ASSESSMENT OF PROFESSIONAL'S PERCEPTION OF KNOWLEDGE AND SKILLS REQUIREMENT OF CONTRACTORS FOR MASS HOUSING CONSTRUCTION

By

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DECLARATION

I declare that the work in this Thesis entitled ASSESSMENT OF PROFESSIONAL'S PERCEPTION OF KNOWLEDGE AND SKILLS REQUIREMENT OF CONTRACTORS FOR MASS HOUSING CONSTRUCTION has been carried out by me in the Department of Quantity Surveying. The information derived from the literature has been duly acknowledged in text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other institution.

_____	_____	_____
Sunday Anyam YARO	Signature	Date

CERTIFICATION

This thesis entitled ASSESSMENT OF PROFESSIONAL'S PERCEPTION OF KNOWLEDGE AND SKILLS REQUIREMENT OF CONTRACTORS FOR MASS HOUSING CONSTRUCTION by Sunday AnyamYARO meets the regulations governing the award of the degree of Master of Science (Project Management) of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to my late father, Mr. Ahua Anyam Yaro; my late brother James Adege Yaro; my beloved nephew, Jonathan D. James; My Mum, my siblings and Gaints Moulding Forum Yebu.

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ABSTRACT

Housing is an important indicator for determining the level of development of a society or country. Nigeria has high deficit of housing needs for her citizens and mass housing has been identified as a strategy for filling the gap. The construction of housing requires expertise from the players of the industry especially the constructors (Contractors) to ensure safe and hygienic housing. But absence of requisite knowledge and skills amongst mass housing contractors has been identified as part of the key contributors to the continuous decline in the performance of the Nigerian mass housing construction projects. This research presented findings of an exploratory study aimed at determining the key knowledge and skills required for performance of contractors in construction project delivery. A total of 200 questionnaires were distributed to Architects, Builders, Engineers, Quantity Surveyors and Project Managers working either in consultancy or client organisations. Feedback received from these professionals were analysed using both descriptive and inferential statistics with the aid of SPSS 16.0. Results indicated three broad categories of knowledge and skills that support performance of contractors in construction project delivery: managerial, technical and generic knowledge and skills. Twenty seven (27) identified knowledge and skills underlying the three broad categories were found to fall between moderate to high impact on contractors' performance with weighted mean values between 3.26-4.35. The levels of the contractors' proficiency in the identified knowledge and skills areas were also analysed. The result suggests knowledge and skills gap with weighted mean values between 2.68-3.37 which need to be resolved through contractors training and education. Ten (10) skills and knowledge areas were found to be core due to their high impact on contractors' performance; these are project management and leadership, construction technology, financial management, building code and regulations, communication, teamwork and relationship management, human resource management, creative and innovative ability , risk management, and trade-specific technical know-how. The identified core knowledge and skills was therefore recommended as the basis for contractors' education and training programme aimed at improving their performance in the Nigerian mass housing sector.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Housing is an important indicator of the physical, economic and social development of any nation. It is difficult to talk about the success of a nation, or a society within a nation without analyzing its housing situation. Housing is one of the best indicators of a person's standard of living and his or her place in the society (Nubi, 2000). Housing represents one of the most basic human needs. As a unit of the environment, it has a profound influence on the health, efficiency, social behavior, satisfaction and general welfare of the community (Onibokun 1998). Housing provides a link between the physical development of a city, and its social and economic outcomes. The availability of decent housing for each family defines the level of development which the country has reached. This is because the social and economic wealth of the country can only co-exist with good housing (Alao, 2009).

In 2005 Nigeria housing deficit is estimated to be between 12million to 14 million (Adejumo, 2008 and Oluwaluyi, 2008). According to Babade (2007), to adequately house the urban population in Nigeria, a conservative figure of 409,227 housing units should have been constructed in 1990. Due to neglect, the figure rose to 783,042 units in 1995; 1,333,176 units in the year 2000; 1,543,318 units in 2003 and 2,171,603 units in 2010. This is serious, considering the great significance of the housing sector to the Countries economy. The estimated amount required to provide for the deficit housing units is estimated at US$150-200 billion. The United Nations estimates that Nigeria's population to be 141 million in 2005, and predicted that it would reach 289 million by 2050 (Encarta, 2007). This means the demand and supply will continue to widen if nothing is done immediately. In order to close the deficit gap, researchers suggest that mass housing is the solution. It will provide high number of housing stock in a short time at a lower cost (Okpala, 1985; Onibokun, 1985;

Nubi, 2000; Ahadzie *et al.,* 2007 and Alao, 2009). Nigerian government at different levels adopted the mass housing scheme to meet this urgent need instead of dealing with it one by one (economics of scale). Mass house building projects constitute the single largest construction sector in terms of employment of human resources and value-added in most economies (Wells, 1999; Zawdie & Langford, 2000). Subsequently, in many developing countries, these projects have, by and large, emerged as the largest and most established project based sector in project management practice. In Abuja the predominant construction activity is mass housing, Abuja is the fastest growing capital city in Africa. These houses most often fail in performance when constructed. According to Ogunlana *et al.,* (1996) the failure of any construction project is mainly related to problems in performance.

This failure in performance is attributed to stakeholders carrying out construction activities which the contractor is one of the key players in the delivery of the project objectives (Xiao & Proverbs, 2002). The correct choice of construction contractor(s) to deliver project objectives as design is a critical function of either the client or the client's consultant/project manager. It usually has a significant impact on the success or failure of a project. The performance of a project will definitely correlate with the performance of a contractor (Ajayi & Ogunsanmi, 2010). The Nigerian construction industry is beset with many problems, such as uncompleted projects, poor quality of work, low productivity, non-compliance with specifications/standards, use of substandard building materials and equipments, the employment of incompetent contractors, lack of technical education (knowledge), managerial skills and finance (Aniekwu & Okpala, 1998; Oloyede, *et al.,* 2010; Ajayi & Ogunsanmi, 2010).

A focus on contractors' upskilling needs is therefore crucial especially in mass housing sector which constitute a major component of construction activities in Abuja. The acquisition of relevant knowledge and skills is crucial for contractors' performance (Egbu,

1999 & Mbachu, 2012). It is the responsibility of every nation to nurture, develop and equip her contractors with the available projects so as to have the required experience with which to execute all complexities of national construction challenges. The inability of Nigeria contractors to possess requisite knowledge and skills has led to outsourcing of foreign contractors.

Mbachu (2012) provides the basic knowledge and skills required for contractors to perform in construction projects. If the performance of contractors in mass housing constructions is to be relevant, then the underlying knowledge and skills need to be prioritized to reflect the required knowledge and skills of contractors to perform in mass housing construction projects. This will help contractors to reflect positively on the best practice to improve their performance in mass housing projects.

1.2 STATEMENT OF THE PROBLEM

Nigerian construction industry is dominated by foreign companies in which most of the construction works are being undertaken by expatriates (Adams, 1997 and Odediran *et al.*, 2012).This is due to the deficiencies and incapability of the indigenous firms in areas of financial effectiveness, innovations, dynamism among others (Olugboye, 1998), shortage of Contractors knowledge and skills to meet client demands (Mbachu, 2012). This has resulted in an unwholesome dependence on foreign counterparts (Odediran *et al.*, 2012). A large proportion of these major constructing firms in Nigeria are subsidiaries/affiliates of European, North American and Asian construction firms. The choice and preference for engaging foreign contractors as compared with other indigenous contractors is majorly on lack of technical competence (knowledge), deficiency in managerial skills and planning (Ogbebor, 2002; Chen *et al.,* 2007; Ajayi & Ogunsanmi, 2010 and Odediran *et al.,* 2012).

Based on the above, it is recommended that emphasis should be placed on developing training programmes and educating of local contractors to meet up with current and emergent

technology and innovation (Adams, 1997; Tunji-Olayeni & Omuh, 2012; Odediran *et al.,* 2012 and Mbachu, 2012). However, the Identification and prioritisation of these knowledge and skills along the lines of their relative levels of importance or impact on performance, the extent to which contractors possess these knowledge and skills and a clear understanding that will inform contractors' training, education and competency areas in Nigeria is unclear.

1.3 JUSTIFICATION

The technologies, knowledge and skills with which routine jobs were executed in previous years are no longer adequate for the challenges and competitions in today's business landscape. Technical efficiencies are no longer enough; a broad range of knowledge and skills is now a must-have for survival, growth and sustenance of every business especially the construction sector. This is heightened by the increasing emphasis on the knowledge economy (Mbachu, 2012).

Nigerian contractors are faced with the problems of lack of technical education, managerial skill and finance when compared with their counterparts in developed countries. If the contractor is equipped with the cutting edge knowledge and skills it will enhance productivity and performance (Cabinet Office, 2011 and Autodesk, 2012).

It is the responsibility of every nation to nurture, develop and equip her contractors with the available projects so as to have the required experience with which to execute all complexities of national construction challenges. But instead of this, government has developed foreign companies neglecting their own contractors starved of work. This has made foreign contractors to gain better expertise while the Nigerian contractors remain inexperienced and therefore unable to compete with their foreign counterparts. The prefer patronage of foreign contractors has been attributed to lack of capacity by indigenous contractor (Magesa, 2006; Kibodya, 2008; Urassa, 2008; Mbachu, 2012 and Odediran *et al.,* 2012).

In Abuja mass housing is most predominant construction activity which is bedeviled with quacks and building collapse is eminent. Housing is a basic requirement of any society, this has become imperative to undertake this study which will guide the selection criteria for contractors and informed contractors' training and education (Mbachu, 2012).

This study will assist clients in the selection of contractors and evaluation of contractors to be engaged in mass housing projects. It will also form bases for contractors training and education.

1.4 AIM AND OBJECTIVES

This research aims at assessing the professional's perception of knowledge and skills requirement of contractors in delivery of mass housing construction projects.

To achieve this aim, the followings are the specific objectives:

1. to identify suitable knowledge and skills required for contractors' performance in mass housing construction projects;
2. to examine the level of importance of the identified knowledge and skills;
3. to assess the extent to which the Nigeria contractors possess the identified key skills and knowledge in mass housing projects; and
4. To determine critical knowledge and skills that should inform contractor education and training for improved performance in mass housing project delivery.

1.5 RESEARCH QUESTIONS

What knowledge and skills are most required for contractors to perform in the delivery of mass housing projects?

Does Abuja mass housing Contractors possessed the requisite knowledge and skills to perform in Abuja mass housing projects?

1.6 HYPOTHESES

H1: There is NO significant difference between the perspectives of Consultants and Clients' professionals on level of importance of the identified knowledge and skills requirement of contractors in mass housing construction.

H2: There is NO significant difference between the perspectives of Consultants and Clients' professionals on the current level of proficiency of the identified knowledge and skills requirement of contractors in mass housing construction.

1.7 SCOPE

The study covers the perceptions of construction professionals (Architects, Builders, Engineers, Quantity Surveyors and Project Managers). The study focuses on the construction professional's perception of level of importance of knowledge and skills required for contractor performance and contractor current level of proficiency. This study excludes the perception of contractors from the study in order to avoid biased judgement (self assessment). The study area covers mass housing projects being undertaken at the Federal Capital Territory.

1.8 LIMITATIONS

The use of qualitative approach is found to be most suitable for this study. The task of the qualitative methodologist is to capture what people say and do as a product of how they interpret the complexity of their world, to understand events from the viewpoints of the participants. It has her shortcomings, people understand issues differently. To avoid misinterpretation of the required knowledge and skills for contractors' performance in this research context, definitions were attached to the questionnaires for clear understanding of the research context. Therefore, the accuracy of this research is limited to the accuracy of the information supplied by respondents.

The study is limited to the knowledge and skills requirement of contractors in mass housing construction. It therefore does not consider the knowledge and skills requirement of contractors for other forms of construction such as industrial, education, civil works, etc.

The sample size could reduce the generation of the research results and also limits it confidence. To mitigate all these effects, the sample size was carefully calculated to ensure the right sample size was used that will make the results reliable. This also reduces the subjectivity of data collection and analysis of the research. Furthermore, the study assumed that all the mass housing projects have similar characteristics.

CHAPTER TWO

LITERATURE REVIEW

2.1 NIGERIAN HOUSING SECTOR

Housing and Housing Environments

Housing is by far the most common form of building in the world and has in many ways received considerable attention from decision-makers, architects, planners and critics alike. It is a form of development which has been in existence since the Stone Age. This is because it provides shelter and protects human beings need from harsh climatic conditions and crime. It is in many respects the most central environmental setting encountered by individuals during their daily routine, taking into consideration its psychological and social significance, which make it one of the most vital development issues of our time. Housing environments may provide a haven of security and comfortable, supportive milieu from which individuals organize their daily plans and activities (Oktay, 2001).

Housing, as human habitat, is a critical indicator in determining the level of development and success of a society or country. The availability of decent shelter for each family defines the level of development that the nation has reached. The social and economic wealth can only co-exist with good housing (Ural, 2002). It represents the physical manifestation of investment in a community, and directly relates to a primary concern of municipalities, that of land use and development, and provides a link between social development and physical and economic outcomes. Housing, therefore, appears to be a reasonable and potentially powerful means for monitoring the social, physical, environmental and economic characteristics of a community (Vehbi, Hoskara & Hoskara, 2009)

As economies grow, urbanization accelerates and demographies explode, they pose some of the greatest practical and ethical problems that developing countries face. In the seamless web we call national development; housing is one factor influencing the quality of human

life. But how important is it to human safety? Still more fundamentally, the state of a person's home touches deep chords in the human spirit (Khan, 1988).

Housing problem has been generally accepted as being diverse and complex. Within the spectrum of this problem, one can identify both quantitative and qualitative deficiencies. Abiodun (1991) identified the major housing problems in Nigeria as that of insatiability of human needs for housing. This problem is world-wide and it is of a recurring nature. In fact, it is doubtful if any nation of the world can satisfactorily meet its housing requirements.

