is the process of removing heat from the interior of an occupied space, so as to improve the comfort of the occupants. Air conditioning can be used in both domestic as well as commercial environments as it ensures

dehumidification of spaces filled with heat producing machines or electronic devices. This is however achieved by the installation of electric refrigerant-based air conditioning units.

- **Elevators and Escalators installation:** in the light of improving comfort within building structures, the invention of escalators and elevators came to pass for easy conveyance of people and freight from one floor level to another in multistory buildings. An escalator is a type of vertical transportation in form of a moving staircase which carries people between floors of a building. Escalators consists motor-driven chain of individually linked steps on a track which cycle on a pair of tracks that keeps them horizontal. While on the other hand, an elevator is also known as a lift, a car that moves in a vertical shaft to carry passengers or freight between floor levels of a multistory building and is propelled by electric motors, with the aid of a counterweight through a system of cables and pulleys. (Encyclopedia Britannica, 2013)
  
- **Insulation:** Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems, for instance, tanks, boilers, turbines, pumps, pipes, valves and other structure including HVAC systems to reduce heat loss of absorption, prevent moisture condensation and protect insulation material or reduce sound levels.

#### **2.3.4 Building Construction Crafts under Building Finishes**

Building finishes refers to a group of construction operations relating to the interior and exterior finish of building structures to enhance their services and aesthetic qualities. Finishing works are done in the concluding stage of a building construction process, (The



Great Soviet Encyclopedia). There are wide ranges of material that are used for building finishes. Some of the trades and crafts associated with building finishes are listed thus;

- **Plastering and Rendering:** these terms refer to the finishing done to the surface of a block work, brickwork, concrete work as well as stone work. The process involves application of a moderately wet mix sand, cement and admixture where necessary to the required surface and left to dry. However, based on the look required, plastering and rendering can be fine or coarse, natural or coloured, textured or smooth, pigmented or painted. Rendering is the term given when it is done on the external wall while it is called plastering for interior sides of walls. Rendering however requires a richer mortar mix.
- **Painting:** paint is the general term used for liquid that is used to add colour to the surface of an objects by covering it with a pigmented coating. The process of doing this is painting. The trade involves applying different types of materials to coat a surface, materials like paints, lacquer, varnish, shellac and epoxy resin on all types of construction surfaces. Included in this trade is sandblasting and surface preparation prior to painting. The purposes of painting in building construction are quite numerous, they include; increasing the visual appeal of building surfaces, to protect surfaces against weathering impact, increasing surface durability, and making surfaces water-proof. In buildings however, painting can be done on the interior walls and ceiling, exterior wall surfaces, wooden surfaces and on metals.
- **Ceiling:** is an overhead interior surface that covers the upper limits of a room. It is a finished surface that conceals the underside of the roof structure or the floor of a storey above. Ceiling can be finished with diverse range of materials as well as art works. Ceiling however also refer to the term given to the process of concealing the underside of a roof and in some cases service pipes to give the building interior a befitting look.

- **Tiling:** a tile is a manufactured piece of hard-wearing material that ranges from ceramic, stone, metal and the use of glass for covering floors, walls, roofs, showers, or other object in a building such as tabletops. Tiles can as well refer to similar units made from lightweight materials such as wood, Polyvinyl Chloride used for wall and ceiling finishing. Tiling therefore is the trade of fixing and placing tiles on whatever required surface. Tiles are often used to form wall and floor coverings and can range from simple tiles to complex mosaics. Tiles are most often made of ceramic, typically glazed for internal uses and unglazed for roofing, other material can as well be used as earlier stated.
- **Flooring:** this refers to the term used for a permanent covering of a floor, also refers to the process of installing such floor covering. A floor covering is therefore any finish material applied over a floor structure to provide a smooth and aesthetic walking surface, whether interior or exterior. Different materials can be used for floor finishing and they may include: carpets, laminates, Polyvinyl Chloride tiles, ceramic tiles. Flooring also can be hard flooring, i.e. with the use of concrete, cement and natural stones products like slate, marble, granites as well as stone aggregates like terrazzo. The surface of concrete can be polished with cement paste or stamped to give it a surface finish.

## 2.4 BUILDING CONSTRUCTION CRAFTSMEN

Nigerian Institute of Building (NIOB) (2005), in a Nigerian Craftsmen Summit publication, defined a craftsman as one who has acquired the skill in one or more trades and certified by a master craftsman after a period of supervised training and therefore has the potential to work on a construction project. Ubenyi (1999) described construction craftsmen as trained and skilled operatives or workers who work manually with great expertise at various stages of a construction work. Building construction craftsmen therefore play an important role in the practical actualization of every building construction projects as they are engaged from start

to finish of such projects. While according to Datong (2006), construction craftsmen are described as lower level technical cadre of manpower, he further explained that their qualification ranges from apprenticeship certificate, that is, formally trained to other forms of formal trade certificates which are all below the national diploma cadre. However, people from different educational backgrounds can learn any building construction craft trade, as well as people without any prior educational background. Although some of these crafts trades require short periods of training and others may require more time to develop and master (ETA, 2004). These crafts can be learned on-the-job, through training programs, and through apprenticeship. Other alternative involves attending technical schools or other educational institution where formal classes and hands on training are combined (ETA, 2004).

**Table 2.1 The lists of common craftsmen in the Nigerian building industry**

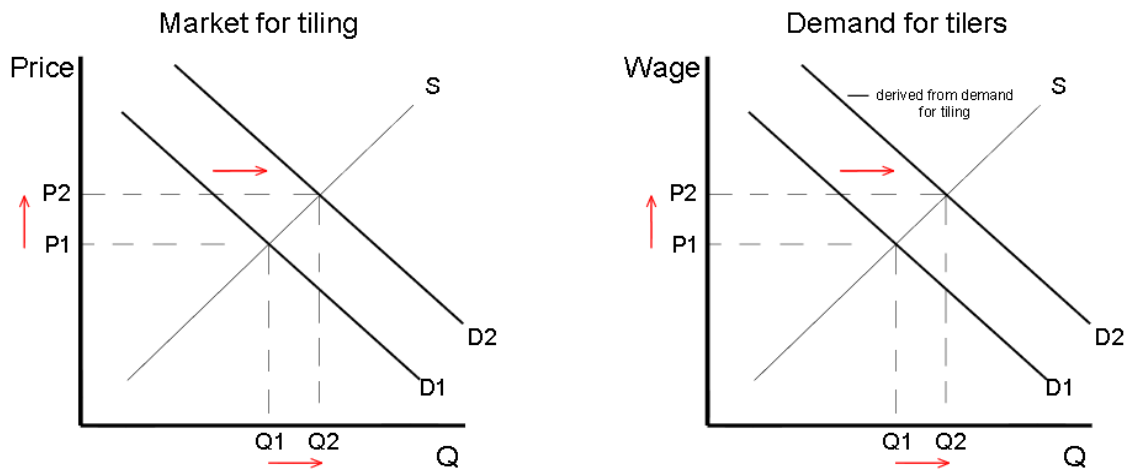
<b>CRAFTSMEN</b>	<b>CRAFTS/ TRADES</b>	<b>FUNCTIONS</b>
<b>Mason/ bricklayer</b>	Masonry	Stone, brick and block laying, concrete placement and finishing.
<b>Carpenter</b>	Carpentry	Fabrication, installation and repair of all types of wood related materials, as well as, the installation of drywall systems and acoustical tile walls and/or ceilings; and sectional scaffold building. Other function are cabinet making, wooden doors, wooden windows, ceiling and roofing
<b>Welder/Iron Bender</b>	Welding/ Iron Bending	fabrication of all types of steel or metal framework on buildings; iron grilles, gratings, stairways, enclosures and other ornamental ironwork and framing systems, including the cutting, drilling

		fastening members together by bolting, riveting, welding, as well as cutting, bending and placement of reinforcement bars in reinforced concrete construction
<b>Roofer</b>	Roofing	Construction of roof carcass and roof covering for all roof types and shapes
<b>Plumber</b>	Plumbing	Includes the installation, modification and repair of utility, supply and disposal systems, fixtures, fittings and equipment such as sewage, water, gas lines, compressed air, vacuum systems, water closets, water heaters, hydrants, valves and pumps.
<b>Electrician</b>	Electrical installations	Electrical wiring of new buildings or maintenance of existing electrical infrastructure, they can also install Air conditioning units and telecommunication systems
<b>Mechanical Systems Technician</b>	Mechanical installations	Installation of mechanical systems such as heating, air conditioning, escalators and elevators, with insulations
<b>Scaffold Builder</b>	Scaffolding	Scaffold builders are responsible for building and taking down scaffolds and temporary structures for buildings and ship structures.
<b>Glazer</b>	Glazing	Glass installations and repair. Including other glasslike material like mirror. As well as glass framing with aluminum or steel.

<b>Painter</b>	Painting	Application of all types of coating materials, including paints, varnish, lacquer, shellac and epoxy resin on all types of construction surfaces. Included in this trade is sandblasting and surface preparation prior to painting.
<b>Plasterer</b>	Plastering and Rendering	Often masons or bricklayers, involves application and/or repairs of finishing plaster surfaces of interior walls and ceilings and exterior walls
<b>Tiler</b>	Tiling	Installation of tile materials on a variety of surfaces, such as floors, walls, ceiling, countertops, and roof decks.

## **2.5 SUPPLY AND DEMAND PATTERN OF BUILDING CONSTRUCTION CRAFTSMEN**

Demand for building construction craftsmen is a concept that explains the amount of insistent request for craftsmen that a construction firm, contractor or an economy is willing to hire at a point in time of a building construction project. Demand for building construction craftsmen is a derived demand as their demands depends on the demand for the craft each craftsman offers. For instance, if there is an increase in demand for tiling, this will lead to an increase in demand for tilers (people that place different tile materials). The demand for craftsmen will also depend on their productivity, the price implication of their services and overall profitability to the construction firm.



**FIGURE 2.1:** Figure showing the demand for Tilers depends on the demand for Tiling.

So many factors contribute to the number and type of craftsmen a contractor is willing to hire or engage per time, the most obvious remains; the wage demand or wage rate, there exists an inverse relationship between the demand for building construction craftsmen and the wage rate a contractor needs to pay for hiring more workers. A high wage rate makes it more costly to hire more workers, and a low wage rate makes labour cheaper. However, a fall in wage rate creates a substitution effect and results in an increase in labour demand. It is important to note that expected quality of output affects demand for building craftsmen irrespective of their wage rate. Expansion in the economy gives rise to an increase in labour demand provided that the rise in outputs is greater compared to an increase in labour productivity. An economic factor that contributes to the pattern of demand for building construction craftsmen is economic recession, during an economic recession, the demand for labour declines as businesses look to cut their operating costs, recession leads to business failures and short-term redundancies, these shortcomings lead to a reduction in the derived demand for labour. However, a fast-growing market contributes to a rise in demand for labour for example, a trending type of wall or floor finish will cause an increase in demand for craftsmen that can execute the trend.

Furthermore, the availability or supply of craftsmen has its effect on their demand. Craftsmen supply refers to the numbers of craftsmen willing and able to execute a building construction craft in the construction industry. A rise in wage or an attractive incentive of higher rewards causes increase in their supply as it attracts other intending labour to move into the industry by learning the trade of their choice. Other factors that however influence the supply of building construction craftsmen includes; opportunities to increase earnings through overtime payments, substitute occupations or crafts, barriers to entry, training on different available crafts or trades, non-monetary characteristics such as risks involved, and migration of labour.

The demand for construction craftsmen could be seasonal, as some crafts do not have an all year round demand as they their demands are more around certain times than other times. The seasonal factors examples are weather condition and festivity. Certain weather condition affects the demand for some crafts for example, it is impossible for a painter to paint an external wall when it is raining. Moreover, it is important to note that crafts skill category as well as its demand pattern is unique to the building construction industry of different countries. Also, some crafts skills are more demanded than the other during the process of a construction project, this is determined by the varying volume and the nature of work parts or sections

## **2.6 FACTORS THAT AFFECT DEMAND OF BUILDING CONSTRUCTION CRAFTSMEN**

The construction industry is labour intensive and is very diverse and is subjected to changes in the environment it operates. Craftsmen are undisputedly the major employee of the construction industry as most of the work has to be done manually by hand. Muya *et al.*, (2006) explains the availability of craftsmen as one of the most critical factors that contributes to the effectiveness of the construction industry. However, there are diverse

factors that contribute to how the services of craftsmen are demanded in the construction industry. The demand for craftsmen is completely controlled by the demand for housing, that is, there can only be a demand for building construction craftsmen when there is a demand for housing. Therefore, the factors that contribute to the demand for housing are the factors that affect the demand for building construction craftsmen.

According to Hansen & Siregar (2012), housing or shelter is one of the major basic human needs; they explained that the concept of housing includes both existing stock and the new units. They furthermore pointed that the nature of the construction industry is that the stock is much larger than the number of new units completed annually and to therefore determine the demand for housing, the whole housing market which includes existing stock and the potential new ones should be considered. The resources related are somewhat allocated through the market mechanism and the public sector, it could also be a mix of the two. More importantly, the clients of the new units have a main role in creating demand which could be either for owner occupation or rent, or for share equity. Myers (2004) believes that the factors that will influence the demand for housing are the same for all types of market, be it; owner occupied housing, privately rented housing or social housing. Myers defined social housing as one that is provided by the government, whose origin is based on the idea that the government pays a subsidy towards provision of housing for accommodation for low income earners. The factors that determine the demand for social housing are however different from those that drives the demand for the other two aforementioned housing markets.

Estimating the demand for housing is complex since housing market is heterogeneous and further categories does exists different from the three markets highlighted, however estimating housing demands can be derived from the housing necessity at a particular point in time. This method is termed “Need Basis Method” (Ofori, 1990). “Housing need” refers to “the extent to which the present housing conditions fall below the levels considered necessary



for health, privacy and development of normal family living conditions”. It points to the gap that exists between the current stock of housing provision and the acceptable standard (often measured in terms of occupancy rates, that is, the number of persons per housing unit) for a particular period of time. The standard therefore is generally set by governments (concerned regulatory bodies) and reflects a social norm of such country. Such standards may include standard of space, congestion (relating to number of habitants per household), availability of main facilities such as amenities etc.

One of the factors that contribute to housing construction demand is the demography of a country. Demography has to do with the social statistics of a country such as population, health and diseases, average age, birth and death of populations. As in the case of Nigeria, population has grown from around 140million in 2006 to around 186million in 2016 (National Bureau of Statistics, 2016), this makes Nigeria a big market for housing industry. However, there are many other factors that influence the demand for housing like; government policies, economy of the country and that of potential clients, social factors, cost of construction, interest of the currency etc.

### **2.6.1 Demography**

Demography is the statistics of a population of human beings. It covers the study of their size, structure and distribution as well as spatial changes in response to birth, migration, aging and death. These three processes, that is, birth, migration and aging contribute to changes in population, including how people inhabit the earth from nations and societies and develop cultures. According to Worldometers (2018) Nigeria has a land area of 923,768 square meter and is the most populous country in Africa with a population of about 193,652, 418 with a yearly growth of 2.61%, notably there has been a steady rise in her population through the years. Housing is one of the basic important need of man, thus the continuous increase in

population would result to an increase in demand for housing. The social issue is making sure that the members of a society have a home to live in. It is important to note that the demand for housing does not only depend on the population, it also depends on the average size of a household.

Housing demand can be described as the willingness and the ability of potential housing consumers to pay for a particular dwelling depending on consumer's income, housing type, location, and preferences and as earlier described that housing includes existing structure as well as new buildings. Migration is another factor that affects the demand for housing; the more people migrate into an area the higher the demand for housing. The increasing growth in population of the country will lead to an increase in demand for new housing units and this directly leads to an increase in the demand for building construction craftsmen due to the labour intensive nature of building construction process.

### **2.6.2 Government policies and Regulations**

This refers to the policies put in place by government as regarding housing policies in the country. In the year 1991, a new housing policy was developed to proffer a solution to the problems of providing shelter for her growing population. However the federal government owned up to its failure in achieving that objective around twenty years later. It was then that they reviewed the existing policy. By 2012, a new housing policy was set by the federal government promising mass housing to make available houses for the citizens of the country which was like a dream come through for the citizens. The policy however pointed out the introduction of a scheme that will make houses available to all citizen of varying financial level. Social housing was another concept that was presented in the policy promising that house will be made available to even the poorest citizen by providing functional houses that are not luxurious (Waziri and Roosli, 2013).

