

Most Critical Factors Responsible For Cost Overruns In Nigeria Building Construction Industry

Oluyemi-Ayibiowu, B. D*., Aiyewalehinmi, O. E., and Omolayo, O. J.

Department of Civil and Environmental Engineering,
The Federal University of Technology, Akure, Nigeria

Abstract—Cost overruns are major problems that face the Nigeria construction industry. Cost overruns can lead to numerous negative effects such as project delay, abandonment and poor quality delivery. It's of high concern to those who are involved in the construction industry. This study was carried out to identify the major causes of cost overruns in Nigeria building construction industry, by means of a literature review and a questionnaire survey. A total of twenty (20) cost overrun causative factors were obtained from literature. The questionnaire survey was distributed to randomly selected respondents from a combination of clients, consultants, contractors, site-engineers, project-managers and sub-contractors. In all, one hundred and forty one (141) questionnaires were distributed to randomly selected respondents (clients, consultants, contractors, site-engineers, project-managers and sub-contractors), one hundred and thirty two (132) questionnaires were returned out of which three (3) questionnaires were found incomplete and invalid. Only one hundred and twenty nine (129) questionnaires were found consistent and valid for use in this research. Relative importance index (RII) and severity index were used to carry out ranking and severity analysis. Based on the data received, six (6) most severe factors of construction cost overrun were identified as: risk and uncertainty related factors (89.5%); lack of financial power by clients (88.5%); weak regulation and control (88.2%); project fraud and corruption (82.6%); variation of prices (81.3%) and indiscriminate change in design/works (80.1%).

Keywords—Construction industry; Cost overruns factors; Relative Importance Index (RII).

1. INTRODUCTION

1.1 Background

The construction industry is very important in the socio-economic growth of a nation, as it improves the overall Gross Domestic product (GDP) of a nation. The successful completion of construction projects within the time frame, budget allocation and of expected quality and durability is therefore fundamentally crucial (Aftab, 2013) [2].

Construction industries in Nigeria are facing a lot of challenges in managing construction projects in areas of budget. Completion of projects in time within the budget, and with desired quality is basic requirements which are seldom achieved in the construction industry. This has become a worldwide problem, leading to project abandonment and huge economic loss. Jackson (2002) [16] studied the problem of cost overrun by investigating 15 projects in Ilorin and found that 73.7% of the projects faced cost overrun at an average of 34.7% of the initial project cost. Investigation of 137 construction projects by Olatunji (2009) [23] showed that 55% of the projects had cost overrun problems, ranging from 5% to 80.8% of project cost. There is need to identify and evaluate the most severe factors influencing project cost.

In Nigeria, we experienced frequent failures and project abandonment due to ineffective management techniques. Cost is one of the major considerations throughout the lifecycle of a project. Unfortunately, most of the projects failed to achieve project completion with the estimated cost. Besides time overrun, cost overrun is also a serious problem in the construction industry. In Nigeria, the trend is more severe, where these overruns sometimes exceeds 100% of the anticipated cost of the project (Assaf *et al.*, 2008) [7]. There is need to evaluate the most severe factors influencing project budgeted overall cost.

Construction industries in Nigeria are facing a lot of challenges in managing construction projects in areas of budget management. The functions of management in construction are: planning, organizing, staffing, directing, controlling and co-coordinating (Gahlot, 2002) [13]. Construction management need well trained engineers and project managers. In any work involving a common goal, management is essential to coordinate the efforts (Oluyemi, 2016) [25]. Serious concerns has been expressed about construction projects which have not been delivered in various parts of the country after huge financial mobilizations has been made. In order to reduce cost and maximize profit, some contractors risk using inferior construction materials and incapable human resources which ultimately results in poor quality and thus compromise safety standards (Wenfa and Xinhua, 2014) [28]. Failure in achieving required quality also has significant negative impact on project costs. Completion of

projects in time within the budget, and with desired quality is basic requirements which are seldom achieved in the construction industry. This has become a worldwide problem, leading to project abandonment and huge economic loss.