In Nigeria, most people live in poor quality housing and in unsanitary environments. This problem of inadequate housing has been compounded by the rapid rates of urbanization and economic growth. Housing difficulties is more serious for the low income groups where problems have been complicated by rapid growth, inflated real estate values, speculative activity, and influx of poor immigrants and lack of planning. One can also cite the increasingly significant shifts in the form and design of housing from the rooming form to flat and single family house forms as a factor responsible for acute shortage of housing for the low income groups (Okpala, 1985). Nigeria housing deficit as estimated by experts who have put the housing shortage in Nigeria as at 2005 at between 12million to 14 million (Adejumo, 2008 and Oluwaluyi, 2008). According to Babade (2007), to adequately house the urban population in Nigeria, a conservative figure of 409,227 housing units should have been constructed in 1990. Due to neglect, the figure rose to 783,042 units in 1995; 1,333,176 units in the year 2000; 1,543,318 units in 2003 and 2,171,603 units in 2010. This is serious considering the poor showing of the housing sector. The estimated amount required to provide for the deficit is estimated at US$150-200 billion. There is a need for the provision of 500,000 units per annum for the next 40 years, An average developer cannot deliver more than 2,000 housing units in 12 months, Housing issues will remain one of the primary social focuses in Nigeria for the next 20 years or more (ERSO Expert Meeting Stockholm, 2008).

The problem of inadequate housing is experienced in both urban and rural areas in Nigeria. For example NISER in a study of rural housing in the nine Southern States of Nigeria found that, the projected demand of housing units on an average of six persons per dwelling unit for the nine states are 5.2 million in 1990, 7.0m in 2,000, 9.5m in 2,010 and 12.7m in the year 2,020. Other manifestations of the housing problem are high rent in the housing market, inadequate mortgage finance and inaccessibility to mortgage loans. Those problems have resulted in overcrowding, poor and inadequate social amenities, unsatisfactory and unwholesome environmental conditions and urban squalor, the absence of open space, the over development of land area leading to the overcrowding of buildings, in-accessibility within residential areas, scarcity and high cost of building materials (Onibokun, 1985). To cope with this menace, various governments introduced the policy of mass housing.

Mass Housing, generally, when first thought of is a term most people use to describe a cluster of high rise, low cost residential buildings. This is usually not always the case. Mass housing is the construction or springing up of a relatively high number of residential buildings in an area in a relatively short period of time due to high demand.

One of the notable periods which brought about the idea of mass housing and also came along with numerous housing problems was the industrial revolution. It was called a revolution because it changed the society in a rapid and significant way. It brought about capitalism and also created a shift from the agricultural society to modern industrial societies. Due to the introduction of capitalism and the movement of goods produced from houses to factories, people migrated from these rural areas of agriculture to cities in search of new jobs, so as to earn a wage or salary. With time, urbanization increased rapidly, and led to a significant rapid increase in population in the industrial cities. Because of this rapid increase in population, more and more housing had to be provided for the labour force. This scarcity of housing led to the construction of mass housing, which had poor living conditions and

were characterized as unhygienic, overcrowded and also lacked infrastructures and social amenities.

The World War is another event in history which affected the provision and construction of housing. After the war, there was a critically high demand of housing because of the number of houses damaged or destroyed by enemy attacks, and also in cities which still stood but had a high number of immigrants in search of shelter. Large numbers of houses were to be built quickly and economically. The idea was to design houses that could be mass-produced and prefabricated. Another event that brought about a change in the housing need up to date is globalization, post-communism which increased immigration to developed countries from other countries, and privatization.

Mass Housing would come to be an important and essential development in most developing countries because of the amount of people moving from rural parts of the country to the urbanized and developing parts. The lack and deterioration of housing environments pose some of the greatest practical and ethical problems which were faced by developed countries and are still being faced by some developed and developing countries.

Nigeria as a developing country, with 36 states, is undergoing a fast process of urbanization. It is a country blessed with agriculture and crude oil. Its major source of income and revenue was from agricultural produce but after the oil boom in the 1970s, Nigeria started shifting its concentration from agriculture to crude oil and, in 2007, became the 15th largest producer of petroleum in the world. Also, it has one of the fastest growing telecommunication markets in the world, and is also developing vastly in information technology. Due to these diversions from agriculture, and a vast development in the urban areas, high populations of people migrate from rural to urban areas in search of jobs to earn a higher salary and a means of living. This migration means an increase in the demand for housing in these urban areas.

Mass housing has become a strategy which Nigeria and most other developing countries take up as a solution to their housing problems. But in most of these mass housing environments, neither the demand for the households nor need of space, or the cultural factors are usually considered during the design process. This coupled with other factors does not only affect the mass housing environments, but also affects the housing of the country as a whole in one way or another.

Some thirty years ago, the Government moved the Federal Capital Territory of Nigeria from Lagos to the inner part of the country, towards the center, and the city of Abuja was founded. As the new Federal Capital Territory of Nigeria, Abuja is a city where urbanization and development in terms of commercial, residential, industrial, social and political growth has been in progress and is still taking place. Today, it is a city of grand avenues and huge complexes, which house government offices.

The population of Abuja has increased tremendously and is still on the increase due to urbanization. Due to this rapid increase in population, there is a long gap between the production of housing and its demand. It is a lovely city, but it is also a city which is too costly for most of the people who work in the government and service industries to afford. As such, like so many other cities in the developing world, it is surrounded by vast neighborhoods of poverty, satellite towns, slums, informal settlements and different mass housing schemes.

The provision of this mass housing in Abuja by the government is an answer to providing shelter for people, but in most cases, these developments come with negative physical, socio – cultural and economic effects on the overall city. Oloyede, *et al.*, (2010) reveal that the blames of building collapse were due to non-compliance with specifications/standards, use of substandard building materials and equipments and the employment of incompetent contractors who do not perform their jobs.

2.2 PERFORMANCE AND CONSTRUCTION PROJECTS

Performance has been described as the degree of achievement of certain effort or undertaking. It relates to the prescribed goals or objectives which form the project parameters (Chitkara, 2005). Performance refer to the contractor's ability to deliver the key project objectives in the most cost-effective manner; the key project objectives being cost, schedule, scope and quality (Chan & Chan, 2004; Mbachu, 2008). From a project management perspective, it is all about meeting or exceeding stake holders' needs and expectations from a project. It usually involves placing consideration on three major project elements i.e. time, cost and quality. (Project Management Institute, 2004). It has been pointed out that, in present highly competitive and uncertain business environment, the client who is the major stakeholder, wants faster delivery of his project with early start of construction work, certitude of performance in term of cost, quality and time, value for money for his investment, minimal exposure to risk and early confirmation of design and price or cost (Centre for Construction Strategic Studies, 1998). Although many tend to concentrate on the elements of cost, quality and time, all others are also important parameters of project performance.

The failure of any construction project is majorly related to the problems and failure in performance. Furthermore, there are many reasons and factors which attribute to such a problem. Ogunlana *et al.,* (1996) stated that the construction industry performance problems in developing economies can be classified in three layers: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies. Okuwoga (1998) opined that the performance problem is related to poor budgetary and time control. Long *et al.,* (2004) comment that performance problems arise in large construction projects due to many reasons such as: incompetent designers and contractors, social and technological issues, poor estimation and change management, site related issues and

improper techniques and tools. Navon (2005) states that the main performance problem can be divided into two groups: (a) causes originating from the actual construction (in many cases the causes for deviation originate from both sources) or (b) unrealistic target setting (i.e. planning).

Success of construction projects depends majorly on success of performance. Many previous researches had been studied performance of construction projects. Dissanayaka and Kumaraswamy (1999) remarked that one of the principle reasons for the construction industry's poor performance has been attributed to the wrong choice of the selected procurement system. Thomas (2002) identifies the main performance criteria of construction projects are financial stability, health and safety, resources, progress of work, relationship with clients, relationship with consultants, standard of quality, management capabilities, relationship with subcontractors, claim and contractual disputes, reputation and amount of subcontracting. Chan and Kumaraswamy, (2002) states that construction time is increasingly important because it often serves as a crucial benchmarking for evaluating the performance of a project and the efficiency of the project organization. An evaluation of performance is done through performance measurement tools. Performance or performance measurement can be studied from project level, organisation level, facility management level or procurement (pre-contract stage).

2.3 PERFORMANCE MEASUREMENT IN THE CONSTRUCTION INDUSTRY GENERALLY

The construction industry is an important part of every economy and that performance measurement holds the key to the achievement of national socio-economic goals. In the construction industry’s current scenario, the systematic ways of performance measurement have influenced many construction government sectors, firms, public and private clients and other project stakeholders (Takim, 2003). Performance measurement has been used in

collecting and reporting information about inputs, effectiveness and efficiency of construction projects. Again, construction firms use performance measurement to evaluate their project performances, both in terms of the financial and non-financial aspects and to compare and contrast the performance with others in order to improve programme efficiency and effectiveness in their organizations (Kagioglou *et al.,* 2000). Furthermore, according to Steven *et al.,* (1996), measurements are needed to track, forecast, and eventually control those variables that are useful to the success of a project, and this has been agreed by many researchers and practitioners (Sinclair & Zairi, 1995; Love *et al.*, 2000 and Chan, 2001). More specifically, Kelada (1999) hints that the performance measurements used apply not only to product or service quality and to business performance, but should also be extended to customer satisfaction, quality management, needs, wants and expectations. Performance measurement provides necessary information for process control, and makes it possible to establish challenging and feasible goals. It is also necessary to assist the implementation of business strategies. Karim and Marosszeky (1999) states that performance measurement systems have been one of the primary tools used by the manufacturing sector for business process re-engineering in order to monitor the outcomes and effectiveness of implementation.

Ward *et al.,* (1991) has mentioned that in evaluating the performance of contractors, 'a common approach is to evaluate performance on the extent to which client objectives like cost, time and quality were achieved'. In a in well advanced countries such as the UK, USA and Japan, those are seen as the three traditional indicators of performance (Moshsini & Davidson, (1992). These traditional measures have become so popular and established due to the objectivity and simplicity surrounding their measurement. Again, in today's construction environment, timely completion within budgetary allocations are highlighted as critical to client requirement in order to attain 'first in the market' advantage over competitors (Kog *et al.,* 1999). However, the 'three measures' provide an indication as to the success or failure of

a project, but is not done in isolation; it provides a balanced view of the performance measurement. Moreover, their implementation in construction projects is apparent at the end of the project, and therefore, they can be classified as 'lagging' (i.e. wait till project completion) rather than 'leading' indicators of performance.

Indeed, Ward *et al.,* (1991) has suggested that

> *Looking back on the conduct of a project, what sticks in the mind is often not so much financial success or early completion, but memories of other people involved and abiding impressions of harmony, goodwill and trust or, conversely, of argument, distrust and conflict.*

The Client's willingness to pursue a given procurement route to achieve a future project is likely to be strongly influenced by these factors. Thus, it is clear that the traditional measures of evaluating the performance of contractors, though very significant, are not sufficient to assess their performance.

Thus, Kagioglou *et al.,* (2000) also concurs that the methods used to measure performance in construction projects fall into three main categories:

1. Financial Perspectives: That is, how do the project's financial stakeholders view the project? For example, use of cash flow and cost benefit analysis;
2. The internal business process perspective: That is, how are we performing in our key process activities? For example, use of critical path analysis.
3. The customer perspective: That is, how do our existing and potential customers see it?

Furthermore, Kagioglou *et al.,* (2000) identified some shortcomings in the three main categories above in that the participants in construction projects, where the aim is to find methods for measuring and managing performance that can be consistently applied to the set of project participants. Again, the categories lack validation from extensive empirical evidence to form the basis for effective performance measurement for organizations.

During the 1990's, there had been some interest in 'emerging' techniques and philosophies to measure and manage performance such as business process re-engineering (BPR) and business process management, benchmarking, total quality management (TQM), that had shifted the focus from 'lagging' towards 'leading' indicators of performance. The majority of these concepts have been imported into construction from the manufacturing industry; (Koskela and Vrijhoef, 2000 and Kagioglou *et al.,* 1998). These techniques have tended to concentrate on construction productivity and those factors that influence it (Motwani *et al.,* 1995), with the aim of achieving continuous improvement through the 'leading' indicators of performance.

For instance, the Integrated Performance Index (Pillai et al., 2002) in India was developed for performance measurement of Research and Development projects, based on their real-life experiences of working on the management system for the Integrated Guided Missile Development Programme of India. The benefit of the integrated performance index is that it can be applied at all phases of the project life cycle to rank the project for selection, to compare project performance under the execution phase and to act as an input for the management of future projects. Another example is the Quality Assessment System in Constructions (QLASSIC) model developed by the Construction Industry Development Board of Malaysia to assess the contractor's performance in terms of quality of the finished product (CIDB Malaysia, 2001). Some few years ago the UK Construction Best Practice Programme (CBPP) launched the 'Key performance indicators' (KPIs) for construction. This was to create an industry-wide performance measurement system to enable good companies to demonstrate their abilities and allow clients to select contractors and consultants on the basis of reliable data (BPRC, 1999). These KPI's give information on the range of performance being achieved in all construction activities and they include the following:

1. Client satisfaction – product

2. Client satisfaction – service

3. Defects

4. Predictability – cost

5. Predictability – time

6. Profitability

7. Productivity

8. Safety

9. Construction Cost

10. Construction Time.

These KPIs are intended for use as benchmarking indicators for the whole industry, whereby an organization can benchmark itself against the national performance of the industry and identify areas for improvement, that is, where they perform badly.

Despite the usefulness of performance measurement, it has not been widely implemented in construction companies and information on the performance of the construction industry as a whole is also scarce (Dayana *et al.*, 2005).

Judging from the preamble presented so far, it is evident that the criteria of cost, time and quality are in no doubt the foundation of performance measurement systems. In theory, performance measurement appears to be one of those suitcase words Bourguignon (1995) in which everyone places the concepts that suit him, letting the context take care of the definition". For example, Moullin (2007) defines performance measurement as evaluating how well organizations are managed and the value they deliver for customers and other stakeholders. According to Neely (1995), performance measurement is the set of metrics used to quantify both the efficiency and effectiveness of actions. Navon (2005) defines performance measurement as a comparison between the desired and the actual performances.