However, making policies is one thing, implementation is another. Good housing policies have a positive ripple effect that includes a boost in the demand for the services of building construction craftsmen. Taxation is another means, by which government regulation can have an effect on housing demand, if government reduces taxes in housing, as it will reduce the price of houses. The demand for housing will increase as people would be able to afford the price, therefore, on the other side, increase in taxes will result in a decrease in housing demands.

### **2.6.3 Cost of Housing**

One of the factors that affect the cost of building construction is the rate of inflation in a country. Inflation is the rate at which the prices of goods and services increase, inflation leads to a fall in the purchasing power of the nation's currency. According to the National Bureau of Statistics (NBS), inflation in Nigeria has lowered for the 10th consecutive time in the year 2017. This consistent decrease in the rate of inflation has reduced consistently from 18.72% to 15.37%, the lowest it has been since 2016. Before now, the inflation rate has been skyrocketing. Inflation has been the major reason for rising cost of construction. The phase of rising inflation has led to an increase in cost of construction but the present trend, should it continue, would reduce the cost of construction, thereby encouraging more construction activities, commercial developments and infrastructure projects.

### **2.6.4 Interest Rate**

Interest rate has to do with the percentage of principal i.e. the amount of money lent by the lender for using its money. Interest rate does have a strong influence on housing prices, because the rate of interest affects the cost of loan payments. Loans however is a means by which clients can get funds to execute a housing project, but when the rate is not favourable, they don't consider borrowing. The lending rate in Nigeria was reported to have increased

from 17.88% in September 2017, after averaging 14.05% from 1961 to 2017 according to Trading Economics (2017).

Holistically, people are more likely to borrow money when the interest rate is lower because it costs them less than when the interest rate is high. On the other hand, a higher interest rate causes borrowing to slow as it becomes more expensive. This principle applies to loan that comes in form of mortgages. People are willing to take out mortgage when interest rate is lower than when it is higher. During times of low interest rates, more houses are built as there is an increase in demand and developers are able to borrow money at a cheaper rate to finance the construction. Even though, the cost of mortgages is closely tied to interest rate, the selling prices of houses don't always appear in direct correlation. When low interest rate raises the demand for housing, pushing up the prices for houses and the price gets too high, demand can cool, hence causing house prices to crash.

### **2.6.5 Innovations and Technology**

Innovations and technology in the construction industry will be a continuous trend in the face making improvements in the sector. However, innovations are usually specific to a particular trade. Technology helps a number of sectors to boost their process as well as productivity, with the construction sector not exempted. It helps the industry achieve time, cost and quality purpose and objectives of a building construction project. The sector is considered as an information intensive sector because it requires a lot of processes, and those processes require extensive information between stakeholders and workers.

Different types of innovation technology come in forms of; prefabrication, longer life materials and components, machinery and equipments, new project management, new building material displacing the existing ones and so on. The possible effects of these innovations on manual labour workforce include; net reduction in labour demand, increased

demand for craftsmen that have learnt the new trade trend, reduction in unproductive time for labour, and the need for training and retraining in the new innovation scope.

#### **2.6.6 Environmental Factors**

Some environmental factors like geographical factors, climate and weather, natural occurring disasters could affect the demand for housing. Housing market is highly geographical, geographical features could be man-made, that is, urban and rural; or natural, natural consists of land forms and ecosystem for example, terrain types, and other physical environmental features. For instance, a nations housing price may be falling while some parts of such nation still be experiencing price hike. Desirable areas can defeat market trends as demand is high with limited supply. Natural disasters also causes the need for re-housing of displaced people

#### **2.6.7 Nature of Building Construction Project**

Nature of a building talks about the different types of buildings, for instance, multi-storey or bungalow; the materials used e.g. brick, sandcrete blocks, concrete, glass, wood, steel, etc.; the proposed duration for the project; construction methodology; purpose of building, for example, residential, industrial, commercial, religious purpose and so on. The nature or characteristics of a building construction project influences the demand for labour required for the execution of the project. The more complex a proposed building construction project is the more likely it is for more demand for manpower.

#### **2.6.8 Preference or Taste**

The preference and taste of people also determines the rate of demand of housing, for instance, people have different choices, some wants to live in exclusive mansions, some wants to live in the city, some want to and have the capacity to live in a well-furnished house, some even prefer housing in developing parts of a country, and so on. Hence, the more

people demand for a particular housing type, the direct influence it has on the demand for craftsmen and their workmanship

### **2.6.9 Others**

Other factors that influence the demand for housing are high/low rents, access to loans, higher income

## **2.7 FACTORS THAT AFFECTS THE AVAILABILITY OF BUILDING CONSTRUCTION CRAFTSMEN**

Availability of building construction craftsmen is down to their supply as well as their willingness to take on an available job. Among the factors that influence the availability of craftsmen in the industry are age group of the skilled craftsmen in the industry, the rate of entrants of new craftsmen into the skilled trade, the rate of incentives, that is, wages available to craftsmen, funding and state of vocational education and training system in the country, perception of construction labour, level of commitment by government and the construction industry as regards training, creating enabling policies, enabling environment, and so on (kolawole and Frank, 1999; Obiegbu, 2002; Bokinni, 2005; Nwagu, 2006; and Awe, 2007).

The problem of shortage in skilled workers is a bane to the economic health of a lot of countries around the world. Megudu *et al.*, (2011) described that shortage of skilled labour has impact on different construction activities as well as it has its effects on time, cost and quality of construction work. He further highlighted the likely effect of the shortage on profits and the functions for which the project is undertaken. According to Datong *et al.*, (2011) craftsmen's shortage is not just about the shortage of workers nevertheless the scarcity of competent, skilled and effective craftsmen that are within reach for a particular job. Nigeria needs productive, adequately trained and flexible to help its economic growth as a country going through economic reforms. However reasons for shortages highlighted by

Atter *et al.*, (2012) includes lack of training and retraining, a workforce that is aging, the industry not appealing to young ones or qualified manpower as the industry is becoming increasingly having a poor image over few past decades, so the young ones don't see a viable career path in the industry. This issue therefore is seen as a very disturbing and pressing in the construction industry, with the effects already having serious adverse impact on businesses and the nation's economy. This issue therefore warrants the need to train and improve the skills of existing and potential craftsmen so as to eliminate the issue of poor performance. Bustani (2011) posits that it is important that skilled craftsmen are easily accessible for the high efficiency, productivity and the performance of the construction industry.

Previous studies confirmed the existence of shortage of skilled craftsmen in Nigeria (Datong *et al.*, 2011; Long *et al.*, 2012). They highlighted aging of existing skilled craftsmen, reduction of the quantity of people learning the crafts-trades, bad vocational training system in the country, poor image attached to construction labour as a trade done by uneducated people and irresponsibility on the part of the country's government towards skill training, other factors that contributes to the supply of craftsmen according to Awe (2006); Bokinni (2005); Darren *et al.*, (2012) includes introduction of new technologies as well as materials that requires high skill.

### **2.7.1 Organizational Training and Retraining of Skilled Craftsmen.**

Long *et al.*, (2012) noted that to sustain economic growth of a country, capacity building in form of training is important as they consider human asset as important to any establishment. Unusually, quite a number of construction firms in Nigeria appear to be narrow in their dealing as the focus more on profits than the individuals that does the work and make the money. This is one of the problems that affect the training of craftsmen as most firms hardly

consider improving their workforce but they would rather want their workforce to improve on their outputs (Datong, 2007).

Onuka *et al.*, (2012) asserts that the problems of incompetence, inefficiencies and ineffectiveness results when there is no craftsmen training and retraining program in a construction firm. Hence, when there is no training policy in such firm, the three problem earlier mention will become inevitable. Onuka *et al.*, (2012) then responds that training and development must be considered as a vital tool for improving the outdated status of the construction industry into a more effective modern state by ensuring that skilled craftsmen are readily available by updating the skills of the existing manpower.

### **2.7.2 Aging of Skilled Workforce in the Industry**

This is a factor that affects the supply of craftsmen in the industry at the moment, as the present average age of competent craftsmen and artisans in the Nigerian construction industry rages between 45 – 50 years of age with few young skilled ones available to ensure posterity of skilled craftsmen and if this issue is not addressed, skilled and efficient craftsmen and artisan would go into extinction (Datong *et al.*, 2011).

### **2.7.3 Rapid change in technology**

Dubem *et al.*, (2012) confirms that the construction sector is going through a fast change in technology all over the world and attributed this to the growing improvements since the advent of computer technology. With numerous inventions, demands for quality installations have grown from the clients, bringing about a necessity for the construction industry to meet up their expectations. However, Okuntade (2014) reports that the construction industries around the world has been adapting to the demand through skill acquisition. Despite this growing trend around the world, Nigeria, however is one of the countries lagging behind in adapting to the trend and this has affected the number and quality of the man power we have



(Dubem *et al.*, 2012). The country's economy will be effectively serviced by the construction industry if only skilled and trained people are involved in its dealings, for example reliable construction team and skilled craftsmen (Datong *et al.*, 2011).

#### **2.7.4 Poor Remuneration**

Lack of adequate reward or added advantages is a major reason that determines the supply of craftsmen as remuneration attached to a trade determines the amount of workforce it attracts. There is no regulation as pertaining to the minimum wage for construction workers in Nigeria. Fagbenle (2004) confirmed the different wage structure across the country. He further describes how the attributes of the construction industry has made it uneasy for workers in construction to join trade union, thereby not giving room for joint negotiation of their wages unlike the case of government establishment. This issue has made construction workers, even the skilled ones, to seek greener pasture where they can be properly remunerated, or make them not to work with full loyalty (Fagbenle, 2004).

#### **2.7.5 Lack of Motivation**

Fagbenle (2004) explains the boundless nature of human potentials; he however concedes that motivation is required for excellence. Solomon *et al.*, (2012) described motivation as an art of inspiring someone to perform a duty. Motivation however has been an issue in Nigerian construction firms, as majority of them don't take it into consideration when dealing with their workforce. Motivation boosts productivity, and its absence leads to high turnover of workforce. According to Fagbenle (2004), skilled craftsmen can be motivated by several means, however highlighted economic reward as the most important as a sound wage structure with an enticing incentive plan needs to be installed. Ugheru (2006) further contributed other motivation means such as promotion, welfare packages, job security, involvement in decision making and so on.

### **2.7.6 Lack of Appeal to the Young and Potential Workers**

Young people as well as potential skilled craftsmen no longer find the construction industry appealing due to the bad image attached to construction labour. It is seen as a work done by uneducated and less intelligent and incompetent craftsmen (Darren *et al.*, 2012). This poor image has dismayed young people from considering the construction industry as a viable career path. The researchers then identified the reason for this as inefficiency leading to poor workmanship, resulting to rework, hence cost and time overrun. Awe (2006), notes that youths in Nigeria don't show interest in acquiring skills compared to the situation of developed nations where studies have shown that a high number of young intending people interested in undergoing training in various construction crafts are fast outgrowing the numbers of facilities offering the training.

### **2.7.7 Poor Weather Condition**

Though farfetched, unfavorable weather affects the supply of craftsmen, as they would prefer under a favourable weather condition than in an unfavourable condition. Dai *et al.*, (2009) opines that extreme weather conditions as a factor affects the productivity of craftsmen as well as workmanship. This means few or no labour would want to take on a job in a harsh weather condition. Faisal *et al.*, (2006) sighted an example of Saudi Arabia to be hot and stated that this makes it difficult to execute some construction work as the quality of workmanship is affected.

## **2.8 CONSTRUCTION PROJECT PERFORMANCE**

Several reports and studies have verified the importance of the construction industry to any nation. According to Takim & Akintoye (2002), the pace of the economic growth of any nation in many ways can be measured by the development of physical infrastructures, which includes buildings, roads and bridges. They went further noting that project development

involves several parties, diverse processes, and varying phases and stages of work as well as a massive input from both the private and public sectors, with the main goal of concluding the project successfully. The construction industry is however dynamic in nature as the concept of project success has remained ambiguously defined in the construction industry as project success means different things to different parties involved in a construction process.

A construction project is either successful or not, depending on the projects performance. Several past studies have reviewed the construction projects performance. According to Reichelt and Lyneis (1999), the dynamics of a project performance can be categorized into three important structures. The structures includes: work accomplishment, the effects of feedback on productivity and quality of work as well as the upstream to downstream phases effects. Thomas (2002) asserts the main performance criteria for construction project performance as including progress of work, financial stability, and standard of quality, resources, health and safety, relationship with clients, consultants' relationship, managerial capabilities, claims and contractual disputes, reputation, relationship with subcontractors, and amount of subcontracting. As for Chan and Kumaraswamy (2002), construction time is more important as it most of the time serves a vital benchmarking to assess a project performance, as well as efficiency in project organization. Cheung *et al.*, (2004) describes that people, cost, quality, time, safety and health, communication, client's satisfaction and environment are the major performance indicators. However, Navon (2005) reports that a control system is vital to identifying factors that affect efforts put into a construction project, and that one or more Project Performance Indicators (PPI) is required for each of the project goals. But as for Pheng and Chuan (2006), human factors always play an important part in determining a project's performance.

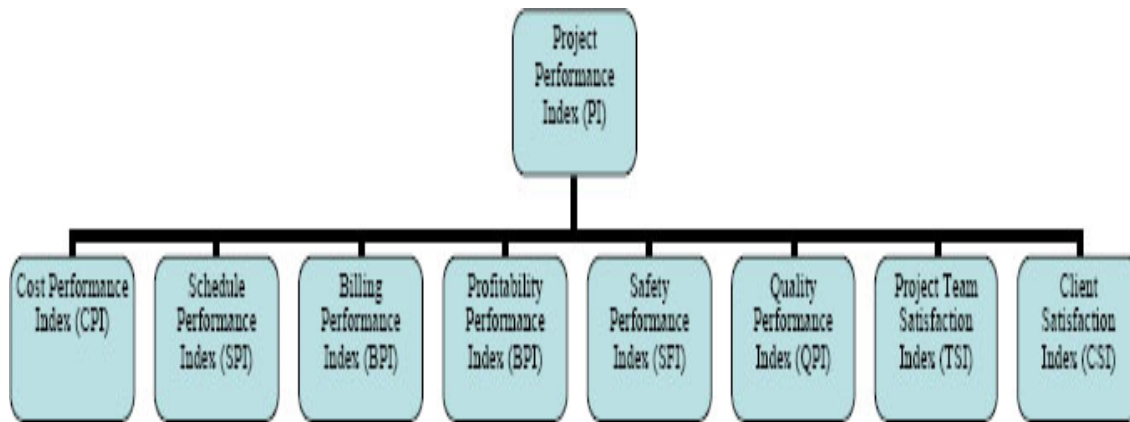
Windapo and Martins, (2008) describes Project performance as the ability of a project to be delivered at the right time, cost and quality as well as achieving a high level of client

satisfaction. Nassar (2009) points out that the main reason for planning and controls which are basic functions of project management is for the purpose of ensuring a well coordinated and successful project. He went further highlighting setting of objectives that will guide the various decisions to be made during the course of a construction project as a basic element of planning. Those decisions includes trade-offs between schedule, cost and quality as well as other performance attributes. Integration and quantification of the various aspect of performance is required for effective monitoring of progress of construction projects. The traditional performance indicators in the construction industry include completion time, cost and quality (Nassar). Most current project control systems quantitatively measure cost and schedule status forgetting the other major aspects of project performance such as cash flow, profitability, quality, safety, project team satisfaction and client satisfaction that are in some cases as important as cost and schedule. Only few project management systems quantify the later project attributes and do so independently without proper integration to the overall project performance (Nassar). The perception of success and failure of projects is usually based on personal indices and experience of the project manager and it is not uncommon that two project managers would assess the performance of the same project using the same data differently (Rad, 2003). The difference in their judgments is as a result of lack of a clear and consistent evaluation procedures and methods of project performance. For example, there are several occasions where a project in under budget and progressing as scheduled, yet it is considered a failure by upper management because of low quality or poor safety performance records. On the other side, a project can be behind schedule and over budget and still considered as successful because of its high quality, excellent safety records and to the satisfaction of the client. Great efforts are however normally spent on accurately measuring some performance indices like costs and schedule where as the evaluation of the overall performance is carried out in a less structured manner (Nassar, 2009).