This study is aimed at identifying those factors influencing project cost and determining the most severe factors, for an efficient and effective project cost management in Nigeria construction industry. The specific objectives are to: identify the factors influencing project cost and rank the most severe factors. Relationship that exists between cost and other parameters such as: roles of project team (respondents); academic qualification; level of experience (in years); type of project; project funding; and past project challenges will be determined. The scope of this research is limited to identification of the factors influencing project cost, and ranking of the most severe identified factors within Nigeria, using Lagos, Abuja and Portharcourt metropolis of Nigeria as case study areas. Target respondents for this study are the principal actors in the construction industry namely: owner/client, consultant, contractor, site-engineers, project-managers, and sub-contractors. The study involved: collection of site reports on cost on some large construction sites; data collection from selected project sites with the aid of well structured and unstructured questionnaires; personal interviews; and analysis of data.

1.2 Cost Overrun

Cost is one of the major considerations throughout the lifecycle of a project. Unfortunately, most of the projects failed to achieve project completion with the estimated cost. Besides time overrun, cost overrun is also a serious problem in the construction industry. In Nigeria, the trend is more severe, where these overruns sometimes exceeds 100% of the anticipated cost of the project (Assaf *et al.*, 2008) [7]. Despite the wide availability and use of different project management methods and software packages, many construction projects still suffer cost overruns (Olawale *et al.*, 2010) [24].

Developed countries have lessons to learn as well since cost overrun in the construction industry is a worldwide phenomenon (Ameh *et al.*, 2010)[4]. Construction industry is a project oriented industry. Without projects, there won't be construction industries and no development. Approximately 90% of projects worldwide have cost overrun ranging from 50 to 100% of project cost (Frimpong *et al.*, 2003) [11]. Like other countries, Malaysian construction industry is also facing a lot of challenges in completing the construction projects within the estimated cost (Ibrahim *et al.*, 2010 & Toh *et al.*, 2011) [14 & 27] and more than 50% of projects face cost overrun (Endut *et al.*, 2009) [9].

Kaming *et al.* (1997) [18] identified factors influencing construction cost overruns on high-rise building projects in Indonesia through a questionnaire survey administered to 31 project managers. The results showed that major factors affecting project cost were increased in materials cost due to inflation, inaccurate quantity estimation and supply, labour cost increase due to environmental restriction, improper siting of project location, lack of experience of

project type, unpredictable weather conditions and lack of experience of local regulation. Jackson and Steven (2001) [15] examined the causes of cost overrun in building projects of Ilorin through questionnaire survey and found that major factors of cost overruns were fluctuation in the prices of materials/Labour, variation orders, delay in honoring certificates, lack of proper analysis of tenders, selection of incompetent contractors, lack of proper appraisal of projects and unrealistic representation of clients' needs. Jackson (2002) [16] studied reasons of budget overrun in UK through questionnaire survey and found that major reasons of overrun were design changes, design development factors, information availability, method of estimation, performance of design team and project management.

Chang (2002) [8] studied the reasons of cost increase through 4 case projects to quantify their contributions in engineering design projects in USA. The finding of the study showed that the major reason for cost increase was owner request of changes in scope and additional works. Frimpong *et al.* (2003) [12] conducted a questionnaire survey consisting of 26 factors to study major contributors of cost overrun in groundwater drilling projects in Ghana. Out of 26 factors considered, top 10 factors are monthly payment difficulties, poor contract management, material procurement, inflation, contractor's financial difficulties, escalation of material prices, cash flow during construction, planning and scheduling deficiencies, bad weather and deficiencies in cost estimates prepared. Amu and Jeje (2005) [5] evaluated the cash flow policies and its effect on the completion time of projects in western Nigeria. They identified that 27.4% of the total numbers of sixty-two projects considered were completed within the time frame, while 72.6% were yet to be completed on the agreed time frame. The 73.3% of the yet to be completed projects were due to cash flow problems, that is, lack of subsequent fund after the initial mobilization fees provided by the government for the projects. The other 11.1, 13.3 and 2.2% were delays due to the lack of mobilization fees, equipment breakdowns and poor weather conditions respectively. The major constraints to the timely completion of projects in the western states considered therefore were due to cash flow problems. Koushki *et al.* (2005) [19] studying problem of cost increase in the private residential projects of Kuwait mentioned that three main contributors to cost overruns were contractor-related problems, material-related problems and owners' financial constraints. Omoregie and Radford (2006) [26] study found out the major factors causing cost overrun in infrastructure projects of Nigeria were price fluctuations, financing and payments of completed works, poor contract management, schedule delay, changes in site conditions, inaccurate estimates, shortage of material, imported materials and plant items, additional works, design changes, subcontractors and nominated suppliers, weather, non-adherence to contract conditions, mistakes and discrepancies in contract conditions and fraudulent practices. Azhar *et al.* (2008) [7] investigated cost overrun causes in construction industry of Pakistan. A survey using questionnaire containing forty two (42) factors showed that the top ten cost overrun factors found were fluctuation in prices of raw materials, unstable cost of manufactured