Alternatively, Adams *et al.,* (2002) defines performance measurement as the process of quantifying the efficiency and effectiveness of past action. Again, Hatry (2006) defines performance measurement as the regular measurement of the result (outcomes) and efficiency of services or programmes. While these definitions provide an understanding of the performance measurement concept each one of the definitions above also has its own shortcomings. Example, Moullin's (2007) definition is fine if we want to define what performance assessement is but not appropriate if our purpose is to define performance measurement. The reason is that, as it happens with other processes, the purpose of performance measurement is regular evaluation, which suggests that if we want to manage for results through managing measures, then we should consider performance measurement not just as a rear-view mirror to evaluate our past performance but as a tool to support day to day decision making process (Nduru, 2010).

For the purposes of this research, the definition of performance measurement as given by Takim *et al.,* (2003) would be adopted. Takim *et al.* (2003) defined performance measurement as the regular collecting and reporting of information about the inputs, efficiency and effectiveness of construction projects. The definition provides the opportunity for a day–to-day decision to be taken concerning the efficiency and effectiveness of the inputs applied which is a vital component of any effort at managing for results.

2.4 AN OVERVIEW OF NIGERIAN CONSTRUCTION INDUSTRY AND CONTRACTORS' PERFORMANCE MEASUREMENT

Nigeria has an estimated population of 170M and it is located in the sub-Sahara region of

Africa. Its land area is 924770km^2, and it is made up of 36 states. The country has a significant role in the socio-economic and political arena of the African continent (Mansfield, Ugwu & Doran, 1994).The construction industry contributes a lot to the gross domestic product. In Nigeria, construction investment accounts for over 60% of the gross fixed capital

formation (GFCF) i.e. the total national investment (Dlakwa & Culpin, 1990). Problems in construction projects in Nigeria have hold back planned economic developments. Present construction projects are complex efforts requiring the support of the design and construction profession (Ogunsemi & Jagboro, 2006).Therefore, a realistic time for execution of project will reduce the possibility of disputes between clients and the contractors (Almomani, 2000). It will also reflects the contractor's ability to organize and control site operations, to optimally allocate resources and to manage the flow of information to and from the design team and among contractors (Xiao & Proverbs, 2002).The correct choice of construction contractor(s) is a crucial function of either the client or the client's consultant/project manager. It usually has a significant impact on the success or failure of a project. Attempting to predict contractor performance with regard to a forthcoming project requires appraisal of current workload and residual resource capacities as well as investigation of performance on recent projects (Kuwaraswamy, 1996).One of the most difficult decisions taken by the client in the construction industry is chosing the contractor. Every construction project faces adversity and uncertainty and an inappropriate contractor increases the chances of delays, cost overruns, substandard work, disputes or bankruptcy (Elinwa & Joshua, 2001). Nigerian contractors are faced with the problems of lack of managerial, technical education, and generic knowledge and skills when compared with their counterparts in the developed countries. The performance of a project will definitely correlate with the performance of a contractor. The assessment of performance has been a challenge for the construction industry for decades. Several models and procedures have been proposed for the evaluation and measurement of project performance. However, most of these procedures limit their analysis to selected measures such as cost, schedule, or labour productivity (Alarcon, 1994). The increasing competitiveness of the Construction Industry motivates companies to evaluate performance and implement efficiency improvement strategies in order to obtain competitive

advantage. Therefore, more focus should be directed towards the site constructors which are the contractors. To raise the levels of competitiveness, contractors need to increase the use of performance assessment tools as a means of supporting performance improvement programmes. Nigerian researches have scanty or no comprehensive study on the required knowledge and skills relevant for contractors' performance talk more of contractors' performance measurement criteria and frameworks for various project type. Contractor performance is defined to embrace construction cost, construction time, construction quality and sustainable development, the philosophy being that the achievement of one aspect of performance should not be at the expense of another (Hong & Proverbs, 2003). From the viewpoint of Poon (2003), the major indicator of the contractor's performance is the client's satisfaction. Poor contractor performance, as characterized by poor work quality and low productivity, is common in the construction industry. Moreover, other problems associated with poor performance are late completion, cost over-runs, unacceptably high accident rate, insensitivity to environmental considerations, rework, poor work practices and adversarial relationships (Allens, 1994; Henry, 1994; Lobelo, 1996; Alwi, Hampson & Mohammed, 2002).

Measuring performance is a complex problem (Ofori & Chan, 2001 as cited in Alwi et al., 2002). This is because every contractor is unique in the manner in which he/she follows design specifications, method of delivery, administration, and composition of team members.

Assessment of performance has been a challenge for the construction industry for decades.

Al-Momani (2000) states that the success of any project is related to two important features, which are service quality in construction, delivered by contractors and the project owner's expectations.

However contractor performance is critical to the success of any construction project which is the determinant of cost, time and quality standard because the contractor converts the design into practical reality (Xiao & Proverbs, 2003). Late completion of construction projects has been found to be a major setback in the construction industries in Nigeria (Amu, Adeoye & Faluyi, 2005). According to Odusami and Olusanya (2000) projects executed in Lagos metropolis experienced an average delay of 51% of planned duration for most projects. Construction cost in Nigeria is 40% expensive when compared with Kenya, Brazil (35%) and Britain (30%).Therefore an improved contractor performance can leads to increased client satisfaction, improvement in reputation and competitiveness in the market (Ogunsemi & Jagboro, 2006). Nigerian contractors need to be given requisite knowledge and skills for them to perform maximally.

2.5 KNOWLEDGE AND SKILLS FOR IMPROVING THE CONTRACTOR'S PERFORMANCE IN PROJECT DELIVERY

Knowledge is sometimes viewed as if it was a concrete manifestation of abstract intelligence, but it is actually the result of an interaction between intelligence (capacity to learn) and situation (opportunity to learn), so it is more socially-constructed than intelligence. Knowledge includes theory and concepts and tacit knowledge gained as a result of the experience of performing certain tasks. Understanding refers to more holistic knowledge of processes and contexts and may be distinguished as know-why, as opposed know-that. A distinction is often made between general knowledge, which is essential irrespective of any occupational context or so fundamental as to be considered basic life knowledge, and knowledge that is specific to a sector or particular group of occupations and only likely to be encountered in such contexts. Weinert (1999), for example, distinguishes:

> *General word knowledge (generally measured by vocabulary tests that are part of many intelligence measurements, and overlapping considerably with what is defined as crystallised intelligence), and more arbitrary specialised knowledge. This*

> *specialised knowledge is necessary for meeting content specific demands and solving content-specific tasks. In contrast to general intellectual abilities, one can consider arbitrary knowledge as a demand- specific competence*.

Usually the term skill is used to refer to a level of performance, in the sense of accuracy and speed in performing particular tasks (skilled performance). Skilled performance has long been a subject of psychological enquiry and is of obvious interest to employers. Bryan and Harter (1899; 1897), who undertook one of the earliest systematic studies (practical) of skills acquired in the work environment (by telegraph operators at Western Union), demonstrate that skill acquisition involves a series of stages associated with reaching the plateau of performance and that improvements continue well beyond achieving an adequate level. Welford (1968) defines skill as a combination of factors resulting in competent, expert, rapid and accurate performance. Egbu (1999) also makes a distinction between knowledge and skills. Egbu (1999) provided that skills consists the activities or patterns of behaviour which workers undertake in order to accomplish a given desired result. On the other hand, knowledge is the ideas, wisdom and facts workers acquire through experience, theory and practice; the acquisition of which gives them an ability to understand.

In the context of this study, knowledge is the insight or understanding of facts, truths, principles or procedures which a worker gains through a formal or informal learning process, or through education and training (Mbachu, 2012).

Skills refer to the practical ability or competencies a worker gains from applying knowledge over time in a hands-on work setting (Mbachu, 2012). Several studies have been undertaken on the key skills and knowledge required for successful project delivery and contracting (Egbu, 1999; Walker & Shan, 2002; Eom, *et al.*, 2008). Emphasis has been naturally placed on technical competency as this underlies quality and effectiveness of the project delivery. Nevertheless, Chaplin (2010) is of the opinion that the most technically qualified contractors do not necessarily win the most work, excel in project delivery and run successful businesses;

argued that, as small businesses, contractors need a balanced range of competencies that include negotiation, sales, marketing, and business skills.

Negotiation skills are very important because certain contracts have terms and conditions that could pose risks and cash flow problems to the contractor's overall ability to deliver a project successfully and profitably. Negotiation knowledge and skills could assist the contractor achieve favourable bargains that could decrease risks and imminent cash flow problems on a job (Chaplin, 2010). Through negotiations, a contractor could avoid conflicts and disputes, thereby avoiding costly and time-consuming adjudications, arbitrations or litigations (Mbachu, 2012).

Chaplin (2010) also argued that financial, business and accounting skills are equally important, as they help the contractor to make sound economic and financial decisions that result in better project outcomes, especially as they relate to making the best use of financial and tax advantages. The erroneous perception is that a contractor does not need such skills as there are accountants and independent financial advisers whose job is to help the contractors make the best financial and commercial decisions. However, it makes a huge difference if the contractor can obtain the fundamental of these knowledge and skills and utilize them to guide his or her day-to-day decisions and initiatives.

One of the most talked-about knowledge and skills that support innovation, productivity and performance, and that is perceived to shape future directions in the way buildings are designed, constructed and operated, is the building information modeling (BIM). Building Information Model is basically a three dimensional digital representation of a building and its intrinsic characteristics. It is made of intelligent building components which include data attributes and parametric rules for each object. For example, a window of certain material and dimension is parametrically related and hosted by a wall. Moreover, Building Information

Modeling provides consistent and coordinated views and representations of the digital model including reliable data for each view. This saves a lot of designer's time since each view is coordinated through the built-in intelligence of the model.

According to the National BIM Standard, Building Information Model is a digital representation of functional and physical characteristics of a facility and a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition. Building Information Modeling is the process and practice of virtual design and construction throughout its lifecycle. It is a platform to share knowledge and communicate between project participants. In other words, Building Information Model is the process of developing the Building Information Model. Construction managers or general contractors can use BIM to extract quantities of work to prepare cost estimates. Moreover, they can provide powerful 3D renderings. Furthermore, schedule integrated BIM known as 4D BIM can be used for safety analysis, animations and to prepare site logistic plans. Construction managers can use BIM to coordinate work with subcontractors. They can also update schedule and costs with BIM. Finally, they can turn over an as-built building information model to the owner's maintenance team. The construction industries of some developed countries are increasingly being tasked to adopt BIM in project design and documentation processes. For instance, contractors aspiring to tender for government projects in the UK have up to 2016 to adopt BIM or miss out on the government tender awards. This recent UK government announcement in its Building Information Model strategy requiring fully collaborative 3D BIM for its projects by 2016, with all project and asset information, documentation and data being electronic as a minimum (Cabinet Office, 2011).

The Autodesk (2012) also identifies several dividends of Building Information Model (BIM) including the ability to help the contractor visualize and simulate more efficient construction

workflows and build better buildings. The key argument is that with the greater insights provided by the BIM, project teams could communicate, collaborate, and share data more effectively throughout the planning and construction phases of the project, thereby improving productivity and performance. Overall, Building Information Model supports a comprehensive work flow solution that could help the contractor build and communicate more effectively, and gives the contractor the added flexibility to adapt easily to changing project and team requirements (Mbachu, 2012).

The Associated General Contractors of America (AGCA, 2011) also identifies further benefits of BIM to include:

- The ability to visualize what is to be built in a simulated environment; this helps to identify and resolve at the onset any potential collisions or constructability issues in the assembling process.

- Fewer errors and corrections on site; these give rise to higher quality at a lower cost;

- The ability to do more 'what if' scenarios, such as looking at various sequencing options, site logistics, hoisting alternatives, costs, etc.

- The ability for the building owner and users to visualize the end product and request for changes or confirm the design at the early stage, thereby minimizing late stage change orders and associated issues.

- Fewer callbacks at the post construction phase; these help to lower warranty and repair costs.

- The ability to feed design data direct to machine tools, thereby creating a link between design and manufacture, which eliminates unnecessary intermediaries.

However, the key obstacles to an industry-wide uptake of the technology include incompatibility of the various 3D models for the architectural and engineering services designs, low computer literacy, lack of standards and protocols, resistance to change and the differing requirements of clients and lead designers (Cabinet Office, 2011).

Contractors are also increasingly being required to have knowledge and skills of life cycle analysis and costing, especially for projects procured by owner-occupiers and the government. This requires a shift of focus from the capital or initial costs to whole of life costs and assessment. For Example, bothered by the increasing incidences of post handover defects, the UK government now requires those who design and construct buildings to work towards integrating their design and construction of an asset with the operation phase and to assure their operational performance for a period of three to five years (Cabinet Office, 2011). More also, the UK government emphasizes on coordination and leadership, value management, supplier relationship management and client relationship management as the key competencies for success, which suppliers in the construction industry must have (Cabinet Office, 2011).

Overall, there is no lack of information on the key knowledge and skills required of the contractors and other key role players for the successful implementation of projects. In fact, one gets confused by the information overload. What is lacking is a prioritization of the key knowledge and skills along the lines of their relative levels of importance or impact on productivity and performance, the extent to which contractors possess the high impact knowledge and skills, and hence a clear understanding of where the critical skills gap exists. This information could support the agenda for further skill development through education and training of the contractors.

The identified knowledge and skills can be grouped into; Managerial knowledge and skills, technical and generic knowledge and skills.

The table below shows these knowledge and skills identified from lecture with their definitions in context of this study.