In corroboration to Nassir's claims, Kyei (2011) also believes that there has been too much emphasis on the traditional measures of project success (i.e. the triad of time, budget and specification), and that rigorously sticking to these yard sticks can in certain way actively detract from project success. That is why many studies have now identified other aspects in which projects are measured and evaluated such as innovation (Harty, 2008), client satisfaction (Collins and Baccarini, 2004), environmental performance (Eriksson and Westerberg, 2012) and safety (Chan and Chan). Consequently, these measures have also been considered as success criteria in construction project delivery.

The criteria for success are however much more wider, according to Wateridge, (1998), the performances of stakeholders also contribute to the success of a construction project, as measuring project performance involves evaluating their performance, evaluating their contributions and understanding their expectations. A stakeholder is an individual or group, inside or outside the construction project, who has a stake in, or can influence the construction performance. Construction projects can potentially have different sets of stakeholders such as clients, consultant, contractors, sub-contractors, artisans, craftsmen, suppliers and end users to mention a few. A successful construction project performance is achieved when stakeholders meet their requirements, individually as well as collectively (Atkinson, *et al.*, 1997).

Nassar, 2009 reiterates that construction project success is often measured by the evaluation of three parties: the project team, the construction organization, and client's organization. He produced a hierarchical model for construction project success that forms the structural foundation for a formal construction performance evaluation system. The model presents a hierarchy of construction performance objectives that takes into account all success factors as viewed by major players. The goal hierarchy is flexible and systematic enough to handle specific project requirement. The model is shown in figure 2.1 below;



**Figure 2.2:** Hierarchy Design for the Project Performance Model

[Source: Nassir, (2009)]

## 2.9 KEY PERFORMANCE INDICATORS

According to Investopedia, Key performance indicators (KPI) are a set of quantifiable measures a company uses to assess how well it meets its set strategic and operational goals or to assess its performance over time. It also applies to the construction industry as those measures are used by the major stakeholders (Client, consultants, and contractors) in the industry to measure performance on certain projects. Key Performance Indicators is used in tracking progress, monitoring of costs, assessing client satisfaction, identifying strength and weaknesses, comparing performance across and between projects, as well as assessing specific areas of a project; for example safety, sustainability and waste management.

Karim and Marosszeky (1999) described the purpose of KPIs as to allow a comparison several projects and to help identify the existence of similar patterns, and that it can help identify dysfunctions in procurement process. They went ahead studying the development of key performance indicators to measure project performance, their study pointed out the indicators such as cost of pricing the tender as a percentage of contract value, number of times base tender price changed, cost of pricing the tender as a percentage of contract value, time from the first tender to actual award of contract, average delay in payment of agreed

variations, average time for approval of agreed variations. Dissanayaka & Kumaraswamy (1999) made use of project characteristics, procurement system, project team performance, contractor characteristics, client's representation characteristics, design characteristics and external conditions to evaluate cost performance. Although Samson and Lema (2002) suggested that the characteristics of recent performance measurement indicators requires the analysis of both the organization and environment like global competition, quality awards, nature of work, organizational role, external demands and power of Information Technology. They further explained that the indicators should be able to identify causes of problem, identify potential opportunities for improvement, and address all possible performance drivers.

Cheung *et al.*, (2004) highlights time, cost, quality, client satisfaction, and client changes, performance of the business, as well as safety and health as seven main performance indicators. Although Navon (2005) explains that a number of research studies in recent years have been done to fully augment project performance control of various project performance indicators. He described these with the concept of measuring indirect parameters, hence converting them into the proposed indicators. The parameters described include;

- Labour and earthmoving productivity based on measuring the location of workers or earthmoving equipment at a regular time intervals;
- Progress based on the above data;
- A comprehensive control of construction materials starting by monitoring orders and purchasing up to the movement of the materials on site.

However Pheng & Chaun's (2006) view of project performance measurement can be achieved by two set of indicators. They highlighted the first indicator as related to the owner, users, stakeholders and the public in general; these which refers to the set of people that will

look at the project from the macro point of view, and the second set was described as involving the developer, non-operator as well as the contractor who will all look at the project performance from a micro point of view. But for Jin *et al.*, (2006), the factors based on relationship that affects the performance of building projects in china were their course for study. They used thirteen performance metrics to measure the level of success of construction projects. They categorized the factors into four groups, which were; cost, quality, time and relationship performance. The however recommended that foreign firms that are planning to enter or have entered the Chinese construction industry must learn to build corporate and peaceful relationships with the Chinese partners and to cap it all ensure satisfactory project performance by ensuring adequate consideration of all the factors mentioned above. A validated key performance was developed by Ugwu & Haupt (2007) for sustainability appraisal; they made use of South Africa as case study, also making use or four sections in a questionnaire to identify the relative importance of Key Performance Indicators. From their study, economy, environment, resource utilization, society, health and safety and project management administrations were the main indicators.

## **2.10 FACTORS THAT AFFECT CONSTRUCTION PROJECT PERFORMANCE**

With the project performance indicators that were highlighted in the previous section, it is important to know that some factors come under each performance indicators. These factors are contributing factors to performance measurement of a construction project.

**2.10.1 Cost Factors:** for proper and effective cost control, these factors needs to be harnessed. Various contributing factors to the cost performance of a construction project performance are listed as follow;

- Market share of organization
- Liquidity of organization
- Cash flow of project



- Profit rate of project
- Overhead percentage of project
- Project design cost
- Material and equipment cost
- Project labour cost
- Project overtime cost
- Motivation cost
- Cost of rework
- Cost of variation orders
- Waste rate of materials
- Regular project budget update
- Cost control system
- Escalation of material prices
- Differentiation of currency prices

**2.10.2 Time Factors:** the contributing factors to the timely completion and delivery of a building construction project, determines whether a project will be done on time, or behind schedule. Among those time factors are;

- Site preparation time
- Planned time for construction
- Percentage of orders delivered late
- Time needed to implement variation orders
- Time needed to rectify defects
- Average delay in claim approval
- Average delay in regular payments

- Unavailability of resources
- Average delay because of closures leading to materials shortage

**2.10.3 Quality Factors:** quality in building construction is very important; it involves a combination of required standard, functionality (usefulness of the facility in achieving its purpose); durability; impact and performance of completed facility. The contributing factors to quality performance of a project are as follow;

- Conformance to specification
- Availability of competent staff
- Quality of equipment and raw materials
- Quality assessment system in organization
- Quality training/meeting

**2.10.4 Productivity Factors:** for a positive performance of building construction project, productivity cannot be overemphasized. Productivity describes all measures of the efficiency of production. Productivity in construction is the efficient use of resources; labour, land, money, materials, information etc. among the factors that affects productivity in construction projects are;

- Project complexity ,
- Skilled labour availability
- Number of new projects / year
- Management-labour relationship
- Absenteeism rate through project
- Sequencing of work according to schedule

**2.10.5 Client satisfaction factors:** clients are the end users in any building construction project; therefore their satisfaction is very paramount. Customer satisfaction in the building

construction industry is how well a contractor matches a client's expectations. Few from the factors that affect client satisfaction in the course of a project are;

- Information coordination between owner and project parties
- Leadership skills for project manager
- Speed and reliability of service to owner
- Number of disputes between owner and project parties
- Number of rework incidents

**2.10.6 Project Team Satisfaction factors:** evaluating project team satisfaction is as important as assessing customers satisfaction. This involves assessment by a project team if it has met its set goals or not. The factors that predispose the satisfaction of a building construction project team are;

- Characteristics of project team
- Clear project goals
- Clarity about evaluation and rewards
- Effective leadership
- Manageable level of stress or conflict

**2.10.7 Health and Safety factors:** health and safety measures also determine the performance measurement of a construction project. The construction industry is a high hazard industry, it involves series of activities that exposes its workers to hazards, hence ensuring a safe working environment for the workers by providing personal protective gears and putting in place measures that will reduce or eliminate the hazards will boost performance. The factors that affect health and safety are;

- Application of health and safety measures in construction organizations
- Safe access to project location

- Conflicts on construction sites
- Perception of workers towards safety
- Nature of project.

**2.10.8 Innovation and learning Factors:** innovation and learning helps improve performance of a construction project. The following factors help improve on future projects as they affect performance because they affect innovation and learning required to execute new projects as well as help improve the performance of consultants and contractors.

- Learning from own experience and past history
- Learning from best practice and experience of others
- Work group
- Review of failures and solving them

**2.10.9 Environmental Factors:** construction project performance is affected by different environmental factors, namely;

- Air quality
- Noise level
- Wastes around the site
- Climate condition etc.

These factors affect productivity as well as time performance of projects

## **2.11 EVALUATING AND MEASURING CONSTRUCTION PROJECT PERFORMANCE**

According to Cheung *et al.*, (2004), quite a large number of performance indices can be used to measure project performance and these indices could be related to groups such as cost, time, quality, client satisfaction, client changes, business performance, and health and safety.

However, cost, time and quality are identified as the three predominant dimensions for evaluating project performance. Pheng & Chuan (2006), posits a different way of evaluating project performance, they came up with making use of two sets of indicators, namely; the first related to owners, users, stakeholders, and general public; the category of people that will look at the project from a macro point of view. The second being the set of people that will look at the project performance from a micro point of view which includes the developers as well as the contractors. Tangen (2004) writes that performance measurement is complex and that most of the time it involves at least three disciplines, namely; economics, management and accounting. Tangen further explained that quite a number of factors contribute to the choice of a sustainable method of measurement, the factors highlighted were; purpose of measurement, the level of detail required, and time made available for the measurement, existence of available predetermined data, as well as measurement cost.

Navon (2005) described performance measurement as a comparison between desired and actual performance. He notes that management will do well to analyze the cause or reason for any deviation that is identified in the performance of a project. He furthermore identified the possible reasons for deviation and schematically divided them into two different groups, namely; (i) setting unrealistic target or (ii) reasons resulting from actual construction, as it is said that deviation mostly originate from these aforementioned reasons. Navon (2005) noted that measurement of performance is required not only to control present projects but also update historical database that allows for better planning of other projects in the future in terms of cost, schedules, resource allocation and so on. According to Pheng and Chuan (2006), the measurement of project performance cannot be limited to the traditional criteria of time, quality, and cost as other measurement criteria does exists in projects management and products. Cheung *et al.*, (2004) claims that New South Wales Public Works department in Australia launched a Project Performance Evaluation (PPE) framework that covers a wide

range of performance parameters. The PPE parameters highlighted are time, communication, cost, safety, quality, claims and conflicts resolution, environment and contract relations while the main functions of PPE is to ensure that measures of project performance covers soft parameters as well, which includes communication and dispute resolutions.

In the United Kingdom, Key performance Indicators (KPIs) refers to a project performance measurement tool, and was developed by the KPI working group that is under the United Kingdom Construction Best Practice Program to include cost, time, and quality, client satisfaction, change orders, health and safety, business performance. The steps involved in the implementation of KPIs are; (i) decide what to measure (ii) collect data and (iii) calculate the KPIs. Both the PPE and KPIs are however valuable tools to measure the performance of a construction project. Previous studies have shown that both PPE and KPIs are suitable for measuring performance. According to Iyer and Jha (2005), it is complex to measure the performance of modern construction project because they are multidisciplinary in nature as they involve contractors, designers, sub-contractors, specialists, construction managers and consultants participating in the process. The increasing sizes of projects had contributed to the continuous increase in the numbers of participants and since the goal of a given construction project is meant for all participants to work towards, performance measurement will be without meaning if the participant's perspective and the criteria for measurement is not clearly stated. Studies have however obtained different criteria such as schedule compliance, cost compliance, and quality compliance to measure project performance.

Lehtonen (2001) presented a new framework for measuring logistics in construction by making use of two different dimensions to improve productivity. The first dimension makes use of measures, which is further subdivided into two measures, namely; improvement measures that help identify problems with the present practices, and this measure is used for development projects. The second sub-measure is called the monitoring measure, and is used

to continuously monitor operations. The second dimension of the framework however is the focus of measures. This explains the organizational level measures can be adopted. Therefore, information should be available at the project and company level, including the supplier or subcontractor level.

Samson and Lema (2002) also proposed a system for performance measurement, the system consists of construction business perspective, and perspectives such as innovation and learning, processes, stakeholders, processes and financial perspective were highlighted. The indicators that emanate from the perspective are divided into three groups, namely; drivers indicators, process indicators and result indicators. They further highlighted leadership's commitment, employee's empowerment and involvement, and the coordination of information as well as its management as the keys to the success or failure of the measurement system they proposed. Furthermore, Shen *et al.*, (2005) provided another means for measuring environmental performance of construction activities done by a contractor by calculating the environmental performance of the contractor. This poses a simple indicator for the measurement and the communication of the level of environmental performance of a contractor.

An objective technique that can used to measure the performance and progress of a building construction project is the use of Earned Value Management (EVM) or Earned Value Project/Performance management (EVPM). The history of EVM dates back to the turn of the 20<sup>th</sup> century, based largely on the principle of "earned time" that was made popular by Frank and Lilian Gilberth, the concept however got waves in the United States Department of Defense in the 1960s. The original concept of EVM was called Program/Project Evaluation and Review Technique (PERT/COST), but was considered not adaptable then by contractors who were compelled to make use of it. EVM however emerged as a method to be used by managers and executives for the management of project in the late 1980s and early 1990s.

One of the early commercial adopters of EVM was the construction industry. (Wikipedia, 2017)

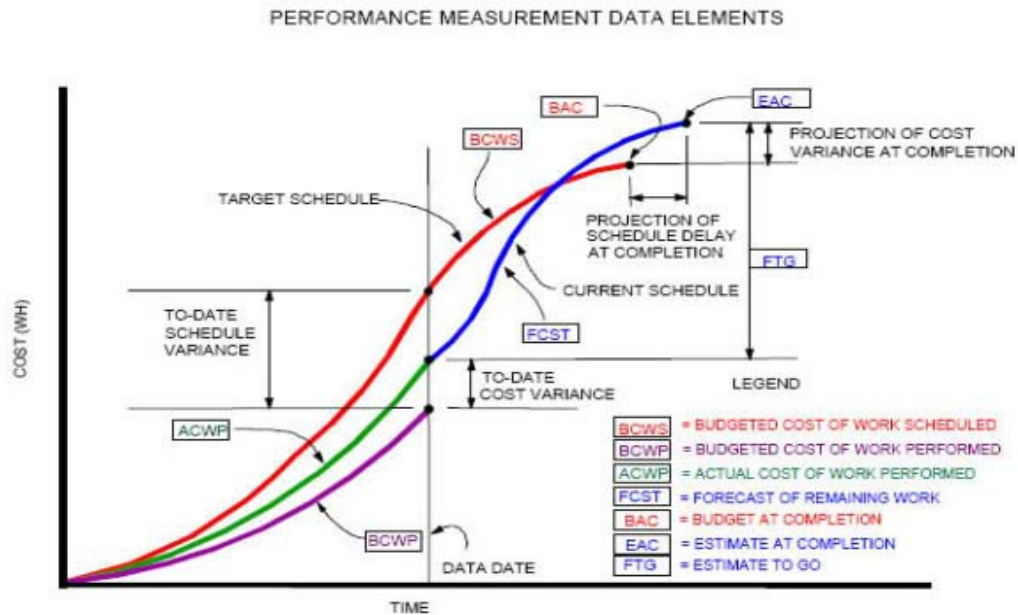
EVM incorporates the three major performance indicators which are scope, Time and costs. EVM is also capable of delivering a correct forecast of problems of performance that could be encountered during the course of a project. This attribute is considered an important one to project management. According to early research on EVM, the use of EVM has significant impact on project planning and control, it use also improves definition of project scope and the overall analysis of project performance. However, recent studies have shown that using the EVM methodology helps to positively predict the success of a project (Marshall, 2007). EVM has grown in popularity in more recent years; it has grown beyond government contracting which is a sector that has enjoyed the value of EVM because it is also useful in the disputes settlement as it helps substantiate contract disputes.

Earned Value Management involves some essential features for its successful implementation, among these features are;

- Project plan that presents the work to be executed
- A planned work valuation, called Planned value (PV) or Budgeted Cost of work Schedule (BCWS), and
- Earned Value (EV) or Budgeted Cost of Work Performed (BCWP). This shows how much of the budget and time should have been spent considering the amount of work done so far.