materials, high cost of machineries, lowest bidding procurement procedures, poor project (site) management/ poor cost control, delays between design and procurement phases, incorrect/ inappropriate methods of cost estimation, additional work, improper planning, and unsupportive government policies. Le-Hoai *et al.* (2008) [20] studied the causes of cost overrun in large construction project of Vietnam using questionnaire survey. The investigation included 21 causative factors and top 5 common and very sever causes of cost overrun were poor site management and supervision, poor project management assistance, financial difficulties of owner, financial difficulties of contractor; design changes. Enshassi *et al.* (2009) [10] conducted questionnaire survey to identify major causes of cost overrun in construction projects of Gaza by investigating 42 factors amongst contractors, consultants and owners. Results indicated that top ten factors that cause cost overruns as perceived by the three parties include increment of materials prices due to continuous border closures, delay in construction, supply of raw materials and equipment by contractors, fluctuations in the cost of building materials, unsettlement of the local currency in relation to dollar value, project materials monopoly by some suppliers, resources constraint: funds and associated auxiliaries not ready, lack of cost planning/monitoring during pre- and post-contract stages, improvements to standard drawings during construction stage, design changes, and inaccurate quantity take-off.

Kaliba *et al.* (2009) [17] carried out a study to determine the contributors of cost escalation in road construction projects of Zambia. The finding of study showed that the main causes of cost escalation included bad or inclement weather due to heavy rain and flooding, scope changes, environmental protection and mitigation costs, schedule delay, strikes, technical challenges, inflation and local government pressure. Abdullah (2010) [1]; Aibinu and Jagboro (2002) [3] stated that these identified factors are part of the whole literature review on the factors causing cost overrun happening worldwide. They further stated that comprehensive review consisting of 46 published articles has resulted in identifying 78 common factors of cost overrun, which were considered for further investigation to find the relevancy and significance of these factors towards construction industry. As a part of literature review, studies on time overrun factors were also considered as: cost overrun is directly correlated with time overrun and it is difficult to separate the factors causing overrun between cost and time overrun, as the reasons for cost increases are normally also the reasons for time.

Ameh *et al.* (2010) [4] investigated the causes of cost overrun in 53 telecommunication projects of Nigeria through structured questionnaire survey containing 42 factors. Survey results showed that top seven factors were lack of experience of contractors, cost of material, fluctuation in the prices of materials, frequent design changes, economic stability, high interest rates charged by banks on loans received by contractors, mode of financing, bonds and payments as well as fraudulent practices and kickbacks.

2. MATERIAL AND METHOD

2.1 Study Areas

Three locations (study areas) were selected in Nigeria for this research. These are Abuja, Lagos and Portharcourt (Figure 1). The choice of locations was based on commercial viability, social status, economic considerations and area accessibility which provide opportunities for diverse industries like: construction, consulting, manufacturing, agriculture, telecom, marketing, legal, health and technological advancement.

2.2 Data Source

In this research, questionnaires were administered to collect necessary data. With the aid of latest version of the SPSS software, all collected data were analysed to carry out: descriptive analysis of respondents' characteristics, ranking and severity analysis, reliability statistics and Pearson correlation. A total of One hundred and twenty nine (129) experienced personnel involved in handling construction projects, responded to the questionnaires in Lagos, Abuja and Portharcourt, as a representative of the entire Nigeria construction sites.