TABLE 2.1: Knowledge and Skills Identified from Literature for Contractors' Performance

S/No	Code	Knowledge and skills	Summary of knowledge, skills, abilities, outcomes
		Managerial/ Business Skills and Knowledge	
1	M1	Project management and leadership	This covers knowledge and understanding of the managing of projects with appropriate tools, people skills, also the characteristics and behaviour of a leader.
2	M2	Risk management	This covers the management of risk on construction projects. It includes the ability to identify, assess and mitigate risks.
3	M3	Contract and compliance management	This covers various forms of contracts used in projects. It includes having an awareness of all of the main standard forms of contract and a thorough understanding of contract law, legislation, and the specific forms that have been used. Also includes compliance with the contract.
4	M4	Financial management, accounting, cost/cash flow management	This covers the knowledge and understanding of finance, accounting concepts, cost control mechanisms, life cycle costing and cash flow management.
5	M5	Human resources management	This covers knowledge and understanding of the principles and practice of managing people (staff)
6	M6	Business and administration, record keeping	This covers the knowledge and understanding of construction business process, management, documentations and record keeping.
7	M7	Strategic management	This covers the strategy the contractors employed to achieve high performance: process of goals creation, a mission statement, values and organizational objectives
8	M8	Resilience to change,	This covers the knowledge and understanding to manage

		flexibility/adaptability to change (change management)	transitioning/shifting of work section, individuals, teams from a particular state to the desired (Variation).
9	M9	Marketing and public relation management	This covers the knowledge and understanding of the principles and processes of marketing and public relation management (e.g. business proposals, advertisements, etc)
10	M10	Teamwork and relationship management	This covers the knowledge and understanding of the principles, behaviours and dynamics of working in a team.
		Technical Skills and Knowledge	
11	T1	Building code and regulations	This covers the knowledge and understanding of building codes and regulations and their principles of application.
12	T2	Construction technology	This covers the knowledge and understanding of the design, methodology and construction of buildings.
13	T3	Trade-specific technical know-how	This covers trades secrets and technology. It applies the understanding of the trade (Housing) and the technicalities involves and also the expertise in the trade and techniques.
14	T4	Blueprint reading and specifications	This covers the understanding and accurate interpretation of the design plan, specifications and given instructions from project owners.
15	T5	Procurement and contract bidding strategies	This covers clear understanding of various procurement routes, the public procurement Act and bidding strategies in winning contracts.
16	T6	Plant/ equipment technical know-how and selection strategy	This covers the knowledge and understanding of different plants/equipments, their mode of operation and selection strategy for efficient usage of the plant/equipments.
17	T7	Materials technology and selections strategy	This covers the knowledge and understanding of building materials and the ability of using the best material for the right job with quality and cost effectiveness.
		Generic Skills and Knowledge	
18	G1	Communication	This covers knowledge and understanding of effective oral, written, graphic and presentation skills including the methods and techniques that are appropriate to specific situation.
19	G2	IT; computer literacy; BIM	This covers the knowledge, operation and understanding of computer packages , Building information management and literacy of information technology
20	G3	Negotiation and dispute resolution	This covers the skills and knowledge of negotiation and

			dispute resolution in construction projects. It involves having awareness of the various processes and techniques commonly used in the industry as well as detailed understanding of how these are applied in practice.
21	G4	Legal	This covers the knowledge and understanding of the laws governing building construction and statutory obligations.
22	G5	Decision-making	This covers the ability to make quick and accurate decisions.
23	G6	Numeracy and problem-solving	This covers the knowledge, confidence and competence to use numbers and think mathematically as applied to problem solving (e.g. Sum, addition, multiplication, division etc)
24	G7	Politics	This covers the knowledge and understanding of the principles of political operation of government and organisations.
25	G8	Social/ networking	This covers the knowledge and understanding of social networks and networking in business operations (internets, networking, etc)
26	G9	Can-do altitude, multi-tasking/multi-skilling	This covers the knowledge and skills of being confident and resourceful in the face of challenges, the ability to carry out different tasks in a short time and possessing different skills above the required basic skills (Being so good at the job).
27	G10	Creative and innovative ability	This covers knowledge and ability to innovate and be creative.

Source: Mbachu (2012).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

A research design is the programme that guides the investigator in the process of collecting, analysing and interpreting observations (Uji, 2009). This research focuses on the knowledge and skills requirement of contractor in Abuja mass housing project delivery; it is designed broadly into two parts; the first part of this research work comprises of literature survey which was carried out to provide the background information on performance measurement, contractors' knowledge and skills for mass housing construction projects. From the literature review, the issues for this study were highlighted and identified. The second part comprises of obtained data through the design and administration of questionnaires, the questionnaires were produced to deduce the objectives of the study.

3.2 RESEARCH INSTRUMENT

There are a number of tools and techniques in identifying and assessing knowledge and skills required for contractors' performance e.g. brainstorming, expert opinion, structured interviews, questionnaires, checklists, historical data, previous experience, evaluation of other projects but this study employed the use of questionnaires. This is done to give the respondents the opportunity to express their opinions concerning the problem under study. Answers provided are standard and can be compared from person to person, the answers are much easier to code and analyse. It also enables the respondents to rank the level of importance and current level of proficiency using the Likert scale.

3.2.1. Design of Questionnaire

A questionnaire is a series of questions asked to individuals to obtain statistically useful information about a given topic. When properly constructed and responsibly administered, questionnaires become a vital instrument by which statements can be made about specific

groups or people or entire populations. In designing the questionnaire, the objectives of the study were first established. This was done to help in determining what questions to ask and how to ask them. Again, very short and concise questions were fielded as questions that are long and wordy may appear confusing to respondents. All these were done in order to ensure that the responses received would be reliable. In designing the questionnaire, the aim of the study, which is assessment of critical skills and knowledge required for contractors' performance in Abuja mass housing was taken into consideration.

The questionnaire consisted of two parts namely;

i. General information of the respondents and
ii. Relative importance of knowledge and skills required for contractors' high performance in project delivery and current level of proficiency with an addendum for additional information

The assessment of the questionnaires was based on the Likert scale 1-5 as described below

Table 3.1: Likert Scale

RANK	**1**	**2**	**3**	**4**	**5**
LEVEL OF IMPORTANCE	Not important	Slightly important	Moderately important	Important	Very important
CURRENT LEVEL OF PROFICIENCY	Poor	Fair	Good	Very Good	Excellent

3.2.2. Sampling Technique

The purposive sampling technique was used for data collection. This was because the study wanted to elicit views of professionals who have specific expertise in mass housing construction like Architects, Engineers, Quantity Surveyors, Builders and Project Managers

in mass housing projects delivery. Again, the advantage of doing this is that you have experts opinions backing any decision(s) made. Also, contractors were excluded in the sample to avoid bias judgement of their own perspective. The target population was Consultants and Clients (i.e. professionals in the mass housing delivery) in the Federal Capital Territory region only.

This location (Abuja) was selected due to the following:

a) Abuja is one of the fastest growing capital cities in the world with so many construction activities in and around the city especially mass housing development (REDAN, 2012). It was imperative to focus on the most representative samples of the intended population to obtain the answers that are relevant to the study.

b) Over ten thousand (10,000) mass housing units are under construction in Abuja and REDAN (Real Estate Developers Association of Nigeria) is partnering with National Bureau of Statistics (NBS) and National Population Commission (NPC) to construct four hundred thousand (400,000) mass housing units in Abuja which will start soon (REDAN, 2013).

c) Again, Abuja is the administrative capital and a commercial centre of Nigeria where a lot of consultants (i.e. professionals) operate.

3.2.3. Determination of the Sample Size

The total population of registered mass housing developers that are into construction activities is 80 companies (REDAN 2012 directaries) employing 22 average number of professionals (Architects, Engineers, Quantity Surveyors, Builders and Project managers). This translates into 1760 (80 x 22) professionals in Abuja mass housing sub-sector. According to Cochran (1977) and Israel (1992), the following factors should be considered when deciding a sample size:

- The level of precision required in the estimate (i.e. the sampling error).

- The confidence level (the risk upon which the researcher is willing to accept that the sample is within the average).
- The intrinsic level of variability of the factors (variables) to be estimated.
- The sampling method to be used.
- The homogeneity (or otherwise) of the population.
- The number of categories of data to be analysed.
- The level of disaggregation of the study result and
- The resources constraints (cost, time ,personnel and equipment)

Based on the above recommendations, this study considers confidence level of 95%, level of precision 7%, level of variability 50% and a Purposive sampling method

Thereafter, the sample size was decided based on this formula:

$n = \frac{N}{1+N(e)^2}$ (Yamane, 1967)

Where n is the sample size, N is the population, and e is the level of precision. This formula was deduced from Conchran (1965) of $n_o = \frac{Z^2pq}{e^2}$ where n_o is the sample size, Z^2 is the abscissa of the curve that cuts off an area α at the tails, e is the desired level of precision and p is the estimated proportion of an attribute that is present in the population.

Considering the above factors for deciding sample size and using the formula;$n = \frac{N}{1+N(e)^2}$, the research adopted a 95% confidence level, P = 50% (maximum variability), e = ±7% precision against the 10% maximum allowable error (Kish, 1995) and N = 1760 (professionals).

When this formula is applied, we got;

$n = \frac{1760}{1+1760(0.07)^2}$ = 183 professional

This research administered total of 200 questionnaires to professionals.

The table 3.2 shows how questionnaire was distributed.

Table 3.2.Sample Frame of the Professionals

Professional	No. of Questionnaires Distributed
Architects	45
Engineers	45
Quantity Surveyors	45
Builders	45
Project Managers	20
Total	**200**

3.3 DATA COLLECTION

Data collection can simply be seen as implying to commit to one form of record or the other, the extracted facts which must be true in reality within the context of the subject matter being investigated (Asekhame, 2010). Based on the discourse above, data collected for this research were primarily obtained from questionnaires; the questionnaire contained questions that allowed the respondents to rank level of importance of the twenty seven (27) identified knowledge and skills requirement for mass housing contractors to perform, it also determine the level of proficiency mass housing contractors possesses in the indentified knowledge and skills.

The Federal Capital Territory (FCT) Abuja was the area under consideration. The data for this study was collected via questionnaire.

3.4 DATA ANALYSIS

The data obtained from the questionnaire survey was analyzed using descriptive and inferential analysis. The analysis was carried out with the aid of SPSS 16.0.

3.4. 1. Descriptive Analysis

Descriptive statistics gives numerical and graphic procedures to summarize a collection of data in a clear and understanding way. It is the term given to the analysis of data that helps describe, show or summarize data in a meaningful way. Examples of descriptive statistics are frequency distributions, measures of central tendency (mean, median, and mode), and chart like pie charts and bar charts that describe the data. This research used weighted mean and standard deviation for it descriptive analysis. Weighted mean and standard deviation were used to determine the level of importance of the identified performance measures and the level of current proficiency. The standard deviations (SD) of responses were used to measure the variability or dispersion of the responses. Standard deviations thus highlighted how clustered the mean response values are around the means for each knowledge and skills. Higher SD is interpreted as higher disparity or variation. These selected statistical tools are much appropriate for ordinal scale as applied to this study.

The result of the mean was ranked, mean scores are "indicators" to establish a rank order of importance for the factor (Idrus & Newman, 2002). For example, if the mean score of particular variable is 3.2, then it could be interpreted that the variable is perceived to be between "moderately important" and "important" but tends more towards being "moderately important". Likewise for level of proficiency tend towards "good" and "very good".

3.4.2. Inferential Analysis

Inferential analysis provides procedure to draw inferences about a population from a sample. Inferential statistics are techniques that allow us to use these samples to make generalizations about the populations from which the samples were drawn. To address this issue of generalization, we have tests of significance. These tests of significance tell us the probability

that the results of the analysis could have occurred by chance when there is no relationship at all between the variables studied in the population. Examples of inferential statistics include linear regression analyses, logistic regression analyses, ANOVA, correlation analyses, structural equation modelling, and survival analysis, to name a few. This study used ANOVA for it inferential analysis.

ANOVA (Analysis Of Variance)

A procedure for comparing more than two groups (Dependant and Independent groups). There is one way and two ways ANOVA but this study used One-way Analysis of Variance (ANOVA) to test whether the mean values were equal for those working for consultant organisation and client organisation. The used of one-way ANOVA was employed for this research because the data involves analysis for just two groups (comparing the means of two groups with more than one independent variables); The client and consultancy organisation and this is suitable for this type of research (McCrum-Garner, 2008). The 'F statistics' was used to test the null hypothesis that both groups (client & consultancy organisation) had the same mean. 'F significant' indicates the probability of rejecting the null hypothesis of no difference between the mean values between the groups. A probability value (significant level) below 0.05 suggests a high degree of difference of opinion between groups on that factor (Uji, 2009).

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.1 RESPONSE RATE

A total of 200 questionnaires were distributed purposively to professionals within Abuja as shown in the table below;

Table 4.1*: Details of Questionnaires Administered and Returned*

	Sample size	**No. Of Questionnaires distributed**	**No. of Questionnaires returned**	**Percentage of Returned**
Professionals	200	200	98	49

Source: Field Survey, February (2013).

The table below described the responsiveness of questionnaires returned

Table 4.2*: Responsiveness of Questionnaires Returned*

	Sample size	**No. Of Questionnaires Returned**	**No. of Responsive Questionnaires**	**Percentage of Responsiveness**
Professionals	200	98	84	86%

Source: Field Survey, February (2013).

Table 4.2 shows the responsiveness of the questionnaires. 86% of the questionnaires is within the of sample frame. This is because those that have never participated in mass housing projects were excluded from the sample frame. They have no experience to assess the contractors which they never have contact with. This group represents 14% of the returned questionnaires.

4.2 CHARACTERISTICS OF RESPONDENTS

4. 2.1. Characteristics of Respondents

Table 4.3*: Response Rate According to Professions*

	Architects	Builders	Engineers	Quantity Surveyors	Project Managers	Total
No. of Questionnaires administered	45	45	45	45	20	200
No. of Questionnaires returned	32	12	19	28	7	98
Response Rate	71.1%	26.7%	42.2%	62.2%	35%	49%

Source: Field Survey, February (2013).