The most basic requirements of EVM measures progress using PV and EV. However, more features are involved, when implementing EVM for larger or more complex projects, features such as forecasts of cost performance, be it, over budget or under budget and the performance according to schedule, be it, behind or ahead of schedule.





**Figure 2.3:** Calculating and Reporting Earned Value

[Source: PMBOK (2014)]

As Shown in figure 2.2 below, computing earned value involves the following topics and formulae,

- **Schedule Variance (SV):** this is explained as the cost comparison of what has been earned to what has been budgeted. It measures the difference in value between the work planned to be done and the work that has been accomplished.

$$SV = BCWP - BCWS$$

$$SV (\%) = (SV/BCWS) \times 100\%$$

- **Cost Variance (CV):** this is the cost comparison of what has been earned to what has been spent.

$$CV = BCWP - ACWP$$

$$CV (\%) = (CV/BCWP) \times 100\%$$

For the Earned Value Variances, if the Schedule Variance (SV) and Cost Variance (CV) are negative, then this shows that the project is behind schedule and above budget, hence, if SV and CV are positive, then the project is ahead of schedule and below budget. SV and CV can be converted to efficiency indicators to reflect the cost and schedule performance or the trend of any project at fixed intervals; these indicators are Schedule Performance Index (SPI) and Cost Performance Index (CPI)

- **Schedule Performance Index (SPI):** indicates how far behind or ahead of schedule a project is in terms of the work accomplished and tends towards unity as the project progresses. It is of less value as project nears completion.

$$\text{SPI} = \text{BCWP}/\text{BCWS}$$

- **Cost performance Index (CPI):** this is the index of earned value to actual costs.

$$\text{CPI} = \text{BCWP}/\text{ACWP}$$

Where;

BCWP = Budgeted Cost of Work Performed [Earned Value (EV)]

BCWS = Budgeted Cost of Work Scheduled [Planned Value (PV)]

ACWP = Actual Cost of Work Performed [Actual Cost (AC)]

From the earned value indices,

SPI > 1 indicates that project is ahead of schedule (early)

SPI < 1 indicates project is behind schedule (late)

CPI > 1 indicates cost under-run (under spent)

CPI < 1 indicates cost over-run (over spent)

CPI is the most commonly used cost efficiency indicator, SPI is used to predict the completion date and is sometimes used in conjunction with CPI to forecast the project

completion estimates, CPI and SPI can be evaluated by using either cumulative or monthly figures.

## **2.12 IMPACT OF CONSTRUCTION CRAFTSMEN AVAILABILITY ON PROJECT PERFORMANCE**

Craftsmen availability is explained as the ease of access of construction craftsmen or how readily such resources can be gotten or hired. The effect of craftsmen in the building construction industry is very vivid when it comes to their end products, most especially when it involves competent and skilled craftsmen. According to Datong (2006), the absence of skilled craftsmen may have effect on the final product of a project; he further highlighted low productivity, bad quality, time overruns, cost overruns, bad work ethics, and frequent work rate and so on as other effects of skilled craftsmen shortage. The availability of craftsmen for the purpose of executing a building construction project has its effect on the performance of the contractor and well as the performance of the final product which is the interest of the client and consultants. However, this paper focuses on how craftsmen availability affects contractors' performance. According to Ayegba and Agbo (2014), the effect of craftsmen availability on the performance of contractors can be divided into two, namely; direct and indirect costs. The difference between these costs is that direct costs can be measured while indirect costs are difficult to measure. Past literatures have reported the severe impact that the availability of skilled craftsmen has had on project performance, with an increasing pressure on construction contractors to deliver the desired quality, at the right cost and time (Olomolaiye and Ogunlana, 1989; Ugheru, 2006; Medugu, 2011).

Furthermore, the relevance of readily available skilled craftsmen cannot be over emphasized as they possess the potential of riding inefficiencies that result from poorly executed projects. Bustani (2000) verifies that the quality and availability of skilled craftsmen is an important factor that contributes to the effectiveness of the construction industry. Various studies have

investigated the existence of unskilled craftsmen in the Nigerian construction industry (Wogu, 2010, Kazaure, 2011; Ndibe *et al.*, 2013). They described that various contractors have considered investing in trainings and development of personnel because skilled personnel have been insufficient and inadequate in the face of rising demand for higher quality buildings from clients, considering the Nigerian industry. One major component of the Nigerian construction industry is the implications of skill shortages on cost, time, quality, and productivity; all factors that contribute to the success of a construction project compared to other developed countries like the United States of America, and United Kingdom where construction site operations are well mechanized.

The effects of the availability of building construction craftsmen on construction project performance are circled around time, cost, quality and productivity; key performance measures in a building construction project.

### **2.12.1 Impact on Project Time**

Time is a very important factor when it comes to determining construction project performance. Every building construction project has a duration that is always clearly stated out in the contract documents. Moreover, the breakdown of the duration for each work section of the project is also always presented in contract documents in form of a construction program. However, a lot of factors are considered in determining the duration for a construction project but several unforeseen factors can as well lead to time overrun. The aim and goal of a project manager or a contractor is the great responsibility of keeping a project within time and budget. According to the old saying “time is money”, which means that time is a valuable resource, every time overrun has a cost implication on the project. Time overrun or delay can come from all phases of construction, be it, design or construction phase, but the services of craftsmen are needed in the construction phase. According to Ahmad *et al.*,

(2003) delay in construction is common, costly, complex and risky as time is important for both the owner and the contractor. However, the damages caused by delay is substantial to owners considering that they pay for the project, this has led to owners devising provisions in contract document to anticipate, manage and compensate for such unforeseen circumstance (Brennan, 2002).

Mainsfield *et al.*, (1994) examined the causes of delay as well as cost overrun in construction projects in Nigeria, they identified financing and payment for completed works, changes in site conditions, bad contract management, and poor construction planning as the major causes. Although Ogunlana *et al.*, (1996) posits that delay is caused by problems of shortage in resources which includes labour, incompetent contractors, and problems caused by consultants or clients. Many previous researches have been done to investigate the causes of time overrun in building projects worldwide, (Odeh and Battaineh, 2001; Ameh and Osegbo 2011; Haseeb *et al.*, 2011). Nevertheless, little or none of those studies have focused on the effect that the availability of craftsmen might have on project performance, considering the labour intensive nature of the construction industry.

### **2.12.2 Impact on cost**

Chitkara (2011) defined construction project as a high value, time bound and special construction process of creating a construction facility or service, that has a predetermined performance objectives defined in terms of specification of quality, completion time, budgeted cost and other specified constraint. Cost was highlighted as one of the main parameters of adequately defining construction project. Chitkara (2011) further went ahead defining cost as a budgeted expenditure that a client has agreed to pay for acquiring a desired construction facility. According to Odesola *et al.*, (2012) performance and productivity of a construction project is affected by cost overrun, resulting from rework. Cost overrun is

therefore the difference between the actual cost of a project and the estimated cost of the same project as a percentage of the estimated cost. Actual cost refers to the cost accounted to have been spent as calculated at the completion on project, while estimated cost refers to the forecasted cost as at the inception of the project (Lee, 2008).

Cost in construction consists of several cost elements, which includes labour cost, material costs, plant and machinery cost, administration cost and the rest. Furthermore, costs in construction can be categorized into direct cost and indirect costs, also known as overhead cost. Direct cost refers to the cost that can attached to a specific work item while indirect costs are the cost that can be correlated to a project but not with the performance of a particular activity, so costs that are not direct are categorized under indirect. In the world today, the building construction sector remains one of the most labour intensive industries in the world, as buildings are being assembled by craftsmen piece by piece. The component of labour cost in a building project ranges from 30 – 50% of the overall project cost (Elbeltagi, 2012). This is relatively high enough to be significant in affect the whole actual cost of the project, making the availability issue of building construction craftsmen having a positive or negative effect (cost overrun) on construction cost hence cost performance.

### **2.12.3 Impact on Quality**

Quality in construction industry refers to meeting or exceeding the legal, aesthetic and functional requirement of a project Latham (1994) defined quality as pleasing to the eye, free from defects, fit for purpose with guarantees, durability and client's satisfaction. Achieving acceptable levels of quality in the construction industry has long been an issue (Arditi & Gunaydin, 1997). A project could be done on time as well as within budget and still be considered a failure unless it meets the specified quality or performance criteria.

Attainment of acceptable levels of quality in the construction industry has long been a problem. Great expenditures of time, money and resources, both human and material, are wasted each year because of inefficient or nonexistent quality management procedures. It is however expected of construction projects to create a balance between cost, time and quality, although quality is not always the major objective of the project, poor quality have cost implications to the contractor. (Rodchua, n.d.)

Several authors including (Medugu *et al.*, 2011; Datong *et al.*, 2011 and Bilau *et al.*, 2014) concedes that poor workmanship is a problem affecting the quality delivery of building construction projects in the Nigerian construction industry. Unavailability of competent and skilled craftsmen will lead to poor workmanship, which will in turn lead to rework and rework resulting in time and cost overruns in the delivery process of a project.

#### **2.12.4 Impact on productivity**

Solomon *et al.*, (2012) claims that productivity is the quantity of products and services delivered compared to the amount of material and labour input. According to Rozzi and AbouRizk (1993), Productivity in the construction industry is explained using different terms like production rate, performance factor, unit person – hour rate and so on. They verified that productivity is traditionally refereed to the ratio of input to output. Productivity in construction is the efficient use of resources such as labour, land, money, materials, information etc. Construction is however known to be labour intensive; therefore construction productivity depends majorly on the performance of labour. Rozzo and AbouRizk (1993) presented that the two most important measures of labour productivity as; the effectiveness with which labour is used in the construction process and the relative efficiency of labour carrying out what is required at a given time and place. Labour productivity is known as labour output and is measured as the amount of work done over a period of time.

Since productivity in construction depends majorly on the productivity of labour, and craftsmen are the major labour employees in building construction as they are physically involved in the construction process, the success of any building construction project depends on their availability in right amount as well as competency. Incompetent craftsmen will give room for poor output and rework. Rework is an unnecessary effort of re-executing a process that wasn't done well initially. (Ekambaram, 2006; Abdullah *et al.*, 2012). Rework can also result from excessive workload which could result from limited access to craftsmen. Rework also lead to cost and time overruns that can be caused by incompetent craftsmen, errors, omission, poor coordination etc (Adamu *et al.*, 2011). Abdullah *et al.*, 2012 describes that rework and wastages have adverse effects on project performance and productivity, also highlighting its great adverse effect on profit margin of a construction project to the contractor. Alinatwe *et al.*, (2007), highlights lack of skill of workers as a significant cause of reduced productivity in construction in developing countries.



## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 PREAMBLE**

The purpose of this study is to examine construction craftsmen's availability and how it affects construction project performance. Specifically, the study is designed to answer; what building construction crafts skill category is common to the Nigerian building construction industry, what their pattern of demands are, if there really is shortage of skilled construction craftsmen, how does construction craftsmen availability affects construction project performance.

All research study follows a widely accepted process and standard in order to achieve its aim and objectives. It must also be able to answer the research questions posed by the study. In order to achieve this, the researcher needs to carefully outline the steps, strategy and instruments used to achieve this. This chapter contains the research design, study area; instrument for data collection; data collection procedures; population of the study and sample frame; sampling technique; sample size; data analysis methods.

#### **3.2 RESEARCH DESIGN AND METHODS**

The methodology that was adopted for the purpose of answering the posed research question is quantitative methods. Quantitative methods are used to determine the relationship between two variables, that is, an independent variable and a dependent variable. The main aim of this study is to investigate the availability of construction craftsmen with a view to examining its effects on construction project performance in the Nigerian Construction industry. The quantitative method will help to determine the relationship between "the availability of

construction craftsmen (independent variable) and “project performance” (dependent variable).

For the purpose of this study, the descriptive and cross-sectional research design under the quantitative methodology was adopted. A descriptive research design is also referred to as observational because variables are observed without being intervened. The cross-sectional design is a type of descriptive research design; it allows the investigation of the variables at one or more points at a time. The rationale for this methods is to be able to prove and disprove assumptions, it is cost effective and time saving, enables the observation of a particular group with the different variables on a one-time basis, without attempting to control them. Also, many findings and outcomes can be analyzed to create new theories or studies as well as in-depth research.

### **3.3 STUDY AREA**

A study area is referred to as the geography for which a research is conducted and for which data is analyzed in a report. The study area for this study will be within Nigeria, a West African country with a population of around 186 million (World Bank, 2016). The area selected was limited to the south-western zone which is one of the six (6) geo-political zones of the country. The south-western Nigeria comprises six (6) states; namely Osun state, Oyo State, Ogun State, Ondo State, Ekiti State and Lagos State. Out of the six (6) states, the research area for this study was however limited to three (3) selected southwestern states, which includes; Ogun State, Oyo State, and Lagos State. The justification for the choice of the study area is that they harbour larger volume of construction projects as well as indigenous construction firms.



**Figure 3.1:** States in the South-Western Geopolitical zone.

[Source: OGAFI, 2017]

### 3.4 SAMPLING TECHNIQUE

For the purpose of this study, probability sampling was employed using method of stratified random sampling for the selection of indigenous construction firms across the study area. Also based on the aim and objectives of this study, the technique that was adopted is the purposive sampling which is also known as selective, judgmental or subjective sampling to select respondents from the randomly selected indigenous construction firms. The category of purposive sampling adopted is the homogenous sampling which focuses on a particular subgroup in which all the sample members are similar e.g. their level in the organization's hierarchy as is the considered in this study.

### 3.5 STUDY POPULATION AND SAMPLE FRAME

This study focuses on building construction craftsmen's availability and how it affects construction project performance within the research area. Since the study is a survey

research study, it utilized the information gathered from indigenous construction industry professionals that are directly involved with hiring and managing building construction craftsmen for the purpose of executing their building construction projects. They include project managers, site managers, contractors and sub-contractors. Their professions would vary among builders, architects, civil/structural engineers, and quantity surveyors.

To therefore get a sample frame, a list of indigenous building construction companies that exists within the study area will serve as the study population. Existing building construction companies within the study area with their addresses and contact details were sourced from a recognized online platform called Vconnect Global Services Limited. The choice for this source is for ease of accessibility to potential respondents. There are not less than 300, 330, and 900 active indigenous building construction companies in Oyo, Ogun and Lagos states respectively. (Vconnect, 2017).

### **3.6 SAMPLE SIZE**

Determination of sample size is the process of choosing numbers of observation to include in a statistical sample. It involves selecting elements, subjects or observation from a given population to make inferences about a population. Sample size determination is important due to the difficulty of studying an entire population as in the case of this study.

Determination of sample size is dependent on some factors, they include; margin for error, confidence level and minimum sample response rate. Margin for error is expressed in percentage, and is a measure of how precise your results are, it shows how much uncertainty there could be in the results of a study. Confidence level is also expressed as a percentage and is a measure of how certain the result about to be gotten is. For example, take a sample size sample 100 times, how many times would you get the same results? Typically, confidence level of 90%, 95% or 99% is sort after. In research survey, response rate is the number of

respondents who answered the survey divided by the number of people in the sample, always expressed in percentage. It is also known as completion rate or return rate.

This research anticipates an allowable error estimate of within  $\pm 5\%$  of the true prevalence and a desired confidence of 95%. The sample size for this study is then determined in table 3.1 also using the chart below:

**Table 3.1 Study Population and Sample Size Breakdown**

STATES	No. of registered building construction firms.	Active Indigenous building construction firms	Accessible indigenous building construction firms existing for more than 5yrs (Population)	No of questionnaires shared (sample size)
Lagos State	2,624	900	495	137
Oyo State	539	330	263	73
Ogun State	520	300	245	68
	3,683	1,530	1,003	278

Source: Vconnect, (2017).

NECESSARY SAMPLE SIZES FOR VARIOUS LIBRARY COLLECTIONS								
Collection Size (Population)	Confidence Level/Confidence Interval/Sample Size							
	95% Confident				99% Confident			
	10%	5%	2%	1%	10%	5%	2%	1%
1,000	88	278	706	906	143	400	806	943
10,000	95	370	1,936	4,899	164	624	2,938	6,247
50,000	96	381	2,291	8,057	166	648	3,841	12,486
100,000	96	383	2,345	8,763	166	657	3,994	14,267
250,000	96	384	2,378	9,249	166	661	4,092	15,602
500,000	96	384	2,390	9,423	166	665	4,126	16,105
1,000,000	96	384	2,395	9,513	166	665	4,143	16,369

SOURCE: <http://www.surveysystem.com/sscalc.htm>

From table 3.1, the total numbers of accessible indigenous building construction firms existing for more than 5yrs is 1,003 which represent the population for the study. Therefore from the chart, considering confidence level and interval of 95% and  $\pm 5$ , the sample size is 278. Therefore for this study, the 278 questionnaires were shared proportionally as the ratio of the numbers of accessible indigenous building construction firms existing for more than 5yrs in each of the states, that is, **495 : 263 : 245 = 1,003**. Presenting a percentage ratio of **49.4% : 26.2% : 24.4%** of 278 to derive the sample size for Lagos, Oyo and Ogun States respectively.