This research methodology was carried out under literature review, interviews, questionnaires survey and secondary data collection. These methods acted as supplement to each other which made the data collection more comprehensive, meaningful and valid. Basically, the literature review focused on gaining a better understanding of cost performance and causative factors affecting its overrun in construction projects. These factors were analyzed in conformance to represent the problems of cost overrun in prevailing construction industries in Nigeria through administered questionnaire and interviewing experienced personnel involved in handling construction projects. This revealed the perception of owner/client, consultant, contractor, site-engineers, project-managers, and sub-contractors towards the factors causing cost overrun. Gathered data was ranked using Relative Importance Index (R.I.I) method and statistical tools in order to draw the conclusion in determining the current situation of cost overrun problem and factors contributing to these overrun.

2.3 Population and Sample

The entire population size (N) and total representative sample (n) for this research was determined using simple random sampling (SRS) method. Simple random sampling is a method in which members or items of the population can only be selected one at a time for inclusion in the sample. The sample size (n) for each study area was calculated using:

$$n = n' / [1 + (n'/N)] \quad (\text{Mahmoud, 2012}) [21]$$

Where:

N = total number of population

n = sample size from finite population

n' = sample size from infinite population = S^2/V^2 ;

Where:

S^2 is the variance of the population elements and

V is a standard error of sampling population.

Usually $S = 0.5$ and $V = 0.06$; (Assaf *et al.* 2001 & Moore *et al.* 2003) [6 & 22].

2.4 Relative Importance Index and Severity

The Relative Important Index method (RII) was used to determine Respondent's perception of the relative importance of the identified influencing factors on cost in construction sites.

$$\text{Relative Important Index (R.I.I)} = \frac{\sum_{i=1}^5 (a_i)(n_i)}{A \times N} \quad (1)$$

$$\text{Relative Important Index (R.I.I)} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N} \quad (2)$$

$$(0 \leq \text{R.I.I} \leq 1)$$

Where:

a_i is Constant expressing weight given to i th response: $i = 1, 2, 3, 4, 5$

n is variable expressing frequency of i

Table 1: Likert scale showing ranking and rating

Item	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Description	Not very Important	Not Important	Moderately Important	Important	Very Important
Scale	1	2	3	4	5

The Severity Index (I) was calculated to interpret the degree of severity effect of the identified factors influencing cost on building construction projects using Lagos, Abuja and Portharcourt as case study areas in Nigeria. The categorizations reflected the scale of the respondents answer to questionnaire. The severity index of a category was the average severity indexes of all its related factors.

This index was calculated as follows:

$$\text{Severity Index (I)} = \frac{\sum_{i=1}^5 (a_i)(n_i)}{A \times N} \times 100\% \quad (3)$$

3. RESULTS AND DISCUSSION

N is Total number of Respondents,

A is Highest weight (as shown in Table 1, where $A=5$)

n_5 is Number of Respondent for very important

n_4 is Number of Respondent for Important

n_3 is Number of Respondent for Moderately important

n_2 is Number of Respondent for Not important

n_1 is Number of Respondent for Not very important

The item with the highest RII value was ranked first (1) the next (2) and so on.

Interpretation of the RII values is as follows:

$\text{RII} < 0.60$, item is assessed to have low rating

$0.60 \leq \text{RII} < 0.80$, item assessed to have high rating.

$\text{RII} \geq 0.80$, item assessed to have very high rating.

i.e. **Severity Index (I)** = $\text{R.I.I} \times 100\%$

$$(4)$$

The severity index was categorized into five levels:

- 0-49% was categorized as none severe;
- 50-69% was categorized as fairly severe;
- 70-74% was categorized as moderately severe;
- 75-79% was categorized as severe; and
- 80-100% was categorized as most severe.

The most severe independent factors for cost as the dependent variable under investigation were selected as most relative important factors influencing apportioned research objective.

The results presented are characteristics of respondents to questionnaire distributed (Figure 2); descriptive analysis, ranking and severity analysis; reliability statistics; and correlation results.