The effective response rate of 49%, Frankfort-Nechamias (2009) ascertained that response rate for social research is between 20-40% is good. However response rate is also dependant on the research circumstance. Mbachu (2008) obtained 7.3% response rate in his research on subcontractors, Soetanto et al (2004) obtained a response rate of 18.9%, Nkado (2001) received response rate of 25% on his research on competencies area of professional Quantity surveyors, Proverbs et al (1999) received 21% response rate, Aibinu and Jagboro (2002) obtained 27% response rate, Ibrahim (2001) obtained 47% response rate. Nevertheless, this sample is statistically valid as it yields a 7% standard error against the 10% maximum allowable error (Kish, 1995) at confidence level of 95%.

Table 4.4: The role of Respondents in the Mass Housing Sector

Sector	Frequency	Percentage
Consultancy	51	61
Client	33	39
Total	84	100

Source: Field Survey, February (2013).

Table 4.3 shows the sectors that the survey respondents represent which are the consultancy and client organisations. 61% of the respondents are in Consultancy practice.

The table below shows the experiences of respondents in mass housing projects.

Table 4.5: **Respondents Participation in Mass Housing Projects**

No. of projects	Frequency	Percentage
None	14	14.3
1-3	39	39.8
4-6	23	23.5
7-9	11	11.2
10 above	11	11.2
Total	98	100

Source: Field Survey, February (2013).

Table 4.5 showed majorities of respondents who participated in mass housing project only carried out 1-3 projects with 39.8% while the least are those who carried out 7-9 projects and those 10 above with 11.2% of the total respondents.

4.2.2 Respondents' Assessment of the Level of Importance of Contractors Knowledge and Skills Required to Perform in Mass Housing Delivery

The level of knowledge and skills required from contractors to perform in mass housing project delivery is shown in Table 4.6.

Table 4.6 showed the weighted means, standard deviation and ranks of the respondents' assessment of level of importance of the identified knowledge and skills required for contractors' performance in mass housing delivery in Abuja.

Table 4.6: Knowledge and skills requirement of contractor in mass housing to perform as perceived by Respondents.

Knowledge and Skills	*Consultancy Organisation*		*Client Organisation*		*Total*				
	Mean	*Rank*	*Mean*	*Rank*	*Mean*	*S.D*	*Rank*	*F*	*Sign.*
Managerial/ business Skills and Knowledge									
Project management and leadership	4.27	1	4.45	1	4.35	1.058	1	0.577	0.450
Risk management	3.92	7	4.18	9	4.02	1.202	9	0.938	0.336
Contract and compliance management	3.86	10	4.18	7	3.99	1.167	11	1.508	0.223
Financial management, accounting, cost/cash flow management	4.12	4	4.18	6	4.14	1.184	3	0.580	0.810
Human resources management	3.92	8	4.27	4	4.06	1.090	7	2.105	0.151
Business and administration, record keeping	3.76	17	3.88	19	3.81	1.058	17	0.231	0.632
Strategic management	3.61	20	3.52	26	3.57	1.090	24	0.143	0.706
Resilience to change, flexibility/adaptability to change (change management)	3.61	19	3.91	18	3.73	1.165	18	1.345	0.250
Marketing and public relation management	3.53	22	3.55	25	3.54	1.197	25	0.004	0.953
Teamwork and relationship management	4.06	5	4.09	14	4.07	1.200	6	0.014	0.906
Technical Skills and Knowledge									
Building code and regulations	4.16	3	3.94	16	4.07	1.138	5	0729	0.396
Construction technology	4.20	2	4.36	2	4.26	.946	2	0.626	0.431
Trade-specific technical know-how	3.80	12	4.33	3	4.01	1.081	10	5.040	0.027
Blueprint reading and specifications	3.78	16	4.12	11	3.92	1.055	15	2.069	0.154
Procurement and contract bidding strategies	3.80	15	4.09	12	3.92	1.100	14	1.370	0.245
Plant/ equipment technical knowhow and selection strategy	3.80	11	4.09	13	3.92	1.044	13	1.524	0.220
Materials technology and selections strategy	3.80	14	4.12	10	3.93	1.117	12	1.629	0.205
Generic Skills and Knowledge									
Communication	4.02	6	4.18	8	4.08	1.020	4	0.503	0.480
IT; computer literacy; BIM	3.57	21	3.91	17	3.70	1.190	20	1.653	0.202
Negotiation and dispute resolution	3.65	18	3.85	21	3.73	1.123	19	0.642	0.425
Legal	3.49	25	3.79	22	3.61	1.162	22	1.320	0.254
Decision-making	3.80	13	3.85	20	3.82	.946	16	0.044	0.835
Numeracy and problem-solving	3.49	24	3.94	15	3.67	1.155	21	3.109	0.082
Politics	3.22	26	3.33	27	3.26	1.233	27	0.181	0.672
Social/ networking	3.18	27	3.64	24	3.36	1.229	26	2.871	0.094
Can-do altitude, multi tasking/multi-skilling	3.51	23	3.73	23	3.60	1.163	23	0.698	0.406
Creative and innovative ability	3.88	9	4.24	5	4.02	1.041	8	2.438	0.122

Source: Field Survey, February (2013)

Table 4.6 showed that the weighted means of the respondents' perceptions of level of importance of the identified knowledge and skills ranges between 3.26 and 4.35. This indicates that all the knowledge and skills are important for contractors to perform in Abuja mass housing delivering. The result showed the mean of three most importance knowledge and skills as **Project management and leadership (4.35), construction technology (4.26) and financial management (4.08)** which supports the findings of Mbachu (2012) with top three knowledge and skills level of importance as Project management, risk management and financial management. The three least important knowledge and skills were **politics (3.26), social/network (3.36) and marketing and public relation (3.54)** still support the findings of Mbachu (2012) with three least importance as business and public relations, politics and social/network. The ANOVA also demonstrated that there was no significant difference between the opinions of consultancy and client organisation opinions except for the knowledge and skills of trade-specific technical know-how which was higher than 0.05significance level.

4.2.3. Core Knowledge and Skills for Contractors' Performance

Table 4.7 shows the core knowledge and skills requirement of contractors in mass housing construction using the Likert scale: 1= Very low, 2= Low, 3= Moderate, 4= High and 5= Very high. The result shows that the core knowledge and skills require for contractors to perform in mass housing projects are Project management and leadership, Construction technology, Financial management, Communication, Building code and regulations, Teamwork and relationship management, Human resource management, Contract and compliance management, Creative and innovative ability, Risk management and Trade-specific technical know-how while others have moderate impact on the required knowledge and skills for contractors' performance.

Table 4.7: Core Knowledge and Skills required for Contractors' Performance

The table below shows the ranking of knowledge and skills required for contractors' performance in mass housing project delivery showing their impact on performance.

Knowledge and skills	*Mean*	*Std. Deviation*	*Impact of importance*	*Rank*
Project management and leadership	4.35	1.058	High	1
Construction technology	4.26	.946	High	2
Financial management	4.14	1.184	High	3
Communication	4.08	1.020	High	4
Building code and regulations	4.07	1.138	High	5
Teamwork and relationship management	4.07	1.200	High	6
Human resource management	4.06	1.090	High	7
Creative and innovative ability	4.02	1.041	High	8
Risk management	4.02	1.202	High	9
Trade-specific technical know-how	4.01	1.081	High	10
Contract and compliance	3.99	1.167	Moderate	11
Materials technology and selection strategies	3.93	1.117	Moderate	12
Plant/equipment technical know-how and selection strategy	3.92	1.044	Moderate	13
Procurement and contract bidding strategies	3.92	1.100	Moderate	14
Blueprint reading and specifications	3.92	1.055	Moderate	15
Decision-making	3.82	.946	Moderate	16
Business and Administration	3.81	1.058	Moderate	17
Change management	3.73	1.165	Moderate	18
Negotiation and dispute resolution	3.73	1.123	Moderate	19
IT; computer literacy; BIM	3.70	1.190	Moderate	20
Numeracy and problem solving	3.67	1.155	Moderate	21
Legal	3.61	1.162	Moderate	22
Can-do attitude, multi-tasking/multi-skilling	3.60	1.163	Moderate	23
Strategic management	3.57	1.090	Moderate	24
Marketing and public relation	3.54	1.197	Moderate	25
Social/networking	3.36	1.229	Moderate	26
Politics	3.26	1.233	Moderate	27

Source: Field Survey, February (2013)

4.2.4 Respondents' Assessment of the Level of Current Proficiency of Contractors in Mass Housing Projects

Table 4.8 showed the weighted means, standard deviation and ranks of the respondents' assessments of the current level of proficiency in delivery of the identified knowledge and skills requirement for contractors in mass housing construction.

Table 4.8: Respondents' Perception of Current Level of Proficiency of Contractors' Knowledge and Skills in Mass Housing Projects

Knowledge and Skills	*Consultancy Organisation*		*Client Organisation*		*Total*				
	Mean	*Rank*	*Mean*	*Rank*	*Mean*	*S.D*	*Rank*	*F*	*Sign.*
Managerial/ Business Skills and Knowledge									
Project management and leadership	3.02	11	3.33	12	3.14	1.142	12	1.521	0.221
Risk management	2.63	26	2.76	27	2.68	1.121	27	0.268	0.606
Contract and compliance management	3.00	12	3.21	19	3.08	1.132	16	0.701	0.405
Financial management, accounting, cost/cash flow management	3.22	4	3.15	21	3.19	1.146	6	0.062	0.804
Human resources management	3.00	14	3.45	6	3.18	1.077	8	3.682	0.058
Business and administration, record keeping	3.08	7	3.21	18	3.13	.915	14	0.424	0.517
Strategic management	2.61	27	2.94	26	2.74	1.077	26	1.921	0.170
Resilience to change, flexibility/adaptability to change (change management)	2.92	18	3.06	24	2.98	1.006	21	0.380	0.539
Marketing and public relation management	3.22	3	3.12	23	3.18	1.008	7	0.174	0.677
Teamwork and relationship management	3.08	6	3.61	2	3.29	1.025	4	5.608	0.020
Technical Skills and Knowledge									
Building code and regulations	3.06	8	3.27	14	3.14	1.121	13	0.727	0.396
Construction technology	3.22	2	3.58	3	3.36	1.060	2	2.349	0.129
Trade-specific technical know-how	2.86	21	3.39	9	3.07	1.039	18	5.524	0.021
Blueprint reading and specifications	3.02	9	3.39	8	3.17	1.028	9	2.713	0.103
Procurement and contract bidding strategies	3.00	13	3.48	5	3.19	1.114	5	3.931	0.051
Plant/ equipment technical knowhow and selection strategy	2.88	20	3.42	7	3.10	1.060	15	5.523	0.021
Materials technology and selections strategy	3.02	10	3.36	11	3.15	1.092	11	2.013	0.160
Generic Skills and Knowledge									
Communication	3.16	5	3.70	1	3.37	1.050	1	5.591	0.020
IT; computer literacy; BIM	2.76	25	3.36	10	3.00	1.182	20	5.416	0.022

Negotiation and dispute resolution	2.80	22	3.24	15	2.98	1.064	22	3.506	0.065
Legal	2.80	23	3.15	22	2.94	1.123	24	1.941	0.167
Decision-making	2.88	19	3.00	25	2.93	.889	25	0.348	0.557
Numeracy and problem-solving	2.78	24	3.24	16	2.96	.898	23	5.500	0.021
Politics	3.43	1	3.21	17	3.35	1.217	3	0.647	0.423
Social/ networking	2.94	17	3.30	13	3.08	1.100	17	2.200	0.142
Can-do altitude, multi-tasking/multi-skilling	2.94	16	3.48	4	3.15	1.012	10	6.142	0.015
Creative and innovative ability	2.96	15	3.21	20	3.06	1.112	19	1.023	0.315

Source: Field Survey, February (2013)

Table 4.8 showed that the weighted means of the respondents' perceptions of the current level of proficiency in the delivery of the identified knowledge and skills ranges between 2.68 and 3.37. This indicated that most of the Abuja mass housing contractors are not so proficient in delivery the identified knowledge and skills currently. The result showed that Abuja mass housing Contractors are currently most proficient in **communication (3.37), construction technology (3.36) politics (3.35)** which differ with the findings of Mbachu (2012) having top three most proficient knowledge and skills as trade-specific technical know-how, social/networking and construction technology. The result also revealed that the Abuja mass housing Contractors is currently least proficient in **risk management (2.68), strategic management (2.74) and decision–making (2.93**). These findings also showed variance with Mbachu (2012) with least proficiency as IT; computer literacy; BIM, strategic management and human resource management. In general, the results showed low values for the standard deviation, which indicate high degree of consistencies in the respondents' opinions. This research proof that Nigerians' Contractors areas of proficiency in knowledge and skills requirements to perform in mass housing differs relatively with New Zealand Contractors as studied by Mbachu, 2012.

The ANOVA result showed there is a significant difference between the opinions of consultancy and client organisation in teamwork and relationship management, trade-specific technical know-how, procurement and contract bidding strategy, plant/equipment technical

know-how, communication, IT, and can-do attitude with significance level less or equal to 0.05.

A further analysis was carried out to establish the knowledge and skills gap which would necessitate developmental programs to improve the knowledge and skills of the contractors to enhance high performance in mass housing delivering.

The weighted mean of level of importance of knowledge and skills and current level of proficiency in delivering of those knowledge and skills is compared.

4.2.5 Comparison of Level of Importance Mean and Current level of Proficiency

Table 4.9 below compared the means of level of importance and current level of proficiency of knowledge and skill required for contractors' performance in mass housing construction projects.