### **3.7 TYPE OF DATA AND DATA COLLECTION INSTRUMENT**

There are basically two (2) sources of data; they are primary data and secondary data. Primary data are those collected specifically for research through interviews, observations etc. while secondary data are those that already exist and can be reused for a new research study. They have been published in the past as records, statement of profits & loss accounts, data from reputable organizations, regulatory bodies and so on.

As for the purpose of this study, the two data types were utilized. Primary data were collected first hand from the respondents, while secondary data were utilized in form of literature review of existing relevant publications, write ups and research studies that are relevant to the subject under study. Primary data sources can come from a range of sources. The use of questionnaire is the most common and was the instrument to be used for data collection for the purpose of this study.

### **3.8 INSTRUMENT DESIGN**

The questionnaire was chosen because it has the ability to gather a large quantity of data and gives room to source data from larger number of people. The research, which focuses on the availability of craftsmen and how that affects construction project performance, considers a

relatively large research area of three (3) south-western states in Nigeria. Respondents will answer a structured questionnaire with different parts. The first part will collect the respondent's nominal or demographic data using open and closed ended questions, while the second part will collect information utilizing a likert scale item relating to the construction craft skill categories common to the Nigerian building industry as well as their pattern of demand; the third part will collect information regarding the existence or non existence of skilled craftsmen shortage in the building construction industry. The last part will investigate the effects of construction craftsmen availability on construction project performance using a likert scale as some of the questions asked will require quantitative answers which will involve rating using an interval scale.

### **3.9 TEST FOR VALIDITY AND RELIABILITY OF RESEARCH INSTRUMENT**

Validity and reliability are two important words in research design, methodology, results and findings. This is understandable for a number of reasons. First, validity measures the degree to which a measuring instrument is able to measure what purpose it is actually designed for. Secondly, reliability in research is the degree to which an assessment tool produces stable and consistent result, that is, the possibility of a research design to produce same result over and over again provided that what is been measured does not change (Asika, 1991).

To therefore ensure the validity and reliability of the research design for this study, a proper designing and a test-retest of the data collection instrument will be adopted so researcher can fine tune the data collection instrument to effectively measure research objectives.

### **3.10 METHOD OF DATA COLLECTION**

With the data collection instrument already decided on, that is. the questionnaire, it is important to have a plan as regarding how this instrument would reach the respondents and how the researcher would get the measuring instrument back for proper analysis. A good plan

or method would reduce or eliminate the instances of non-delivery, or misplacement during transit, which could result in shortfall of data and unnecessary delay. Therefore to achieve those shortcomings, questionnaires were self-administered, questionnaires would be administered by field enumerators, as well as administered online by providing links to the questionnaire. This is so because of the nature of the research area, the different means administering the research instrument relatively helped to increase the speed with which data was collected

### **3.11 DATA ANALYSIS METHODS**

Analyzing data gotten from a study is a process where large amount of raw data is reviewed using statistical techniques in order to make conclusions based on the data that are often unorganized. The data collected from the respondents would be analyzed to determine the potential correlations that may exist between the different parameters. Since this study is a quantitative study, numerical data are expected to be analyzed using different descriptive statistics such as median, mean, and standard deviation to mention a few. In other to accurately present the results of this study, the following statistical methods were employed in analyzing the collected data, they are; frequency distribution, percentage distribution, mean score and mean ranking analysis. However, for ease and speed of data analysis, analysis was aided by a computer based software package - SPSS Statistic. The statistical methods that were adopted are briefly explained below:

#### **3.11.1 Frequency Distribution and Percentage Distribution**

According to the Australia bureau of statistics, a frequency distribution is a table that displays the frequency of different outcomes in a sample. Every entry in frequency distribution table contains counts or frequency of occurrence of values within a particular group and this help to summarize the distribution values in the sample.



A percentage distribution involves expressing the individual class frequencies or count as a percentage of the total sample equated to one hundred (100). Percentage distribution can be likened to a relative frequency distribution or relative frequency table.

### 3.11.2 Mean Score Analysis and Mean ranking

Since this study will be utilizing a 5-point likert scale to measure different variables, calculating an average value or a representative of the set of data will not be straight forward because the set of data gotten from a likert scale are arranged according to magnitude, therefore the use of mean score analysis to compute the mean responses by all respondents will be adopted to identify a representative of the data set. For instance; in identifying the skill construction craft skill category common to the Nigerian building industry, the following 5-point scale will be considered to measure each craft skill demand rate or level; for instance;

1= No Demand 2= Very Low Demand 3= Low Demand 4= Medium Demand 5= High Demand 6= Very High demand

$$\text{Mean Score} = \frac{\Sigma W}{N} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{n_5 + n_4 + n_3 + n_2 + n_1}$$

Where; W = (Sum of scores awarded to a variable; N = Number of respondents)

$n_1$  = number of respondents who answered “very low demand”

$n_2$  = number of respondents who answered “low demand”

$n_3$  = number of respondents who answered “medium demand”

$n_4$  = number of respondents who answered “high demand”

$n_5$  = number of respondents who answered “very high demand”

### 3.11.3 Relative Importance Index (RII)

Relative Importance Index (RII) is a non-parametric technique that is based on the aggregate weighing of the initial frequency score of factors. The relative importance of the respondents' responses to the items on the likert scale will be indexed for proper analysis and presentation of results. RII is useful because it takes into account the size of the population and valuable when comparing risk factors, that is independent variables. RII is calculated thus:

- Rank cases on each variable
- For tied ranks and for categorical variables, assign mean rank
- Divide the ranks by the sample size creating a value ranging from 0 to 1

$$RII = \frac{\text{Mean Score}}{A} = \frac{\Sigma W}{AN}$$

W = (Sum of scores awarded to a variable;

A = largest integer on the response scale ( $A_{\max}$ )

N = respondent sample (the sum of  $n$  respondents selecting a response multiplied by the point's integer value, for each option on the scale)

Relative Importance Index (RII) is additionally known as weight, it could be a sort of relative significance investigations. RII was utilized for the investigation since it best fits the reason for this study. Agreeing to Johnson and LeBreton (2004), RII helps in finding the commitment a particular variable makes to the desire for a model variable both without anyone else's input and by joining it with other pointer factors.

## **CHAPTER FOUR**

### **DATA ANALYSIS AND DISCUSSION OF RESULTS**

#### **4.1 PREAMBLE**

This chapter presents and discusses the findings from analyzing the data that was collected through the collecting instrument. Presented in this chapter are trends and patterns that illustrate the availability of building construction craftsmen in southwestern Nigeria, sampling Lagos, Ogun and Oyo States. This chapter also presents answers to the research questions initially drafted. It presents the demographic information of respondents, professional background of respondents, the existence of skilled labour shortage, the crafts category common to the Nigerian building construction industry including their patterns of demand, and the effects of building construction craftsmen availability on project performance.

The initial data collection efforts targeted 278 respondents, and 211 copies of questionnaires were appropriately filled and completed across the three states, which represents 75.9% of the initial sample size. The breakdown across the three states showed that 88 questionnaire copies were filled and returned from 137 distributed in Lagos State. 65 questionnaires were filled and returned out of 73 that were distributed in Oyo State while 58 questionnaires were returned from 68 shared in Ogun State.

#### **4.2 EDUCATIONAL LEVEL OF RESPONDENTS**

The table (Table 4.1) summarizes the educational levels of all the respondents captured in this research study. The largest percentage of the respondents has Master or Doctorate (MSc./ PhD) qualification, at 42.7%, followed by those with Bachelors degree in science, technology or engineering (BSc/ B.Tech/ B.Eng) at 37% and the least of them, (20.4%) has an ordinary or higher diploma qualification. This result depicts that all the respondents are adequately

educated in the built environment field and have the understanding to adequately divulge relevant and authentic information relating to this research study.

**Table 4.1 Educational Level of Respondents**

	Frequency	Percentage (%)	Cumulative %
ND/HND	43	20.4	20.4
BSc/ B.Tech/ B.Eng	78	37.0	57.3
M.Sc/ PhD	90	42.7	100.0
<b>TOTAL</b>	<b>211</b>	<b>100.0</b>	

*Source: Researcher's Field Survey*

Although this study is not a comparative study, it however covers a study area of three (3) different southwestern states whose data were collected separately then aggregated. Table 4.2 therefore shows the educational level of respondents across the three states.

**Table 4.2 Educational Level of Respondents According to States**

State of Operation		Frequency	Percent (%)	Cumulative %
Lagos State	ND/HND	13	14.8	14.8
	B.Sc/ B.Tech/ B.Eng	30	34.1	48.9
	M.Sc/ P.hD	45	51.1	100.0
	<b>Total</b>	<b>88</b>	<b>100.0</b>	
Ogun State	ND/HND	18	27.7	27.7
	B.Sc/ B.Tech/ B.Eng	22	33.8	61.5
	M.Sc/ P.hD	25	38.5	100.0
	<b>Total</b>	<b>65</b>	<b>100.0</b>	
Oyo State	ND/HND	12	20.7	20.7
	B.Sc/ B.Tech/ B.Eng	26	44.8	65.5
	M.Sc/ P.hD	20	34.5	100.0
	<b>Total</b>	<b>58</b>	<b>100.0</b>	

*Source: Researcher's Field Survey*

A notable observation from Tables 4.1 and 4.2 is that a largest percentage (42.7%) of the respondents has attained masters or doctorate degree in their education level. The premise for this distribution is that the respondents at managerial roles were targeted.

### 4.3 DISTRIBUTION OF RESPONDENTS BY ROLE HELD IN FIRM

Table 4.3 below shows the distribution of respondents by the roles they held in their respective firms. Most of the respondents are project managers with a percentage frequency of (28.4%), which is the followed by site managers with percentage frequency of (27.5%). Lowly represented are contractors, consultants and sub-contractors with 19.4%, 17.5% and 7.1% percentage distribution respectively.

These results explain the reason for the distribution of respondents' educational level in the previous section. The main managerial roles of majority of the respondents in their respective firms are the reason for the distribution high education level as represented in the previous section.

**Table 4.3 Distribution of Respondents by Role Held in Firm**

	Frequency	Percentage (%)	Cumulative %
Project Manager	60	28.4	28.4
Site Manager	58	27.5	55.9
Contractor	41	19.4	75.4
Consultant	37	17.5	92.9
Sub-contractor	15	7.1	100.0
<b>Total</b>	<b>211</b>	<b>100.0</b>	

*Source: Researcher's Field Survey*

The prevalent distribution of the different roles held by the respondents in their firms puts them in suitable positions where any information required about their experience and

relationships with labour or craftsmen in relation to their own performances when undertaking any building construction project will be provided.

Table 4.4 below also shows the data distribution of respondents by roles held in firms on the basis of state of operation. This presents a more microscopic insight into the distribution according to the states. The distribution by the three states represents the same order as the summary. It shows proportionality by the population of building construction firms in the states, with the descending order; Lagos Ogun, Oyo States.

**Table 4.4 Distribution of Respondents by Role Held in Firm by states**

State of Operation		Frequency	Percentage (%)	Cumulative %
Lagos State	Project Manager	22	25.0	25.0
	Site Manager	24	27.3	52.3
	Contractor	20	22.7	75.0
	Consultant	16	18.2	93.2
	Sub-contractor	6	6.8	100.0
	<b>Total</b>	<b>88</b>	<b>100.0</b>	
Ogun State	Project Manager	18	27.7	27.7
	Site Manager	19	29.2	56.9
	Contractor	11	16.9	73.8
	Consultant	11	16.9	90.8
	Sub-contractor	6	9.2	100.0
	<b>Total</b>	<b>65</b>	<b>100.0</b>	
Oyo State	Project Manager	20	34.5	34.5
	Site Manager	15	25.9	60.3
	Contractor	10	17.2	77.6
	Consultant	10	17.2	94.8
	Sub-contractor	3	5.2	100.0
	<b>Total</b>	<b>58</b>	<b>100.0</b>	

*Source: Researcher's Field Survey*

#### 4.4 DISTRIBUTION OF RESPONDENTS' PROFESSION/DISCIPLINE

The distribution of the respondents by their profession or discipline is well represented in the two tables (Table 4.5 and Table 4.6) below. Table 4.5 shows the summary of the different discipline of all the respondents while Table 4.6 above also represents the distribution of respondents' discipline by each state representing the south western part of Nigeria.

**Table 4.5 Distribution of Respondents' Profession/Discipline**

	Frequency	Percentage (%)	Cumulative %
Builder	54	25.6	25.6
Architect	53	25.1	50.7
Engineer	54	25.6	76.3
Quantity Surveyor	32	15.2	91.5
Others (Estate surveyor)	18	8.5	100.0
<b>Total</b>	<b>211</b>	<b>100.0</b>	

*Source: Researcher's Field Survey*

From the summary in Table 4.5, 25.6% of the respondents are builders, 25.1% are architects, and 25.6% are engineers, while 15.2% are quantity surveyor, while 8.5% filed under others and all listed as estate surveyors. The figures show that the respondents are mostly builders, architects and engineers (Civil, Mechanical or Electrical) as the relative difference in their respective count is little. This represents a good background for the respondents as they (builders, architects, and engineers) are closely or directly involved in the hiring of labour or craftsmen for building construction process, hence the reliability of the information that they divulged.

**Table 4.6 Distribution of Respondents' Profession/Discipline by state**

State of Operation	Frequency	Percentage (%)	Cumulative %
<b>Lagos</b>	Builder	24	27.3
<b>State</b>	Architect	22	25.0
	Engineer	19	21.6

	Quantity Surveyor	13	14.8	88.6
	Others (Estate surveyor)	10	11.4	100.0
	<b>Total</b>	<b>88</b>	<b>100.0</b>	
<b>Ogun State</b>	Builder	15	23.1	23.1
	Architect	13	20.0	43.1
	Engineer	22	33.8	76.9
	Quantity Surveyor	10	15.4	92.3
	Others (Estate surveyor)	5	7.7	100.0
	<b>Total</b>	<b>65</b>	<b>100.0</b>	
<b>Oyo State</b>	Builder	15	25.9	25.9
	Architect	18	31.0	56.9
	Engineer	13	22.4	79.3
	Quantity Surveyor	9	15.5	94.8
	Others (Estate surveyor)	3	5.2	100.0
	<b>Total</b>	<b>58</b>	<b>100.0</b>	

*Source: Researcher's Field Survey*

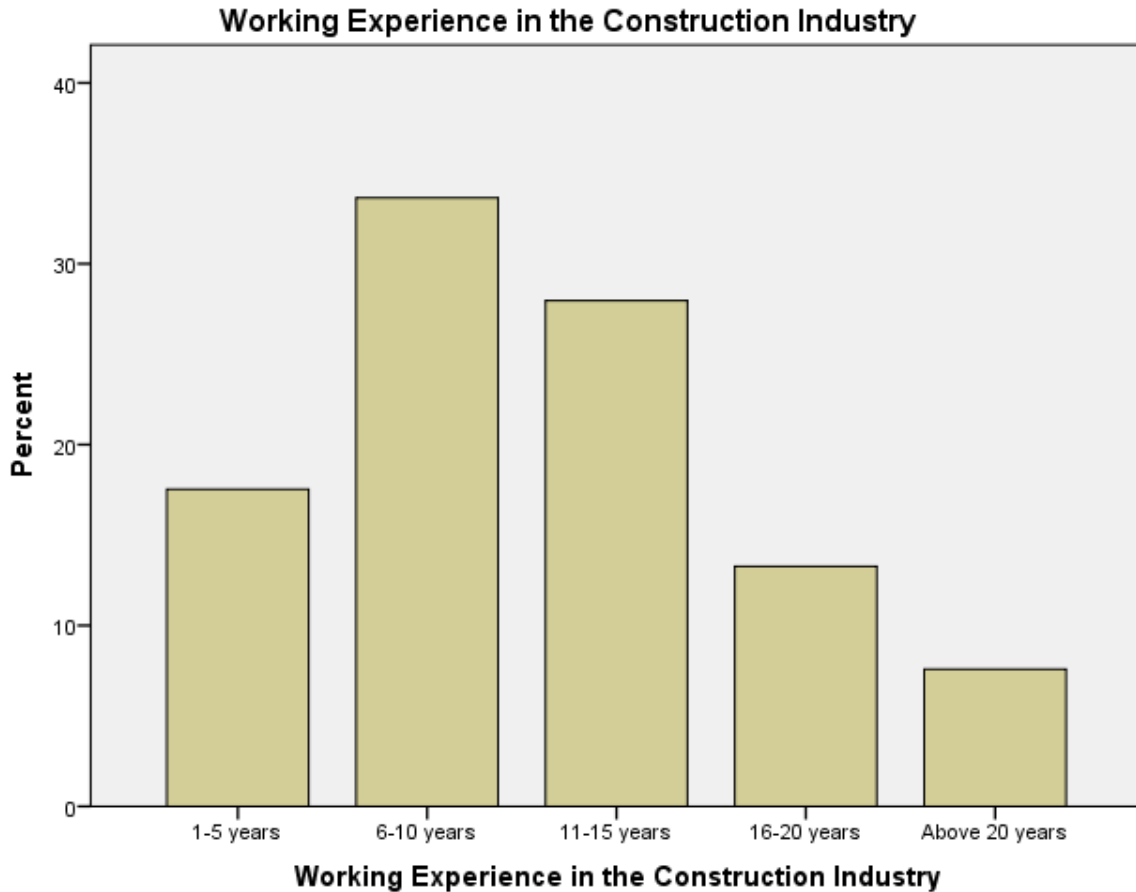
#### **. 4.5 WORK EXPERIENCE OF RESPONDENTS IN THE CONSTRUCTION INDUSTRY**

One of the benefits of work experience to this study is that the more the experience of the respondents in the construction industry, the more knowledge they have about the field and the more reliable the information they give. The work experiences of the respondents in the construction industry are shown and represented in Figure 4.1 below. The figure represents a normal distribution, as 37(17.5%) respondents have between 1-5 years of experience in the construction field, 71(33.6%) respondents however have between 6-10 years of experience in the field, which was the highest, while 59(28%) of the respondents have between 11-15 years of experience in the field, 28(13.3%) of the respondents have between 16-20 years of



experience in the construction field and the last category are those that have more than 20 years of experience in the construction industry, 16(7.6%) of them fall under this category.

**Figure 4.1 Work Experiences of Respondents in the Construction Industry**



*Source: Researcher's Field Survey*

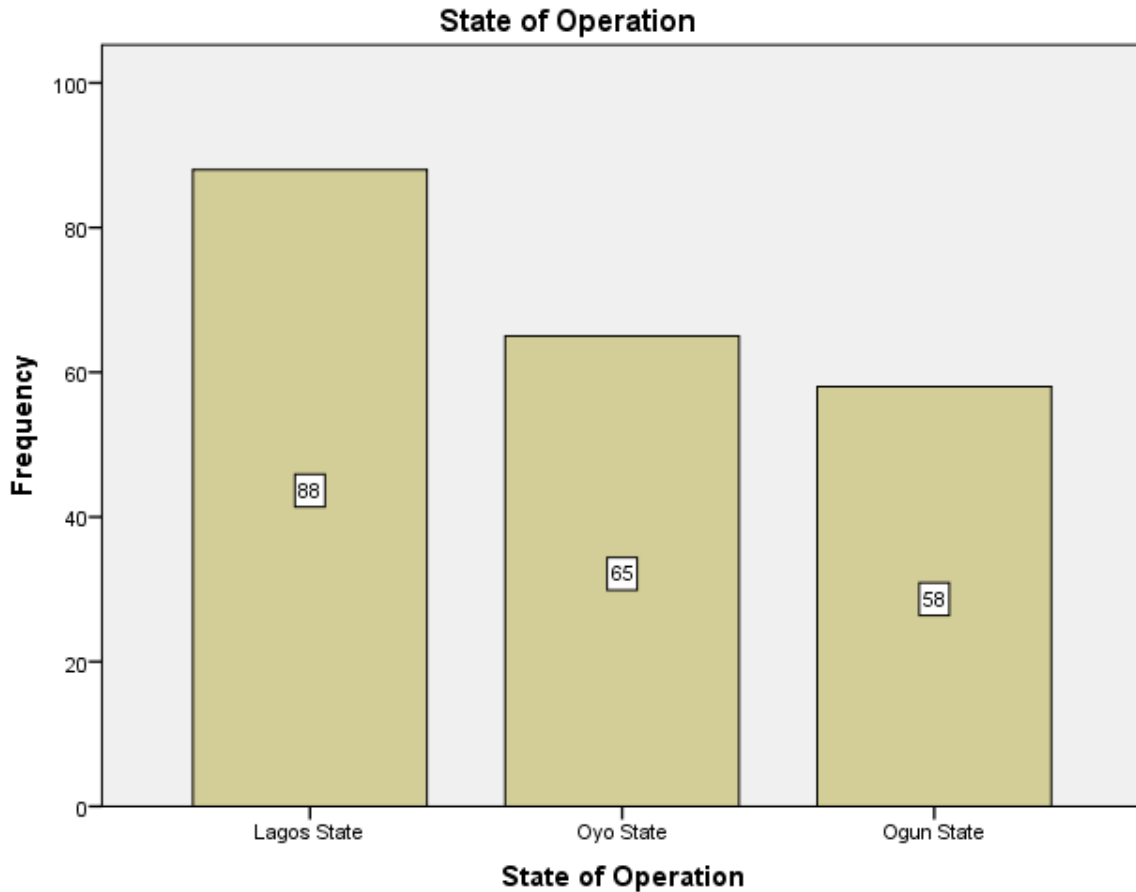
The figure above shows that majority of the respondents are well experienced in construction industry.

#### **4.6 RESPONDENTS' STATE OF OPERATION**

The three states where this research was conducted includes Lagos state, Ogun state and Oyo state. The figure 4.2 below presents the frequency of the respondents from each of those states. Most (88) (41.7%) of the respondents represented Lagos State, while 65(30.8%)

numbers of the respondents operates in Oyo State and 58(27.5%) of the total numbers of respondents operates in Ogun State.

**Figure 4.2 Respondents' State of Operation**



*Source: Researcher's Field Survey*

#### **4.7 CONSTRUCTION SKILL CATEGORY COMMON TO THE NIGERIAN BUILDING CONSTRUCTION INDUSTRY**

This section presents the results of the findings of the skill set categories that are common to the building construction industry in Nigeria. Table 4.7a below shows the mean responses to the common building construction craftsmen as gotten from the mean score of all the responses provided by the respondents to each crafts trade variable, as presented on the data collection instrument using a likert type scale.

**Table 4.7a Mean Score Response to Skill Categories Common to the Nigerian Building Construction Sector**

<b>Crafts Trade</b>	<b>Mean Score</b>
Masonry	4.39
Carpentry	4.29
Welding/Iron bending	4.20
Roofing	4.07
Plumbing	3.96
Electrical Installations	3.55
Mechanical Installations	4.14
Scaffolding	2.99
Glazing	2.90
Painting	4.36
Plastering/Rendering	4.42
Tiling	3.98
Unit Installation	3.06

*Source: Researcher's Field Survey*

Table 4.7a above presents the mean score of the responses to each craft trade category in no particular order. For proper inferences and conclusion to be drawn, the data were sorted by ranking the mean score for each variable in descending order; this is well presented in Table 4.7b below. According to the table, the crafts trade category that is most common to the building construction industry is plastering and rendering, which has a mean item score of 4.42, this trade is however closely related to masonry as the two can sometimes be grouped together. This relativity was confirmed by the result of this study as masonry, which is sometimes unconventionally referred to as bricklaying, came closely second (2nd) in the rank

order with a mean item score of 4.39. The result presents that painting is among the very common craft trade categories in the Nigerian building construction industry, with a mean item score of responses of 4.36 and ranking third on the Table 4.7b below. Painting is then followed by carpentry which has a mean score 4.29, having a high demand as well. The table also shows that welding/ iron bending has a high demand in the Nigerian building construction industry although coming behind plastering/ rendering, masonry, painting and carpentry to take the 5th place in the rank order after getting a mean score of 4.20. Mechanical installations and roofing are the next two crafts category with high demands in the industry as they possess mean scores of 4.14 and 4.07 respectively.

**Table 4.7b Skill Category Common to the Nigerian Building Construction Sector in a Rank Order**

Crafts Trade	Mean Score	RII	Rank
<b>Plastering/Rendering</b>	4.42	0.884	1st
<b>Masonry</b>	4.39	0.878	2nd
<b>Painting</b>	4.36	0.872	3rd
<b>Carpentry</b>	4.29	0.858	4th
<b>Welding/Iron bending</b>	4.20	0.840	5th
<b>Mechanical Installation</b>	4.14	0.828	6th
<b>Roofing</b>	4.07	0.814	7th
<b>Tiling</b>	3.98	0.796	8th
<b>Plumbing</b>	3.96	0.792	9th
<b>Electrical Installation</b>	3.55	0.710	10th
<b>Unit Installation</b>	3.06	0.612	11th
<b>Scaffolding</b>	2.99	0.598	12th
<b>Glazing</b>	2.90	0.580	13th

Mechanical installation ranks 6th, while roofing ranks 7th respectively. Thus, from the results, the construction skill categories that has high demand or very high demand in the Nigerian building construction industry in descending rank order includes; plastering/rendering, Masonry, Painting, Carpentry, Welding/Iron Bending, mechanical Installation, and Roofing as they all have mean item scores that fall between 4 (High Demand) and 5 (Very High demand).

The table also shows that Tiling, Plumbing, Electrical Installation and Unit Installation have mean scores that fall between 3 and 4, which means that their demand rate fall between medium demand rate and high demand rate. Tiling comes in the 8th rank with a mean item score of 3.98, while plumbing and Electrical installation rank 9th and 10th respectively with mean scores of 3.96 and 3.55 respectively. The result also presents Unit installation in rank 11 with a mean score of 3.06. The results however presents that these crafts trades; Tiling, Plumbing, Electrical Installation and unit Installation are common to the building construction industry in Nigeria but have relatively medium demands.

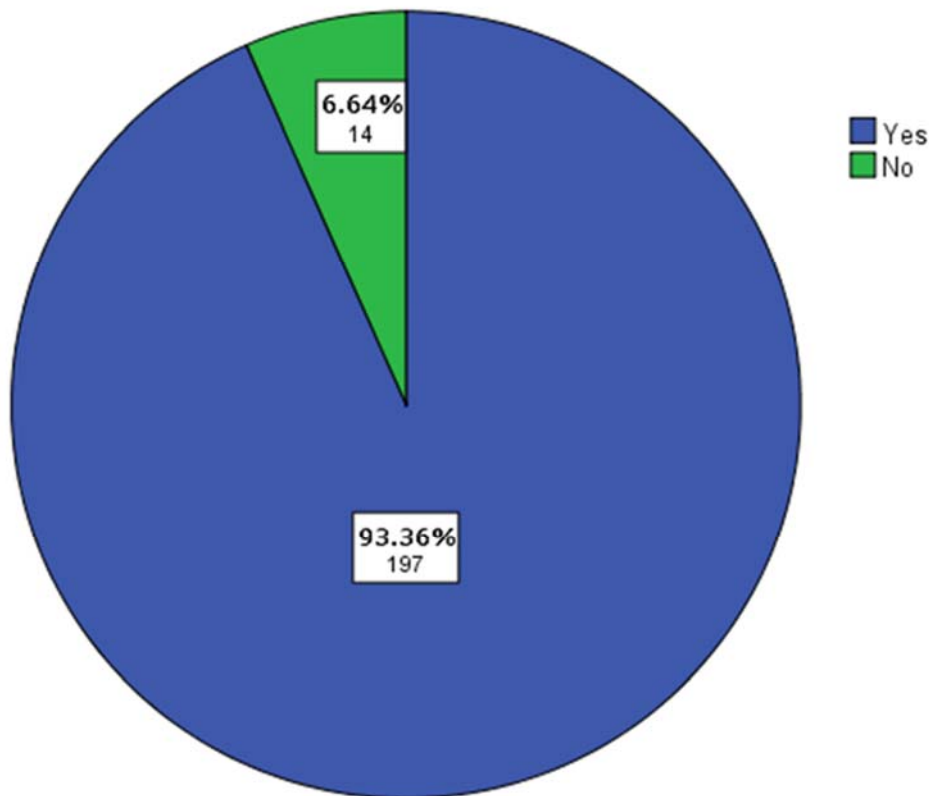
Also from Table 4.7b above, scaffolding and glazing occupy the last two spots on the rank table of skill crafts common to the building construction companies in Nigeria, taking the 12th and 13th spots respectively. They have mean item score of 2.99 and 2.90 respectively. What this mean is that scaffolding and glazing are however common to the Nigerian building construction industry but their demand rate is low compared to other craft trades.

Other crafts trades that were listed by the respondents includes Epoxy Flooring engineering which was said to have a relatively medium demand; Tampered Concrete flooring having a high demand especially around Lagos State, Wall and ceiling screeding and Plaster Board ceiling also having a relatively high demand. Furthermore, a notable observation about these

other crafts trades identified by the respondents is that they are crafts skill category under building finishes. This implies that crafts skill trades under building finishes have relatively high demand. The next section furthermore throws more light on the pattern of demand for building construction craftsmen.

#### 4.8 DEMAND PATTERN FOR BUILDING CONSTRUCTION CRAFTSMEN

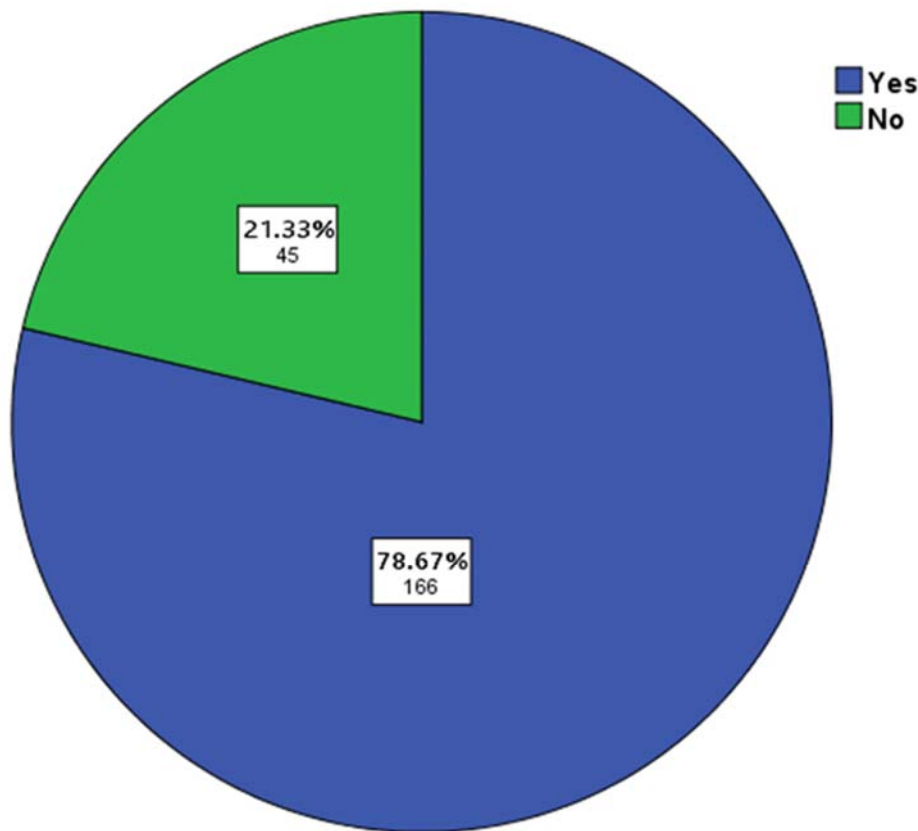
Demand pattern for building construction craftsmen in Nigeria was investigated and the results were analyzed and thus presented. However, majority of the respondents agreed that there are factors that contribute to the demand pattern of building construction craftsmen in Nigeria. As shown in Figure 4.3 below, majority of the respondents; 93.36% agrees that increase in demand for housing will result to an increase in demand for building construction craftsmen, while a negligible percentage of the respondents agree otherwise.