Table 4.9: Comparison of Level of Importance Mean and Current level of Proficiency

Knowledge and Skills	*Level of Importance Mean*	*Current Level of Proficiency Mean*
Project management and leadership	4.35	3.14
Risk management	4.02	2.68
Contract and compliance	3.99	3.08
Financial management	4.14	3.19
Human resource management	4.06	3.18
Business and Administration	3.81	3.13
Strategic management	3.57	2.74
Change management	3.73	2.98
Marketing and public relation	3.54	3.18
Teamwork and relationship management	4.07	3.29
Building code and regulations	4.07	3.14
Construction technology	4.26	3.36
Trade-specific technical know-how	4.01	3.07
Blueprint reading and specifications	3.92	3.17
Procurement and contract bidding strategies	3.92	3.19
Plant/equipment technical know-how and selection strategy	3.92	3.10
Materials technology and selection strategies	3.93	3.15
Communication	4.08	3.37
IT; computer literacy; BIM	3.70	3.00
Negotiation and dispute resolution	3.73	2.98

Legal	3.61	2.94
Decision-making	3.82	2.93
Numeracy and problem solving	3.67	2.96
Politics	3.26	3.35
Social/networking	3.36	3.08
Can-do attitude, multi-tasking/multi-skilling	3.60	3.15
Creative and innovative ability	4.02	3.06

Source: Field Survey, February (2013)

The table above demonstrated variances in the mean of the two groups. The table showed a gap between the paired means of the knowledge and skills which indicated a need for improvement through training and education of contractor to achieve performance in mass housing construction projects. Project management and leadership, contract and compliance, financial management, human resource management, business and administration, marketing and public relation, teamwork and relationship management, building code and regulations, construction technology, trade specific technical know-how, blue print reading and specifications, procurement and contract bidding strategies, plant/equipment know-how and selection strategy, materials technology and selection strategies, communication, IT; computer Literacy, politics, social/network, can-do altitude and creative and innovative ability Abuja mass housing contractors have moderate proficiency in them with mean score ranging from 3.00 to 3.37. Abuja mass housing contractors have low proficiency in risk management, strategic management, change management, legal, decision-making, negotiation and dispute resolution with mean score between 2.68-2.98 which means more effort is require here for contractors in Abuja mass housing to possess requisite knowledge and skills to perform. This support findings of other researchers who opined that developing countries indigenous contractors lack capacity (Egbu, 1999; Ajayi & Ogunsanmi, 2010); Nkado & Mbachu, 2007; Basheka & Tumutegyereize, 2010; Mbachu, 2012 and Odediran *et al.*, 2012).

4.3 DISCUSSION OF RESULTS

The analysis of response data produced weighted mean of level of importance values for the 27 knowledge and skills required for contractors to perform in mass housing projects ranging from 3.29 to 4.36. The results of the analysis for the skills and knowledge performance of contractors could be broadly categorized into three themes: managerial/ business, technical, and generic skills and knowledge. The subcomponents of each theme were shown in Tables 2.1, 4.7 and 4.9.

Management/ business theme, project management and leadership were perceived as the skills and knowledge having the most profound impact on a contractor's performance in project delivery. This result corroborates Egbu (1999)'s finding that leadership, forecasting and planning are among the most important skills and knowledge for success in delivering refurbishment and general construction work. Also, Mbachu (2012) findings showed leadership and project management as most required knowledge and skills. Other high impact managerial/ business skills and knowledge include financial management, risk management, financial management, teamwork and relationship and contract and compliance management while marketing and public relation, strategic management and change management were the least. This confirms Mbachu (2012)'s findings. The perspective of the assessment of Consultancy organisation and client organisations differs a little. The consultancy organisations consider project management and leadership, financial management and teamwork and relationship management as the top three knowledge and skills required for contractors to perform in mass housing while client organisation rated project management and leadership, human resources and financial management as the top three.

Ratings of the technical knowledge and skills subcomponents, it showed that construction technology, building code and regulations and the trade-specific technical know-how were perceived as the skill and knowledge areas that had the highest impact on the contractors'

performance in project delivery. This demonstrates that the contractors must have proficiency in understanding the design, methodology and construction of buildings. The trade-specific technical know-how to be perceived among the top three knowledge and skills, this finding might be due to the fact that subcontractors handle 75 – 85% of the construction work (Mbachu & Nkado, 2007). Making trade-specific technical knowledge a must-have skill and knowledge for effective subcontractor management; this has been identified by Eom, *et.al.,* (2008) and Mbachu (2008) as the key determinant of project success. Other technical skills and knowledge having high impact on contractor's performance in project delivery were materials technology and selection strategy, plant/equipment technical know-how and selection strategy, procurement and contract bidding strategies and blueprint reading and specifications. The perspective of consultancy and client organisation showed that for consultancy organisation, construction technology, building code and regulations and plant/equipment technical know-how are the most required knowledge and skills while for client organisation construction technology, trade-specific technical know-how and material technology topped which demonstrated a variance in opinions.

The generic skills and knowledge domain contains four high impact subcomponents: Communication, creative and innovative ability, decision making and operations research, negotiation and dispute resolution , IT; computer literacy and the building information modeling (BIM), and can-do attitude; multi-tasking/multi-skilling. These findings showed that communication and innovative ability in any business enterprise could result in business transformation. Also, in Cheung (1999) showed that negotiation and dispute resolution skills could help the contractor minimize the escalation of hostility and costs in a project, thereby resulting in more successful outcomes. The ANOVA showed that there was no significant difference between the opinions of consultancy and client organisations except for the knowledge and skills of trade-specific technical knowhow. This means the H1 should be

accepted for all the knowledge and skills but rejected for trade-specific technical know-how which have a significance level higher than 0.05.

This results showed that the core knowledge requirement for mass housing project construction are; Project management and leadership, Construction technology, Financial management, Building code and regulations, Communication, Teamwork and relationship management, Human resource management, Creative and innovative ability, Risk management, and Trade-specific technical know-how while others were moderately required knowledge and skills for contractors' performance in mass housing project delivering.

The analysis of survey response data produced mean current level of proficiency values for the 27 knowledge and skills required for contractors to perform in mass housing projects ranging from 2.68 to 3.37. These findings demonstrated that Abuja mass housing contractors were proficient in communication, construction technology and politics which differed from the findings of Mbachu (2012) with three top most proficient knowledge and skills as trade-specific technical know-how, social/networking and construction technology. These meant that contractors in mass housing needed no training and education in those areas. The findings also demonstrated that Abuja mass housing contractors were least proficient in risk management, strategic management and decision–making which are essential factors for high performance. These findings showed variance with similar works of Mbachu (2012) with the least proficiency as IT; computer literacy; BIM, strategic management and human resource management. The ANOVA revealed there was a significant different between the opinions of consultancy and client organisation in teamwork and relationship management, trade-specific technical know-how, procurement and contract bidding strategy, plant/equipment technical knowhow, communication, IT, and can-do attitude because of which the null hypothesis (H2) should be rejected for the aforementioned skills and accepted for those that showed

significance level to be less than or equal to 0.05. This demonstrated that opinions of consultancy organisation differed from those of client organisations.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

Nigerian contractors are faced with the problems of lack of requisite knowledge and skills to perform when compared with their counterparts in the developed countries. Performance of a project will definitely correlate with the performance of a contractor.

Given the above scenario, it was thought necessary to assess the knowledge and skills required for contractors' performance in mass housing construction project delivery by prioritising these knowledge and skills along the lines of their relative levels of importance or impact on performance, the extent to which contractors possess the high impact knowledge and skills. In order to achieve the above, literature was reviewed in general area of mass housing, performance, performance measurement, and knowledge and skills for contractors' performance.

Data for this study was collected via questionnaires and analysed with descriptive and inferential statistical analysis method. The findings are thus summarised;

a) All the twenty seven (27) knowledge and skills identified from the literature were found to be relevant for contractors' performance in mass housing projects.
b) Ten (10) knowledge and skills were found to have high impact on contractors' performance in mass housing. These ten (10) knowledge and skills (Project management and leadership, Construction technology, Financial management, Building code and regulations, Communication, Teamwork and relationship management, Human resource management, Creative and innovative ability, Risk management, and Trade-specific technical know-how) form critical knowledge and skills required for contractors training and education. Seventeen (17) had moderate impact.
c) The opinions of consultancy and client organisation were not different in assessing the level of importance of the identified knowledge and skills except for trade specific

technical know-how that differs that have significance level of 0.027, H1 is rejected for this factor.

d) It was found that contractors delivering mass housing projects in Abuja were more proficient in communication, construction technology and politics but least proficient in risk management, strategic management and decision–making.

e) The analysis also revealed that there was a significant different between the opinions of consultancy and client organisations in assessing the level of proficiency in teamwork and relationship management, trade-specific technical know-how, procurement and contract bidding strategy, plant/equipment technical knowhow, communication, IT, and can-do attitude (these factors show significance level equal or below 0.05).

f) Furthermore, the analysis established a gap between the required knowledge and skills for mass housing construction project delivery and the contractors' proficiencies in each of them.

5.2 CONCLUSION

Based on the results of the study, it has been established that the identified knowledge and skills are important for contractors to perform. Twenty seven (27) knowledge and skills were identified and was prioritised along the level of their importance and contractors' proficiency in delivering them. The study has provides areas needing improvement through education and training. Also the critical (core) knowledge and skills that will form basis for such education and training has been established which are as follows;

- Project management and leadership: This covers knowledge and understanding of the managing of projects with appropriate tools, people skills, also the characteristics and behaviour of a leader.
- Construction technology: This covers the knowledge and understanding of the design, methodology and construction of buildings.
- Financial management: This covers the knowledge and understanding of finance, accounting concepts, cost control mechanisms, life cycle costing and cash flow management.
- Communication: This covers knowledge and understanding of effective oral, written, graphic and presentation skills including the methods and techniques that are appropriate to specific situation.
- Building code and regulations: This covers the knowledge and understanding of building codes and regulations and her principles of application.
- Teamwork and relationship management: This covers the knowledge and understanding of the principles, behaviours and dynamics of working in a team.
- Human resource management: This covers knowledge and understanding of the principles and practice of managing people (staff).

- Creative and innovative ability: This covers knowledge and ability to innovate and be creative.
- Risk management: This covers the management of risk on construction projects. It includes the ability to identifies, assessed and mitigates risks.
- Trade-specific technical know-how: This covers trades secretes and technology. It applied the understanding of the trade (Housing) and the technicality involved and also the expertise in the trade and techniques.

5.3 RECOMMENDATIONS

The following recommendations are hereby made based on the findings of this research;

a) The core knowledge and skills established in the findings should serve as basis for engaging contractors in mass housing construction projects.
b) The core knowledge and skills identified should serve as prerequisite for contractors training and education.
c) The seventeen (17) factors which are of moderate importance should be included into training and educational program of contractors as selective or optional knowledge and skills areas for contractor.
d) Deliberate efforts should be made to improve contractors' proficiency in the identified knowledge and skills by the contracting organisations and contractors.
e) Government should develop policies that will encourage and force contractors to acquire requisite knowledge and skills before they are engage (e.g. Contractor Registration, Training and Regulatory Board).
f) Further research works should consider other sectors of construction and compare their proficiency, knowledge and skills, current level of importance with mass housing sector. Also, studies should be conducted on perspectives of the contractors themselves on those identified knowledge and skills and compared with the professionals' perspective. In addition, a framework should be developed for Contractors' knowledge and skills including a curriculum development for Contractors education, training and regulatory scheme for construction contractors.

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APPENDICES

Questionnaire A

SPSS 16.0 Analysis Results B

APPENDIX A1

Department of Quantity Surveying,

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Dear Sir/Madam,

An assessment of Knowledge and Skills required for Contractors' performance in Mass housing construction project delivery

This questionnaire is part of a research aimed at promoting the enhancement of knowledge-base for the Mass housing Contractors' in Nigeria. The questionnaire is designed to elicit information on the relative importance of the identified knowledge and skills required for Contractors' high performance in mass housing project delivery in Nigeria as well as the current proficiency levels of the contractors.

Your contribution, by completing the attached questionnaire, would be very valuable to the success of this study which should contribute immensely towards charting the course for future training and development of mass housing contractors in Nigeria. All the information collected from this survey will be treated with utmost confidentiality and no personal or individual information about you or your organisation will be disclosed in the final report or any publication therefrom.

If you have any queries or require further clarification about the questionnaire, kindly contact the researcher at the address or email provided below. Also, please mail the completed questionnaire directly to the researcher at the address provided below.

Thank you very much for your time and cooperation.

Yours faithfully,



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NTRODUCTION

The questionnaire is divided into two major sections; Section A covers general information B requests respondents to rate, on a five-point Likert scale, their self-perceptions of the level of importance of the identified knowledge and skills required for contractors' high performance in housing project delivery and their current level of proficiency. An addendum highlighting the related knowledge, skills and outcomes covered by each knowledge and skills heading is provided as appendix I.

SECTION A: GENERAL INFORMATION

For each of the following, either write the requested information or tick (√) the option that is most applicable.

1. Profession: Architect ( ) Builder ( ) Engineer ( ) Quantity surveyor ( ) Project manager ( )
2. Type of organisation: Consultancy ( ) Client ( )
3. How many Mass housing Project have you participated? None ( ) 1-3 ( ) 4-6 ( ) 7-9 ( ) 10 above ( )
4. What was your role in the project?