**FIGURE 4.3 Increase in Demand for Housing Will Lead to an Increase in Demand for Building Construction Craftsmen**

*(Source: Researcher's Field Survey)*

What this means is that the more the demand for the construction of new building structures, or the demand for maintenance of the existing ones, the higher the demand for building construction craftsmen. This confirms the labour intensive nature of the construction industry. Figure 4.4 below also presents that most of the respondents agree that materials and methods of construction determine the demand of building construction craftsmen. A majority of 78.67% of the respondents agrees and a minority of 21.33% disagrees.

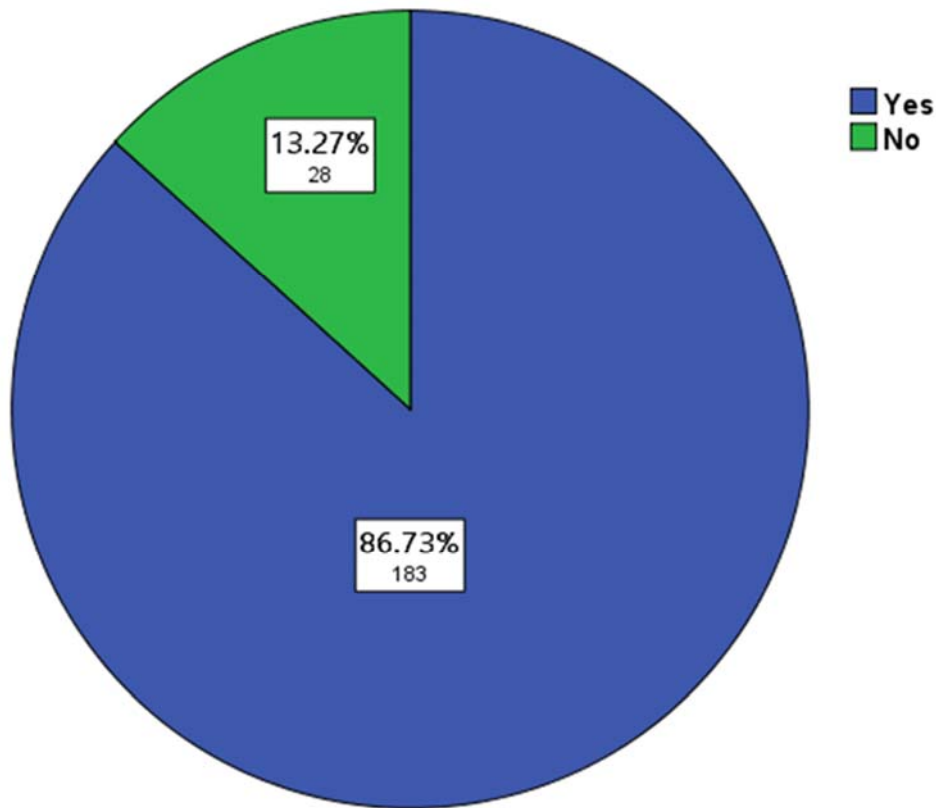


**FIGURE 4.4 Material And Methods of Construction Determines the Demand of Building Construction Craftsmen**

*(Source: Researcher's Field Survey)*

It can thus be said that the type of materials and the method of building construction determines the type, quantity and trade category of the craftsmen to be employed. By the way, since Figure 4.3 above confirmed that increase in demand for housing will result into an increase in demand for building construction craftsmen, it implies that the factors that affect the demand for housing will directly affect the demand for building construction craftsmen.

This statement is confirmed by the Figure 4.5 below. 86.73% of the respondents said ‘Yes’ to housing and demand for craftsmen sharing factors, while 13.27% answered ‘No’.



**FIGURE 4.5 The factors that affect demand for housing directly affects the demand for building construction craftsmen**

*(Source: Researcher’s Field Survey)*

The demand pattern for building construction craftsmen is described by the rate of their demand when investigated under different construction, natural, and socio-economic conditions. This study presented those conditions to the respondent in diverse forms and a likert type scale was employed to retrieve the respondent’s responses. The scale ranged from 1 to 5 (very low demand to very high demand). Table 4.8a .therefore presents the mean score of the responses of the respondents as regarding the demand rate under different conditions in no particular order. The demand rate for craftsmen for the construction of building structural members such as foundations, floor or slabs, walls, columns, beams and so on had a mean



score of 4.43. The demand rate for craftsmen for the construction and installation of building services such as plumbing, mechanical and electrical installations has a mean item score of 4.00.

**Table 4.8a Demand Pattern for Building Construction Craftsmen**

<b>Conditions</b>	<b>Mean Score</b>
Demand rate for the construction of building structure (Foundations, Floors/slabs, walls, Columns, Beams, etc.)	4.43
Demand rate for the construction/Installation of Building Services (Plumbing, Mechanical and Electrical Installations etc.)	4.00
Demand rate for the installation of building fittings (Windows, Doors, and Unit Installations etc.)	4.07
Demand rate for installation of building finishes (Plastering, Screeding, Painting, Tiling, Glazing etc.)	4.22
Demand rate for any crafts trade during cool and raining season	3.22
Demand rate for any craft trade during hot and dry Season	3.93
Demand rate for any crafts trade at periods of change in government	3.06
Demand rate for craftsmen for a relatively large building construction project	4.08
Demand rate when there is a mechanized alternative	3.06
Demand rate during festive periods	2.05

*(Source: Researcher's Field Survey)*

The demand for craftsmen for the installation of building fittings such as doors, windows, cabinets and other units has a mean item score of 4.07. But for the installation of building

finishes, the rate of demand of craftsmen that specializes in this area have a mean score of 4.22. These four aforementioned conditions are all construction related. However, considering nature driven conditions, the mean item score for the demand rate for any building construction craft type during cool and raining season is 3.22, while the mean score for the demand rate for any craft trade during hot and dry Season 3.93. For the socio-economic conditions, demand rate during periods of government change carries a mean item score of 3.06 and 2.05 score for demand rate during festive periods. Furthermore, the demand rate for building construction craftsmen for a relatively large building construction projects has a mean score response of 4.08 while, the mean response score for the demand rate when there is a mechanized alternative is 3.06.

The demand patterns for building construction craftsmen under certain condition are well presented in the Table 4.8b with a Relative Importance Index (RII) for each item as well as a descending rank order from the condition that commands the highest demand of building construction craftsmen to the condition that attract the lowest demand rate. From the table, it is evident that highest numbers of craftsmen are employed for the construction of building structural members such as walls, floors, etc. This is then followed by the finishing stage of a building construction which ranks 2nd on the table for high demand for building construction craftsmen. Demand rate for relatively large project ranks 3rd with a RII value of 0.816 while demand rate for the installation of building fittings (Windows, Doors, and Unit installations etc.) ranks 4th. Demand rate for craftsmen for the construction/installation of building Services (Plumbing, Mechanical and Electrical Installations etc.) ranks in 5th with a Relative Importance of 0.8 presenting a relatively high demand rate. The table also shows that the rate of demand of any building construction crafts is higher in dry and hot periods than in cool and wet conditions, with the two conditions having a RII of 0.786 and 0.644 with a rank of 6th and 7th respectively. Also, judging by the mean response scores, the demand for building

construction craftsmen is lowest when there is a mechanized alternative, a change in government as well as during festive seasons with the three conditions occupying 8th, 8th and 10<sup>th</sup> rank. The implication of this is that demand for craftsmen for the three conditions stated is relatively low.

**Table 4.8b Demand Pattern for Building Construction Craftsmen with Rank Order**

Conditions	Mean Score	RII	Rank
Demand rate for the construction of building structure (Foundations, Floors/slabs, walls, Columns, Beams, etc.)	4.43	0.886	1st
Demand rate for installation of building finishes (Plastering, Screeding, Painting, Tiling, Glazing etc.)	4.22	0.844	2nd
Demand rate for craftsmen for a relatively large building construction project	4.08	0.816	3rd
Demand rate for the installation of building fittings (Windows, Doors, and Unit Installations etc.)	4.07	0.814	4th
Demand rate for the construction/Installation of Building Services (Plumbing, Mechanical and Electrical Installations etc.)	4.00	0.800	5th
Demand rate for any craft trade during hot and dry Season	3.93	0.786	6th
Demand rate for any crafts trade during cool and raining season	3.22	0.644	7th
Demand rate for any crafts trade at periods of change in government	3.06	0.612	8th
Demand rate when there is a mechanized alternative	3.06	0.612	8th
Demand rate during festive periods	2.05	0.410	10th

*(Source: Researcher's Field Survey)*

#### 4.9 INVESTIGATING THE EXISTENCE OF SHORTAGE OF SKILLED CONSTRUCTION CRAFTSMEN AND ITS SEVERITY

Table 4.9 presents the results of the investigation of shortage of skilled construction in the study area. The table shows the mean item score of the respondents' responses collected through a likert-type scale investigating and measuring shortage of skilled craftsmen in each of the crafts trades listed. Table 4.9 also presents the rank order based on the mean score. From the data collection instrument, 1 represents 'No Shortage' and ranges to 5 which represents 'Very High Shortage'. Based on this, the highest ranked trade with craftsmen shortage is glazing and has a mean score of 3.28.

**Table 4.9 Existence and Severity of Shortage of Building Construction Craftsmen and its severity**

<b>Crafts Trade</b>	<b>Mean Score (Response to Shortage)</b>	<b>RII</b>	<b>Rank</b>
Glazing	3.28	0.656	1st
Mechanical Installation	3.21	0.642	2nd
Scaffolding	3.21	0.642	2nd
Roofing	3.01	0.602	4th
Electrical Installations	2.87	0.574	5th
Plumbing	2.80	0.560	6th
welding/iron bending	2.79	0.558	7th
Plastering/ Rendering	2.64	0.528	8th
Tiling	2.64	0.528	8th
Unit Installation	2.64	0.528	8th
carpentry	2.63	0.526	11th
Painting	2.57	0.514	12th
Masonry	2.46	0.492	13th

Craftsmen that do mechanical installations are also not readily sourced as the respondents confirmed that there is shortage in that craft trade. This is evident in the table 4.9 above as it ranks 2nd with a mean item score of 3.21. Also ranked 2nd is Scaffolding with the same mean score as mechanical installation. Roofing comes next in rank 4 with a mean item score of 3.01 which is then followed by electrical installations and plumbing in 5th and 6th ranks respectively with a mean scores of 2.89 and 2.79 respectively. Craftsmen for welding and iron bending has a mean score 2.79 in shortage rate. The table also shows that plasterers, tilers and unit installers have low shortage as though they rank 8th each, all with a mean item score of 2.64. Carpenters, painters and masons appear to have the lowest shortage incidence. They occupy ranks 11th, 12th and 13<sup>th</sup> ranks with mean item response scores of 2.63, 2.57, and 2.46 respectively.

What the results from this study implies is that there still exists shortage of craftsmen in the building construction industry in Nigeria. The result however corroborated the assertions made by Obiegbu (2002) and Njoku (2007) that shortage of skilled craftsmen exists in the Nigerian construction industry. Although, this study shows that the shortage is not severe. The mean response of the respondents towards the existence of shortage lies between 3.28 for the crafts with the highest shortage of craftsmen and 2.46 for the crafts with the lowest shortage of craftsmen. From Table 4.9, the trade with the lowest shortage of craftsmen is masonry. This explains that masons are relatively available; this was followed by painters, carpenters, unit installers, tilers, plasterers, plumbers and electricians. The results presents high shortages of craftsmen in the following trades; glazing, mechanical installations (installation of Heat Ventilation and Air conditioning systems HVAC, Lift and escalators and so on), and scaffolding. Also noticeable is how the shortage rate of these craftsmen relates with the pattern of demand of these crafts described in the previous section.

The pattern of demand shows that more of the craftsmen are required for the construction of building structural members, for building finishes, for unit installation and for installation of building services; electrical and mechanical in that order. It can therefore be confirmed that there are less shortage for craftsmen in crafts that has a high demand pattern in the building construction industry. It could be stated that there is posterity in crafts with high demand pattern; that is, most people learn trades that they feel are viable for them to get employed easily so as to meet ends' need. This could be the justification for shortage of craftsmen for some crafts in the building construction industry in Nigeria as their demand rate might not be high or common.

#### **4.10 EFFECT OF BUILDING CONSTRUCTION CRAFTSMEN AVAILABILITY ON CONSTRUCTION PROJECT PERFORMANCE**

According to the past works; time, cost, quality, and productivity has been the key measures of building construction project performance. This section however presents the results of the inquiry made to examine the effects of construction craftsmen availability on construction project performance.

Accordingly, Eighteen (18) major variables were culled from the literature review. These variables present statements of likely relationship between availability of skilled craftsmen and construction project performance. These variables were then presented to the respondents to solicit their views based on their experiences. On each of the 18 variables, respondents were asked to indicate the extent to which each statement is significant based on their experiences in the building construction industry, on a five – point scale where 1- Insignificant, 2-Less Significant, 3-Moderately Significant, 4-Significant, 5-Very Significant. In order to empirically ascertain the effects of the availability of building construction

craftsmen on the performance of building construction projects, the Relative Importance Index (RII) was employed.

The mean score, the RII and the rank order of each response variable is shown in the figure 4.10 below. 'Rework leads to time overrun' is the most significant statement of fact according to the results presented, with a mean item score of 4.67 and a RII 0.934. Thus time overrun is a bane to a successful construction project and unavailability of skilled craftsmen would result in rework. This statement was confirmed in the second variable, that "engaging competent craftsmen would reduce rework" has a mean score of 4.60 and very significant in rank two (2). Quite a large number of the respondents agrees that the unavailability of skilled craftsmen leads to poor workmanship, which is a quality measure of construction project performance. Furthermore, with a mean item score of 4.43 and a relative index of 0.886 and in rank 4 is that rework leads to cost overrun. As it has been earlier established that engaging skilled craftsmen would reduce rework, availability of skilled craftsmen there have its effect on cost performance of a building construction project. The study also shows that poor workmanship also leads to rework in building construction project.

Most of the respondents attest that efficient craftsmen increase labour productivity and hence project performance. They also agreed and confirmed that access to enough skilled craftsmen would reduce downtime or idle time during building construction projects. Furthermore they confirmed that accessibility of craftsmen would ensure timely execution of projects. These statements all have a mean item scores of 0.870, 0.866 and 0.856 respectively.

Results show that unavailability of competent craftsmen would lead to time overrun in projects and the otherwise will boost time performance of any building construction project. This is related to the time performance measure of project.

**Table 4.10 Building Construction Craftsmen Availability and Construction Project Performance**

<b>Project Performance Measures</b>	<b>Mean Score</b>	<b>RII</b>	<b>Rank</b>
Rework leads to time overrun	4.67	0.934	1st
Engaging skilled craftsmen would reduce rework	4.60	0.920	2nd
Unavailability of skilled craftsmen leads to poor workmanship	4.50	0.900	3rd
Rework leads to cost overrun	4.43	0.886	4th
Poor workmanship leads to rework	4.38	0.876	5th
Efficient craftsmen increases labour productivity	4.35	0.870	6th
Access to enough skilled craftsmen would reduce downtime or idle time	4.33	0.866	7th
Easy access to skilled craftsmen would ensure timely execution of projects	4.28	0.856	8th
Unavailability of competent craftsmen would lead to time overrun in projects	4.23	0.846	9th
Poor workmanship would reduce profit for contractors	4.21	0.842	10th
Engaging efficient craftsmen will help a construction project meet the required standard or quality	4.21	0.842	10th
Clients are often satisfied with their products when efficient and skilled craftsmen are used	4.21	0.842	10th
Easy access to enough skilled craftsmen allow for hiring the best of the best for best performance.	4.21	0.842	10th
Availability of competent and efficient craftsmen would help project to be executed within budget and schedule	4.18	0.836	14th
On site productivity will be reduced when there are no adequate skilled craftsmen	4.14	0.828	15th
Durable and defect free are the products of skilled craftsmen	4.14	0.828	15th
Low supply of quality craftsmen would prolong the planned schedule for construction process	4.07	0.814	17th
Availability of skilled craftsmen would ensure availability of labour resources	4.00	0.800	18th

*(Source: Researcher's Field Survey)*



The respondents confirmed that poor workmanship would reduce profit for contractors and reduce value for customers. Moreover, engaging efficient craftsmen will help a construction project meet the required standard or quality. Results also confirmed that clients are often satisfied with their products when efficient and skilled craftsmen are used. Easy access to enough skilled craftsmen allow for hiring the best of the best for best performance.