   _____

SECTION B:

1. RELATIVE IMPORTANCE OF KNOWLEDGE AND SKILLS REQUIRED FOR CONTRACTORS' HIGH PERFORMANCE IN PROJECT DELIVERY AND CURRENT LEVEL OF PROFICIENCY

*Assess the level of importance of the following identified knowledge and skills required by contractors for high performance in mass housing delivery in Abuja using a scale of **1** to **5**, where **1** = **Not important** and **5** = **Very important**. Also assess the current level of evidence/proficiency of each of the identified knowledge and skills for contractors' high performance in mass housing delivery in Abuja using a scale of **1** to **5**, where **1** =**Poor** and **5** = **Excellent.** Indicate other knowledge and skills and rank in the spaces provided.*

S/No	KNOWLEDGE AND SKILLS REQUIRED FOR CONTRACTORS HIGH PERFORMANCE IN PROJECT DELIVERY	LEVEL OF IMPORTANCE					CURRENT LEVEL OF PROFICEINCY				
		1	2	3	4	5	1	2	3	4	5
1	Project management and leadership										
2	Risk management										
3	Contract and compliance management										

4	Financial management, accounting, cost/cash flow management										
5	Human resources management										
6	Business and administration, record keeping										
7	Strategic management										
8	Resilience to change, flexibility/adaptability to change (change management)										
9	Marketing and public relation management										
S/No	**KNOWLEDGE AND SKILLS REQUIRED FOR CONTRACTORS HIGH PERFORMANCE IN PROJECT DELIVERY**	**LEVEL OF IMPORTANCE**					**CURRENT LEVEL OF PROFICEINCY**				
		1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
10	Teamwork and relationship management										
11	Building code and regulations										
12	Construction technology										
13	Trade-specific technical know-how										
14	Blueprint reading and specifications										
15	Procurement and contract bidding strategies										
16	Plant/ equipment technical knowhow and selection strategy										
17	Materials technology and selections strategy										
18	Communication										
19	IT; computer literacy; BIM										
20	Negotiation and dispute resolution										
21	Legal										
22	Decision-making										
23	Numeracy and problem-solving										
24	Politics										
25	Social/ networking										
26	Can-do altitude, multi-tasking/multi-skilling										
27	Creative and innovative ability										
	Aside from the above knowledge and skills, do you have any you want to recommend to this study? Please freely add them below										
28											
29											
30											
31											

2. ADDITIONAL INFORMATION

Please use the space below to provide additional information, comments and observations you wish to bring to the attention of this study.

APPENDIX A2

Knowledge and skills headings and summary outcomes

S/No	Knowledge and skills heading	Summary of knowledge, skills, abilities, outcomes
1	Project management and leadership	This covers knowledge and understanding of the managing of projects with appropriate tools, people skills, also the characteristics and behaviour of a leader.
2	Risk management	This covers the management of risk on construction projects. It includes the ability to identifies, assessed and mitigates risks.
3	Contract and compliance management	This covers various forms of contract used in projects. It includes having an awareness of all of the main standard forms of contract and a thorough understanding of contract law, legislation, and the specific forms that have used. Also includes compliance with the contract.
4	Financial management, accounting, cost/cash flow management	This covers the knowledge and understanding of finance, accounting concepts, cost control mechanisms, life cycle costing and cash flow management.
5	Human resources management	This covers knowledge and understanding of the principles and practice of managing people (staffs)
6	Business and administration, record keeping	This covers the knowledge and understanding of construction business process, management, documentations and record keeping.
7	Strategic management	This covers the strategy the contractors employed to achieve high performance: process of goals creation, a mission statement, values and organizational objectives
8	Resilience to change, flexibility/adaptability to change (change management)	This covers the knowledge and understanding to manage transitioning/shifting of work section, individuals, teams from a particular state to the desired (Variation)
9	Marketing and public relation management	This covers the knowledge and understanding of the principles and processes of marketing and public relation management (e.g. business proposals, advertisements, etc)
10	Teamwork and relationship management	This covers the knowledge and understanding of the principles, behaviours and dynamics of working in a team.
11	Building code and regulations	This covers the knowledge and understanding of building codes and regulations and her principles of application.
12	Construction technology	This covers the knowledge and understanding of the design, methodology and construction of buildings.
13	Trade-specific technical know-how	This covers trades secretes and technology. It applied the understanding of the trade (Housing) and the technicality involved and also the expertise in the trade and techniques.
14	Blueprint reading and specifications	This covers the understanding and accurate interpretation of the design plan, specifications and given instructions from project owners.
15	Procurement and contract bidding strategies	This covers clear understanding of various procurement routes, the public procurement Act and bidding strategies in winning contracts.
16	Plant/ equipment technical knowhow and selection strategy	This covers the knowledge and understanding of different plants/equipments, their mode of operation and selection

		strategy for efficient usage of the plant/equipments.
17	Materials technology and selections strategy	This covers the knowledge and understanding of building materials and the ability of using the best material for the right job with quality and cost effectiveness.
18	Communication	This covers knowledge and understanding of effective oral, written, graphic and presentation skills including the methods and techniques that are appropriate to specific situation.
19	IT; computer literacy; BIM	This covers the knowledge, operation and understanding of computer packages , Building information management and literacy of information technology
20	Negotiation and dispute resolution	This covers the skills and knowledge of negotiation and dispute resolution in construction projects. It involves having awareness of the various processes and techniques commonly used in the industry as well as detailed understanding of how these are applied in practice.
21	Legal	This covers the knowledge and understanding of laws governing building construction and statutory obligations.
22	Decision-making	This covers the ability to make quick and accurate decisions. It also applies to operations research.
23	Numeracy and problem-solving	This covers the knowledge, confidence and competence to use numbers and think mathematically as applied to problem solving (e.g. Sum, addition, multiplication, division etc)
24	Politics	This covers the knowledge and understanding of the principles of political operation of government and organisations.
25	Social/ networking	This covers the knowledge and understanding of social networks and networking in business operations (internets, networking, etc)
26	Can-do altitude, multi-tasking/multi-skilling	This covers the knowledge and skills of confident and resourceful in the face of challenges, the ability to carry out different tasks in short time and possessing different skill above the required basic skills (Being so good at the job)
27	Creative and innovative ability	This covers knowledge and ability to innovate and be creative.
	The knowledge and skills by you	
28		
29		
30		
31		

APPENDIX A3

Department of Quantity Surveying,

Ahmadu Bello University,

Zaria, Nigeria.

Dear Sir/Madam,

An assessment of Knowledge and Skills required for Contractors' high performance in Mass housing construction project delivery

This questionnaire is part of a research aimed at promoting the enhancement of knowledge-base for the Mass housing Contractors' in Nigeria. The questionnaire is designed to elicit information on the relative importance of the identified knowledge and skills required for Contractors' high performance in mass housing project delivery in Nigeria as well as the current proficiency levels of the contractors.

Your contribution, by completing the attached questionnaire, would be very valuable to the success of this study which should contribute immensely towards charting the course for future training and development of mass housing contractors in Nigeria. All the information collected from this survey will be treated with utmost confidentiality and no personal or individual information about you or your organisation will be disclosed in the final report or any publication therefrom.

If you have any queries or require further clarification about the questionnaire, kindly contact the researcher at the address or email provided below. Also, please mail the completed questionnaire directly to the researcher at the address provided below.

Thank you very much for your time and cooperation.

Yours faithfully,

Yaro, Sunday Anyam

Department of Quantity Surveying,

Ahmadu Bello University,

Zaria, Nigeria.

M.Sc Project Management

Mobile Tel.: 0806 781 5930, 07051801016

Email: sunny.yaro@yahoo.com; sunnyyaro@gmail.com

GENERAL INFORMATION

For each of the following, either writes the requested information or tick (√) the option that is most applicable.

1. Is your organisation involved in mass housing construction in Abuja? Yes ( ) No ( )
2. Is your organisation registered with REDAN to participate in mass housing development in Abuja? Yes ( ) No ( )
3. How many Architect do your organisation employed? _____
4. How many Quantity Surveyors do your organisation employed? _____
5. How many Engineers do your organisation employed? _____
6. How many Builders do your organisation employed? _____
7. How many Project Managers do your organisation employed? _____
8. What are the professions of the employed Project Managers?
   _____,_____,_____
   __
9. How many Allied professionals do your organisation employed? _____
10. How many mass housing (Estate) has your organisation develop in Abuja? _____

APPENDIX B

RESULTS OF SPSS 16.0 ANALYSIS

APPENDIX B1

LEVEL OF IMPORTANCE

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	84	1	5	4.35	1.058
Risk management	84	1	5	4.02	1.202
"Contract and compliance	84	1	5	3.99	1.167
Financial management	84	1	5	4.14	1.184
Human resource management	84	1	5	4.06	1.090
Business and Administration	84	1	5	3.81	1.058
Strategic management	84	1	5	3.57	1.090
Change management	84	1	5	3.73	1.165
Marketing and public relation	84	1	5	3.54	1.197
Teamwork and relationship management	84	1	5	4.07	1.200
Building code and regulations	84	1	5	4.07	1.138
Construction technology	84	1	5	4.26	.946
Trade-specific technical know-how	84	1	5	4.01	1.081
Blueprint reading and specifications	84	1	5	3.92	1.055

Procurement and contract bidding strategies	84	1	5	3.92	1.100
Plant/equipment technical know-how and selection strategy	84	1	5	3.92	1.044
Materials technology and selection strategies	84	1	5	3.93	1.117
Communication	84	1	5	4.08	1.020
IT; computer literacy; BIM	84	1	5	3.70	1.190
Negotiation and dispute resolution	84	1	5	3.73	1.123
Legal	84	1	5	3.61	1.162
Decision-making; operational research	84	1	5	3.82	.946
Numeracy and problem solving	84	1	5	3.67	1.155
Politics	84	1	5	3.26	1.233
Social/networking	84	1	5	3.36	1.229
Can-do attitude, multi-tasking/multi-skilling	84	1	5	3.60	1.163
Creative and innovative ability	84	1	5	4.02	1.041

APPENDIX B2

CONSULTANCY ORGANISATION (LEVEL OF IMPORTANCE)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	51	1	5	4.27	1.133
Risk management	51	1	5	3.92	1.246
"Contract and compliance	51	1	5	3.86	1.167
Financial management	51	1	5	4.12	1.160
Human resource management	51	1	5	3.92	1.074
Business and Administration	51	1	5	3.76	.971
Strategic management	51	1	5	3.61	1.078
Change management	51	1	5	3.61	1.168
Marketing and public relation	51	1	5	3.53	1.155
Teamwork and relationship management	51	1	5	4.06	1.173
Building code and regulations	51	1	5	4.16	1.120
Construction technology	51	1	5	4.20	1.000
Trade-specific technical know-how	51	1	5	3.80	1.184
Blueprint reading and specifications	51	1	5	3.78	1.083
Procurement and contract bidding strategies	51	1	5	3.80	1.167

Plant/equipment technical know-how and selection strategy	51	1	5	3.80	1.040
Materials technology and selection strategies	51	1	5	3.80	1.132
Communication	51	1	5	4.02	1.010
IT; computer literacy; BIM	51	1	5	3.57	1.221
Negotiation and dispute resolution	51	1	5	3.65	1.092
Legal	51	1	5	3.49	1.138
Decision-making; operational research	51	1	5	3.80	.917
Numeracy and problem solving	51	1	5	3.49	1.173
Politics	51	1	5	3.22	1.205
Social/networking	51	1	5	3.18	1.244
Can-do attitude, multi-tasking/multi-skilling	51	1	5	3.51	1.120
Creative and innovative ability	51	1	5	3.88	1.089
Org = 1 (FILTER)	51	1	1	1.00	.000
Valid N (listwise)	51				

Above for consultants

APPENDIX B3 CLIENTS' ORGANISATION (LEVEL OF IMPORTANCE)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	33	2	5	4.45	.938
Risk management	33	1	5	4.18	1.131
"Contract and compliance	33	1	5	4.18	1.158
Financial management	33	1	5	4.18	1.236
Human resource management	33	1	5	4.27	1.098
Business and Administration	33	2	5	3.88	1.193
Strategic management	33	1	5	3.52	1.121
Change management	33	1	5	3.91	1.156
Marketing and public relation	33	1	5	3.55	1.277
Teamwork and relationship management	33	1	5	4.09	1.259
Building code and regulations	33	1	5	3.94	1.171
Construction technology	33	2	5	4.36	.859
Trade-specific technical know-how	33	2	5	4.33	.816
Blueprint reading and specifications	33	2	5	4.12	.992
Procurement and contract bidding strategies	33	1	5	4.09	.980
Plant/equipment technical know-how and selection strategy	33	2	5	4.09	1.042

Materials technology and selection strategies	33	2	5	4.12	1.083
Communication	33	1	5	4.18	1.044
IT; computer literacy; BIM	33	1	5	3.91	1.128
Negotiation and dispute resolution	33	1	5	3.85	1.176
Legal	33	1	5	3.79	1.193
Decision-making; operational research	33	2	5	3.85	1.004
Numeracy and problem solving	33	1	5	3.94	1.088
Politics	33	1	5	3.33	1.291
Social/networking	33	1	5	3.64	1.168
Can-do attitude, multi-tasking/multi-skilling	33	1	5	3.73	1.232
Creative and innovative ability	33	2	5	4.24	.936
Org = 2 (FILTER)	33	1	1	1.00	.000
Valid N (listwise)	33				

Above for clients' organisation.