Availability of competent and efficient craftsmen would help project to be executed within budget and schedule. On site productivity will be reduced when there are no adequate skilled craftsmen. Availability of building construction craftsmen will make durable and defect free products. Low supply of quality craftsmen would prolong the planned schedule for construction for construction process and availability would mean availability

In summary, due to the labour intensive nature of building construction industry, the availability of construction craftsmen has a huge impact on the performance of any building project. Their possessed skills are also as important in a good building project delivery. The availability of these craftsmen has effect on all the measures of project performance, namely; time, cost, quality and productivity.

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 PREAMBLE**

This chapter presents the summary and conclusion of the main research findings in line with the objectives of the study; also the key issues and recommendations suggested to help harness the problem earlier stated in the study. Other suggested areas for further future research are also recommended.

#### **5.2 RESEARCH SUMMARY**

The primary aim of this study was to investigate the availability of construction craftsmen with a view to examining its effects on construction project performance in the Nigerian construction industry, with the following objectives; To identify the construction crafts skill categories common to the Nigerian building industry and to also examine their pattern of demands; To investigate the existence of shortage of skilled construction craftsmen and the severity of such shortages in the study area; To examine the effects of construction craftsmen's availability on construction project performance. The scope of this study was limited to selected south-western states in Nigeria, namely; Lagos, Ogun and Osun State. To achieve these objectives, a survey was developed and data from 211 respondents were collected and analyzed.

The research conclusions were based on a univariate analysis of data. From the results of the analysis, the construction crafts skill category common to the building construction industry in Nigeria includes; Plastering/Rendering, masonry, painting, welding/Iron bending, mechanical installation, roofing, tiling, plumbing, electrical installations, unit installation, scaffolding and glazing in an order of very high demand to very low demand. This presents answers to the first question posed by the research, which is; what are the constructions crafts skill categories common to the Nigerian building industry?

The demand pattern for building construction craftsmen in Nigeria was investigated and the results shows that increase in demand for housing will result to an increase in demand for building construction craftsmen, the type of materials and the method of building construction determines the type, quantity and trade category of the craftsmen to be employed and that the factors that affect the demand for housing will directly affect the demand for building construction craftsmen. The noticeable patterns in the demand of craftsmen includes, demand for craftsmen that is highest during the construction of building structural members, such as walls, floors and slabs, the second highest demand rate is during the finishing stage, for instance, painting, tiling, ceiling and other building finishes, which is the followed by installation of building fittings such as doors, windows and so on also followed by that of building services. Building construction craftsmen demand pattern considering some socio-cultural factors shows that the rate of demand is relatively low during festive periods, at periods of change in government, and during cool and raining season.

Results also present the results from the investigation of the existence of shortage of skilled construction craftsmen and its severity. Results show that shortage of craftsmen still exists but the shortage is not severe. A relationship between demand pattern and the shortage rate was also established as it appeared that there are mild shortages for craftsmen in crafts trades whose pattern of demand results in a high demand rate in the building construction industry.

In achieving the last objective of the study, results from the analysis gave indication on how building construction craftsmen availability affects construction project performance with regards to performance indicators time, cost and quality. Results shows that unavailability of competent craftsmen would lead to time overrun, cost overrun, poor output quality, on site productivity will be reduced when there are inadequate craftsmen. The availability of construction craftsmen therefore has a huge impact on the performance of any building project. Their skills they posses are also as important in a good building project delivery.

### 5.3 CONCLUSIONS

In view of the results of the analysis for this research, the following conclusions were deduced from the study.

- Certain skill categories are common to the building construction industry in Nigeria, due to their rate of demand. They include Plastering/Rendering, masonry, painting, welding/Iron bending, mechanical installation, roofing, tiling, plumbing, electrical installations and so on.
- There is a demand pattern to building construction craftsmen in Nigeria. Most craftsmen are demanded during the construction of building structural members, such as walls, floors and slabs, the second highest demand rate is when installing building finishes, for instance, painting, tiling, ceiling and other building finishes, which is followed by installation of building fittings such as doors, windows and so on.
- In corroboration to previous studies, shortage of building construction craftsmen still exists in the Nigerian building construction industry, but contrary to previous studies about its severity, the present shortage is no more severe.
- There exist mild shortages in trade crafts that are frequently demanded. This establishes a relationship between shortages of craftsmen and demand pattern of the building construction craftsmen.
- There is also an important relationship between the availability of building construction craftsmen and building construction project performance. It affects all the performance indicators of time, cost, quality and productivity.
- The skills possessed by the craftsmen also have an effect on building construction project performance indicators of time, cost, quality and productivity.

## **5.4 RECOMMENDATIONS**

Based on the conclusions of this study, the following recommendations were made;

- Effective skill development programs must be made available by the government at every level to allow training of existing and intending craftsmen by subsidizing or funding vocational training with the purpose of enhancing effective project performance.
- Having a wage structure that is enticing as well as unified wage structure for the skilled crafts will encourage new entrant to learn building construction crafts trades.
- Acquiring multiple skills should be encouraged so as to have enough skilled craftsmen readily available for all crafts trade irrespective of the demand pattern building construction craftsmen

## **5.5 AREAS FOR FURTHER RESEARCH**

The research results have identified several areas that require further research efforts and are detailed below;

- The scope of this study was limited to the southwestern part of Nigeria. Further studies should be done to focus on other geopolitical zones in Nigeria as pertaining to the research topic so as to have a broader view of the research inquiry, as a larger data range will boost the dataset distribution.
- More lights should also be thrown on the relationship between the availability of building construction craftsmen and the pattern of demand of these craftsmen. That is, check for the effects of demand pattern on the availability of building construction craftsmen.

- Another area worth investigating is the turnover of building construction craftsmen, that is, the rate at which building craftsmen leave the building construction industry for other industries.

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**APPENDIX**  
**QUESTIONNAIRE**  
**ON**  
**CONSTRCUTION CRAFTMEN’S AVAILABILITY AND PROJECT**  
**PERFORMANCE IN SELECTED SOUTHWESTERN STATES IN NIGERIA**

Dear Respondent,

This questionnaire is part of a research which aims at studying the existence of construction craftsmen and how it affects the performance of building projects. This study is strictly an academic exercise and all data provided will be treated as strictly confidential. I hereby solicit for sincere and accurate responses.

Thank you for your anticipated cooperation.

Asiyanbola Olatomide David,  
*(Researcher)*

**SECTION A: Respondent Professional Background**

1. Educational level

ND/HND [ ] BSc/BTech/BEng [ ] MSc/ Phd [ ]

Other(specify).....

2. Role held in firm

Project Manager [ ] Site Manager [ ] Contractors [ ] Consultants [ ]

Sub-contractor [ ]

3. Profession/ Discipline

Builder [ ] Architect [ ] Engineer [ ] Quantity Surveyor [ ]

Others (indicate please) .....

4. Working Experience in the Construction Industry

1-5 years [ ] 6-10 years [ ] 11-15 years [ ] 16-20 years [ ] Above 20 years [ ]

5. State of Operation

Lagos State [ ] Ogun State [ ] Oyo State [ ]

**SECTION B: Construction Skill Category Common to the Nigerian Building Construction Industry.**

Kindly tick the appropriate box on how frequent or common the following crafts trades category are demanded in the Nigerian construction industry using (1= Very low demand; 2= Low demand; 3= Medium demand 4= High demand 5= Very high demand)

S/N	Crafts Trades	1	2	3	4	5
1	Masonry					
2	Carpentry					
3	Welding/iron bending					
4	Roofing					
5	Plumbing					
6	Electrical installation					
7	Mechanical installations					
8	Scaffolding					
9	Glazing					
10	Painting					
11	Plastering/ Rendering					
12	Tiling					
13	Unit Installation					
14	Others (If any)(Specify and rank)					
.						
.						
.						

**SECTION C: Demand Pattern for Building Construction Craftsmen**

Kindly tick the appropriate box on the rate of demand of building construction craftsmen during the following construction stages and other period factors using (1= Very low demand; 2= Low demand; 3= Moderate demand 4= High demand 5= Very high demand)

S/N	Description	1	2	3	4	5
1	Demand rate for the construction of building structure (Foundations, Floors/slabs, walls, Columns, Beams, etc.)					
2	Demand rate for the construction/Installation of Building Services (Plumbing, Mechanical and Electrical Installations etc.)					
3	Demand rate for the installation of building fittings (Windows, Doors, Unit Installations etc.)					
4	Demand rate for installation of building finishes (Plastering, Screeding, Painting, Tiling, Glazing etc.)					

		1	2	3	4	5
5	Demand rate for any crafts trade during cool and raining season					
6	Demand rate for any craft trade during hot and dry Season					
7	Demand rate for any crafts trade at periods of change in government					
8	Demand rate for craftsmen for a relatively large building construction project					
9	Demand rate when there is a mechanized alternative					
10	Demand rate during festive periods					

12. Do you agree that increase in demand for housing will lead to an increase in demand for building construction craftsmen? Yes [ ] No [ ]
13. Does the material and method of construction determine the demand of building construction craftsmen? Yes [ ] No [ ]
14. Do the factors that affect demand for housing directly affect the demand for building construction craftsmen? Yes [ ] No [ ]

**SECTION D: Investigating the Existence of Shortage of Skilled Construction Craftsmen and its severity**

Kindly tick the appropriate box on the rate of shortage of skilled craftsmen in the following crafts trades common to the Nigerian building construction industry using (1= No shortage 2=Very low Shortage; 3= Low Shortage; 4= High shortage; 5= Very high Shortage)

S/N	Craft Trades	1	2	3	4	5
1	Masonry					
2	Carpentry					
3	Welding/iron bending					
4	Roofing					
5	Plumbing					
6	Electrical installation					
7	Mechanical installations					
8	Scaffolding					
9	Glazing					
10	Painting					
11	Plastering/ Rendering					
12	Tiling					
13	Unit Installation (Doors, Windows, cabinets etc.)					

**SECTION E: Effect of Building Construction Craftsmen Availability on Construction Project Performance**

Kindly rank each of the statements below using scale **1= Insignificant 2= Less significant 3= moderately significant 4= Significant 5= Very significant**

S/N	Description	1	2	3	4	5
1	Easy access to skilled craftsmen would ensure timely execution of projects					
2	Availability of skilled craftsmen would ensure availability of labour resources					
3	Engaging skilled craftsmen would reduce rework					
4	Access to enough skilled craftsmen would reduce downtime or idle time					
5	Unavailability of competent craftsmen would lead to time overrun in projects					
6	Low supply of quality craftsmen would prolong the planned schedule for construction process					
7	Unavailability of skilled craftsmen leads to poor workmanship					
8	Poor workmanship leads to rework					
9	Rework leads to time overrun					
10	Rework leads to cost overrun					
11	Poor workmanship would reduce profit for contractors					
12	Availability of competent and efficient craftsmen would help project to be executed within budget and schedule					
13	Engaging efficient craftsmen will help a construction project meet the required standard or quality					
14	On site productivity will be reduced when there are no adequate skilled craftsmen					
15	Durable and defect free are the products of skilled craftsmen					
16	Clients are often satisfied with their products when efficient and skilled craftsmen are used					
17	Efficient craftsmen increases labour productivity					
18	Easy access to enough skilled craftsmen allow for hiring the best of the best for best performance.					

**CONSTRUCTION CRAFTSMEN'S AVAILABILITY  
AND PROJECT PERFORMANCE IN SELECTED  
SOUTHWESTERN STATES, NIGERIA**

***BY***

**ASIYANBOLA OLATOMIDE DAVID**

**16PCB01330**

A PROJECT SUBMITTED TO THE DEPARTMENT OF BUILDING  
TECHNOLOGY, COLLEGE OF SCIENCE AND TECHNOLOGY,  
COVENANT UNIVERSITY, OTA, IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE (M.Sc)  
DEGREE IN CONSTRUCTION MANAGEMENT

MAY, 2018

## DECLARATION

I, Asiyanbola Olatomide David, declare that this research work is done by me under the careful supervision of Professor O.I. Fagbenle. This research project has not been presented for any degree elsewhere

All references are duly cited and acknowledged appropriately

.....

.....

Asiyanbola Olatomide David

Prof. O.I. Fagbenle (Supervisor)

## CERTIFICATION

I hereby certify that this study was carried out by Asiyanbola Olatomide David (16PCB01330) in partial fulfillment of the requirements for the award of a Master of Science degree in Construction Management from the Department of Building, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria.

Prof. O.I. Fagbenle ..... (Supervisor)	.....  Signature	  Date
--	------------------------	--------------

Dr. L.M. Amusan ..... (Head of Department)	.....  Signature	  Date
--	------------------------	--------------

Prof. S.T. Wara ..... (Dean of SPS)	.....  Signature	  Date
---	------------------------	--------------

## **DEDICATION**

This work is dedicated to the almighty God for his faithfulness and overwhelming grace upon me to do exploits.



## ACKNOWLEDGEMENT

I want to use this medium to appreciate the wonderful people God used in helping me fulfill this study as a requirement as well as during the course of the main program itself.

I want to appreciate my wonderful supervisor in person of Professor O.I. Fagbenle for his tutelage and guidance towards the success of this study; I so much appreciate the time and efforts sir. My appreciation also goes to the present and immediate past heads of department in persons of Dr. L.M. Amusan and Dr. J.D. Owolabi respectively. Also I must acknowledge the efforts of Prof Odeyinka, Dr Ameh and Dr Ogunsanmi for impacting me with the right knowledge during my course work. Thank you all for the love and cares and mentorship.

I really appreciate my parents; Pastor and Deaconess Asiyanbola for their cares, love and support in all my endeavors. You two have been the best parents anyone can ask for. I thank God for the privilege that I came to be through you, I love you both. I also appreciate my siblings; Biyi, Esther, Praise and Delight Asiyanbola, also my friends and colleagues; Tosin Olusada, Ugochukwu Anih, Gerrard Nwabueze, Kemi Ayodele, Opeyemi Fasanya, Aiyelabola Ayoola, Tiena Doyah, Tomisin Akinbo, Faith Osawaru, Ladi Awotinde, Faniyi Olasunkanmi, Anisere Temitope, Lawal Beloved, Opeyemi makeinde and many more others for their support all through the course of this program. I love you all.

God bless you all.

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## ABSTRACT

Construction activity plays a vital role economic growth and development of any nation by creating employment opportunities as well as housing for habitation or for conducting other business activities. The construction industry is labour intensive and the efforts of its craftsmen towards an efficient performance cannot be overemphasized. Studies in the past have established the shortage of craftsmen in the industry and lack of adequate resources is said to have compounded performance problem in the Nigerian construction industry. This study therefore investigates the availability of construction craftsmen with a view to examining its effects on construction project performance in the Nigerian construction industry by identifying the construction crafts skill categories common to the Nigerian building industry, examining the patterns of demand for building construction craftsmen, investigating the existence of shortage of skilled construction craftsmen and examining the possible effects of construction craftsmen's availability on construction project performance. The survey study utilized both secondary data from past works and primary data sourced by administering a structured questionnaire to construction professionals of indigenous construction firms located across Oyo, Ogun and Lagos state. A total of 278 questionnaires were distributed in strata and (211) copies of questionnaires in total were filled and returned representing a 75.9% return rate across the three (3) states. The breakdown across the three states showing the numbers of questionnaire distributed and (the quantity filled out) presents; 137(88), 73(65), 68(58) in Lagos, Oyo and Ogun state respectively. A five point likert scale was used to rank factors and collected data were analyzed using Relative Importance Index (RII). The results showed that Plastering/Rendering, masonry, painting, and welding/Iron bending, are the common crafts trade in the Nigerian building construction industry. Results also established series of demand pattern for building craftsmen. In corroboration to previous studies, this study confirmed that shortage of building construction craftsmen still exists, but on a contrary to previous studies about its severity, the shortage is presented to be less severe. The study also established a directly proportional relationship between the availability of building construction craftsmen and building construction project performance indicators of time, cost, quality and productivity.

**Key Words:** Building Construction, Craftsmen, Project Performance.