APPENDIX B4

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Project management and leadership	Between Groups	.649	1	.649	.577	.450
	Within Groups	92.339	82	1.126		
	Total	92.988	83			
Risk management	Between Groups	1.357	1	1.357	.938	.336
	Within Groups	118.595	82	1.446		
	Total	119.952	83			
"Contract and compliance	Between Groups	2.040	1	2.040	1.508	.223
	Within Groups	110.948	82	1.353		
	Total	112.988	83			
Financial management	Between Groups	.083	1	.083	.058	.810
	Within Groups	116.203	82	1.417		
	Total	116.286	83			
Human resource management	Between Groups	2.471	1	2.471	2.105	.151
	Within Groups	96.232	82	1.174		
	Total	98.702	83			
Business and Administration	Between Groups	.261	1	.261	.231	.632
	Within Groups	92.692	82	1.130		
	Total	92.952	83			
Strategic management	Between Groups	.172	1	.172	.143	.706
	Within Groups	98.399	82	1.200		

	Total	98.571	83			
Change management	Between Groups	1.818	1	1.818	1.345	.250
	Within Groups	110.884	82	1.352		
	Total	112.702	83			
Marketing and public relation	Between Groups	.005	1	.005	.004	.953
	Within Groups	118.888	82	1.450		
	Total	118.893	83			
Teamwork and relationship management	Between Groups	.021	1	.021	.014	.906
	Within Groups	119.551	82	1.458		
	Total	119.571	83			
Building code and regulations	Between Groups	.948	1	.948	.729	.396
	Within Groups	106.624	82	1.300		
	Total	107.571	83			
Construction technology	Between Groups	.563	1	.563	.626	.431
	Within Groups	73.676	82	.898		
	Total	74.238	83			
Trade-specific technical know-how	Between Groups	5.616	1	5.616	5.040	.027
	Within Groups	91.373	82	1.114		
	Total	96.988	83			
Blueprint reading and specifications	Between Groups	2.274	1	2.274	2.069	.154
	Within Groups	90.143	82	1.099		
	Total	92.417	83			
Procurement and contract	Between Groups	1.650	1	1.650	1.370	.245

bidding strategies	Within Groups	98.766	82	1.204		
	Total	100.417	83			
Plant/equipment technical know-how and selection strategy	Between Groups	1.650	1	1.650	1.524	.220
	Within Groups	88.766	82	1.083		
	Total	90.417	83			
Materials technology and selection strategies	Between Groups	2.017	1	2.017	1.629	.205
	Within Groups	101.554	82	1.238		
	Total	103.571	83			
Communication	Between Groups	.527	1	.527	.503	.480
	Within Groups	85.889	82	1.047		
	Total	86.417	83			
IT; computer literacy; BIM	Between Groups	2.322	1	2.322	1.653	.202
	Within Groups	115.237	82	1.405		
	Total	117.560	83			
Negotiation and dispute resolution	Between Groups	.813	1	.813	.642	.425
	Within Groups	103.889	82	1.267		
	Total	104.702	83			
Legal	Between Groups	1.775	1	1.775	1.320	.254
	Within Groups	110.260	82	1.345		
	Total	112.036	83			
Decision-making; operational research	Between Groups	.040	1	.040	.044	.835
	Within Groups	74.282	82	.906		
	Total	74.321	83			

Numeracy and problem solving	Between Groups	4.043	1	4.043	3.109	.082
	Within Groups	106.624	82	1.300		
	Total	110.667	83			
Politics	Between Groups	.277	1	.277	.181	.672
	Within Groups	125.961	82	1.536		
	Total	126.238	83			
Social/networking	Between Groups	4.238	1	4.238	2.871	.094
	Within Groups	121.048	82	1.476		
	Total	125.286	83			
Can-do attitude, multi-tasking/multi-skilling	Between Groups	.948	1	.948	.698	.406
	Within Groups	111.291	82	1.357		
	Total	112.238	83			
Creative and innovative ability	Between Groups	2.598	1	2.598	2.438	.122
	Within Groups	87.355	82	1.065		
	Total	89.952	83			

APPENDIX B5

LEVEL OF IMPORTANCE RANK IN DESCENDING ORDER

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	84	1	5	4.35	1.058
Construction technology	84	1	5	4.26	.946
Financial management	84	1	5	4.14	1.184
Communication	84	1	5	4.08	1.020
Building code and regulations	84	1	5	4.07	1.138
Teamwork and relationship management	84	1	5	4.07	1.200
Human resource management	84	1	5	4.06	1.090
Creative and innovative ability	84	1	5	4.02	1.041
Risk management	84	1	5	4.02	1.202
Trade-specific technical know-how	84	1	5	4.01	1.081
"Contract and compliance	84	1	5	3.99	1.167
Materials technology and selection strategies	84	1	5	3.93	1.117
Plant/equipment technical know-how and selection strategy	84	1	5	3.92	1.044

Procurement and contract bidding strategies	84	1	5	3.92	1.100
Blueprint reading and specifications	84	1	5	3.92	1.055
Decision-making; operational research	84	1	5	3.82	.946
Business and Administration	84	1	5	3.81	1.058
Change management	84	1	5	3.73	1.165
Negotiation and dispute resolution	84	1	5	3.73	1.123
IT; computer literacy; BIM	84	1	5	3.70	1.190
Numeracy and problem solving	84	1	5	3.67	1.155
Legal	84	1	5	3.61	1.162
Can-do attitude, multi-tasking/multi-skilling	84	1	5	3.60	1.163
Strategic management	84	1	5	3.57	1.090
Marketing and public relation	84	1	5	3.54	1.197
Social/networking	84	1	5	3.36	1.229
Politics	84	1	5	3.26	1.233
Org = 1 (FILTER)	84	0	1	.61	.491
Valid N (listwise)	84				

APPENDIX B6

LEVEL OF PROFICIENCY OUTPUT

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	84	1	5	3.14	1.142
Risk management	84	1	5	2.68	1.121
"Contract and compliance	84	1	5	3.08	1.132
Financial management	84	1	5	3.19	1.146
Human resource management	84	1	5	3.18	1.077
Business and Administration	84	1	5	3.13	.915
Strategic management	84	1	5	2.74	1.077
Change management	84	1	5	2.98	1.006
Marketing and public relation	84	1	5	3.18	1.008
Teamwork and relationship management	84	1	5	3.29	1.025
Building code and regulations	84	1	5	3.14	1.121
Construction technology	84	1	5	3.36	1.060
Trade-specific technical know-how	84	1	5	3.07	1.039
Blueprint reading and specifications	84	1	5	3.17	1.028
Procurement and contract bidding strategies	84	1	5	3.19	1.114

Plant/equipment technical know-how and selection strategy	84	1	5	3.10	1.060
Materials technology and selection strategies	84	1	5	3.15	1.092
Communication	84	1	5	3.37	1.050
IT; computer literacy; BIM	84	1	5	3.00	1.182
Negotiation and dispute resolution	84	1	5	2.98	1.064
Legal	84	1	5	2.94	1.123
Decision-making; operational research	84	1	5	2.93	.889
Numeracy and problem solving	84	1	5	2.96	.898
Politics	84	1	5	3.35	1.217
Social/networking	84	1	5	3.08	1.100
Can-do attitude, multi-tasking/multi-skilling	84	1	5	3.15	1.012
Creative and innovative ability	84	1	5	3.06	1.112
Valid N (listwise)	84				

APPENDIX B7 CONSULTANT'S RESPONSE OUTPUT

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	51	1	5	3.02	1.086
Risk management	51	1	5	2.63	1.038
"Contract and compliance	51	1	5	3.00	1.039
Financial management	51	1	5	3.22	1.119
Human resource management	51	1	5	3.00	1.020
Business and Administration	51	1	5	3.08	.845
Strategic management	51	1	5	2.61	1.021
Change management	51	1	5	2.92	.891
Marketing and public relation	51	1	5	3.22	1.045
Teamwork and relationship management	51	1	5	3.08	.913
Building code and regulations	51	1	5	3.06	1.103
Construction technology	51	1	5	3.22	1.026
Trade-specific technical know-how	51	1	5	2.86	.980
Blueprint reading and specifications	51	1	5	3.02	.969
Procurement and contract bidding strategies	51	1	5	3.00	1.131
Plant/equipment technical know-how and selection strategy	51	1	5	2.88	1.032

Materials technology and selection strategies	51	1	5	3.02	1.086
Communication	51	1	5	3.16	1.065
IT; computer literacy; BIM	51	1	5	2.76	1.088
Negotiation and dispute resolution	51	1	5	2.80	1.059
Legal	51	1	5	2.80	1.040
Decision-making; operational research	51	1	5	2.88	.931
Numeracy and problem solving	51	1	5	2.78	.923
Politics	51	1	5	3.43	1.188
Social/networking	51	1	5	2.94	1.066
Can-do attitude, multi-tasking/multi-skilling	51	1	5	2.94	.988
Creative and innovative ability	51	1	5	2.96	1.131
Valid N (listwise)	51				

APPENDIX B8 CLIENT'S PROFESSIONALS RESPONSE OUTPUT

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project management and leadership	33	1	5	3.33	1.216
Risk management	33	1	5	2.76	1.251
"Contract and compliance	33	1	5	3.21	1.269
Financial management	33	1	5	3.15	1.202
Human resource management	33	1	5	3.45	1.121
Business and Administration	33	1	5	3.21	1.023
Strategic management	33	1	5	2.94	1.144
Change management	33	1	5	3.06	1.171
Marketing and public relation	33	1	5	3.12	.960
Teamwork and relationship management	33	1	5	3.61	1.116
Building code and regulations	33	1	5	3.27	1.153
Construction technology	33	1	5	3.58	1.091
Trade-specific technical know-how	33	1	5	3.39	1.059
Blueprint reading and specifications	33	1	5	3.39	1.088
Procurement and contract bidding strategies	33	1	5	3.48	1.034
Plant/equipment technical know-how and selection strategy	33	2	5	3.42	1.032

Materials technology and selection strategies	33	1	5	3.36	1.084
Communication	33	2	5	3.70	.951
IT; computer literacy; BIM	33	1	5	3.36	1.245
Negotiation and dispute resolution	33	1	5	3.24	1.032
Legal	33	1	5	3.15	1.228
Decision-making; operational research	33	2	5	3.00	.829
Numeracy and problem solving	33	2	5	3.24	.792
Politics	33	1	5	3.21	1.269
Social/networking	33	1	5	3.30	1.132
Can-do attitude, multi-tasking/multi-skilling	33	2	5	3.48	.972
Creative and innovative ability	33	2	5	3.21	1.083
Valid N (listwise)	33				

APPENDIX B9

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Project management and leadership	Between Groups	1.972	1	1.972	1.521	.221
	Within Groups	106.314	82	1.297		
	Total	108.286	83			
Risk management	Between Groups	.339	1	.339	.268	.606
	Within Groups	103.982	82	1.268		
	Total	104.321	83			
"Contract and compliance	Between Groups	.902	1	.902	.701	.405
	Within Groups	105.515	82	1.287		
	Total	106.417	83			
Financial management	Between Groups	.083	1	.083	.062	.804
	Within Groups	108.870	82	1.328		
	Total	108.952	83			
Human resource management	Between Groups	4.140	1	4.140	3.682	.058
	Within Groups	92.182	82	1.124		
	Total	96.321	83			
Business and Administration	Between Groups	.358	1	.358	.424	.517
	Within Groups	69.201	82	.844		
	Total	69.560	83			
Strategic management	Between Groups	2.202	1	2.202	1.921	.170
	Within Groups	94.036	82	1.147		

	Total	96.238	83			
Change management	Between Groups	.387	1	.387	.380	.539
	Within Groups	83.565	82	1.019		
	Total	83.952	83			
Marketing and public relation	Between Groups	.179	1	.179	.174	.677
	Within Groups	84.143	82	1.026		
	Total	84.321	83			
Teamwork and relationship management	Between Groups	5.578	1	5.578	5.608	.020
	Within Groups	81.565	82	.995		
	Total	87.143	83			
Building code and regulations	Between Groups	.917	1	.917	.727	.396
	Within Groups	103.369	82	1.261		
	Total	104.286	83			
Construction technology	Between Groups	2.598	1	2.598	2.349	.129
	Within Groups	90.688	82	1.106		
	Total	93.286	83			
Trade-specific technical know-how	Between Groups	5.653	1	5.653	5.524	.021
	Within Groups	83.918	82	1.023		
	Total	89.571	83			
Blueprint reading and specifications	Between Groups	2.807	1	2.807	2.713	.103
	Within Groups	84.859	82	1.035		
	Total	87.667	83			
Procurement and contract	Between Groups	4.710	1	4.710	3.931	.051

bidding strategies	Within Groups	98.242	82	1.198		
	Total	102.952	83			
Plant/equipment technical know-how and selection strategy	Between Groups	5.883	1	5.883	5.523	.021
	Within Groups	87.355	82	1.065		
	Total	93.238	83			
Materials technology and selection strategies	Between Groups	2.371	1	2.371	2.013	.160
	Within Groups	96.617	82	1.178		
	Total	98.988	83			
Communication	Between Groups	5.845	1	5.845	5.591	.020
	Within Groups	85.715	82	1.045		
	Total	91.560	83			
IT; computer literacy; BIM	Between Groups	7.187	1	7.187	5.416	.022
	Within Groups	108.813	82	1.327		
	Total	116.000	83			
Negotiation and dispute resolution	Between Groups	3.853	1	3.853	3.506	.065
	Within Groups	90.100	82	1.099		
	Total	93.952	83			
Legal	Between Groups	2.421	1	2.421	1.941	.167
	Within Groups	102.282	82	1.247		
	Total	104.702	83			
Decision-making; operational research	Between Groups	.277	1	.277	.348	.557
	Within Groups	65.294	82	.796		
	Total	65.571	83			

Numeracy and problem solving	Between Groups	4.205	1	4.205	5.500	.021
	Within Groups	62.688	82	.764		
	Total	66.893	83			
Politics	Between Groups	.963	1	.963	.647	.423
	Within Groups	122.025	82	1.488		
	Total	122.988	83			
Social/networking	Between Groups	2.623	1	2.623	2.200	.142
	Within Groups	97.793	82	1.193		
	Total	100.417	83			
Can-do attitude, multi-tasking/multi-skilling	Between Groups	5.922	1	5.922	6.142	.015
	Within Groups	79.066	82	.964		
	Total	84.988	83			
Creative and innovative ability	Between Groups	1.266	1	1.266	1.023	.315
	Within Groups	101.437	82	1.237		
	Total	102.702	83			
Org = 2 (FILTER)	Between Groups	20.036	1	20.036	.	.
	Within Groups	.000	82	.000		
	Total	20.036	83			

APPENDIX B10

COMPARISON BETWEEN LEVEL OF IMPORTANCE AND LEVEL OF PROFICIENCY

MEAN OF LEVEL OF IMPORTANCE	MEAN OF LEVEL OF PROFICIENCY
4.35	3.14
4.02	2.68
3.99	3.08
4.14	3.19
4.06	3.18
3.81	3.13
3.57	2.74
3.73	2.98
3.54	3.18
4.07	3.29
4.07	3.14
4.26	3.36
4.01	3.07
3.92	3.17
3.92	3.19
3.92	3.10
3.93	3.15
4.08	3.37
3.70	3.00
3.73	2.98
3.61	2.94
3.82	2.93
3.67	2.96
3.26	3.35
3.36	3.08
3.60	3.15
4.02	3.06