Table 2: Questionnaire Distribution and Responses from the selected study areas

	Abuja	Lagos	Portharcourt	TOTAL
Number Distributed	48	60	33	141
Number of Responses	44	54	31	129
Percentage of Responses (%)	91.67	90.00	93.94	91.49

% Responses = (Number of responses/Number Distributed) X 100%

Table 3: Summary of Characteristics of Respondents

Category	Classification	Frequency	Percent (%)
1. Roles/Position of Respondents	Owners	10	7.75
	Consultant	22	17.05
	Contractor	40	31.01
	Site Engineer	25	19.38
	Project Manager	11	8.53
	Sub-contractor	21	16.28
	Total	129	100
2. Respondents' Academic Qualification	O.N.D	0	0
	H.N.D	26	20.16
	B.Sc/B.Tech	40	31.01
	P.G.D	25	19.38
	M.Sc/M.Tech	32	24.81
	Ph.D	6	4.65
Total	129	100	
3. Respondents' Level of Experience in Construction Project	1 year to 2 year	0	0
	2 year to 5 year	13	10.08
	5 year to 10 year	20	15.50
	10 year to 15 year	43	33.33
	15 year and above	53	41.09
Total	129	100	
4. Respondent's Type of Project	Residential	9	6.98
	Non-Residential	51	39.53
	Public utility	19	14.73
	Civil works	18	13.95
	Commercial/ special trade	32	24.81
	Others that were not specified	0	0
Total	129	100	
5. Type of Project Funding	Public	42	32.56
	Private	65	50.39
	Joint	22	17.05
	Total	129	100
6. Respondent's Previous Project Challenges	Abandoned project (1)	41	31.78
	Delivered behind schedule (2)	52	40.31
	Experienced cost over-run (3)	31	24.03
	Reworked/berated (4)	5	3.88
	has no challenge	0	0
	no project experience	0	0
Total	129	100	

3.1 Ranking Analysis (Relative Importance Index and Severity Index)

From Table 4, the six (6) most severe factors affecting cost as opined by the respondents are: Risk and uncertainty

associated with projects with severity of 89.5%, Lack of financial power (88.5%), Weak regulation and control (88.2%), Project fraud and corruption (82.6%), Inflation of prices (81.3%) and Indiscriminate change in design/works with severity of 80.1%.

Table 4: Factors Influencing Cost Arranged in Order of Ranking

FACTORS	ID	AVERAGE		SEVERITY (%)	RANK
		MEAN	RII		
Risk and uncertainty associated with projects	CF2	4.44	0.895	89.5	1
Lack of financial power of the client	CF8	4.43	0.885	88.5	2
Weak regulation and control	CF18	4.38	0.882	88.2	3
Project fraud and corruption	CF19	4.10	0.826	82.6	4
Inflation of prices (variations)	CF10	4.03	0.813	81.3	5
Indiscriminate Change in design/works	CF1	3.97	0.801	80.1	6
Unpredictable weather conditions	CF5	3.93	0.789	78.9	7
Lack of proper training and experience of Project Manager (PM)	CF3	3.83	0.788	78.8	8
Fluctuation of currency/exchange rate	CF20	3.72	0.771	77.1	9
Low skilled manpower	CF4	3.5	0.703	70.3	10
Delay in payment of completed works	CF9	3.48	0.703	70.3	11
Unstable interest rate	CF17	3.43	0.701	70.1	12
Unstable government policies	CF16	3.43	0.687	68.7	13
Disagreement on interpretation of contract documentation and specification	CF11	3.04	0.570	57.0	15
Use of inappropriate software for cost estimation	CF7	2.81	0.542	54.2	16
Non-performance of subcontractors and nominated suppliers	CF14	2.72	0.526	52.6	17
Dependency on imported materials	CF6	2.62	0.503	50.3	18
Inaccurate evaluation of projects time/duration	CF15	2.45	0.488	48.8	19
Complexity of works	CF13	2.30	0.459	45.9	20

Table 5: Inter-Item Correlation Matrix

		Q1	Q2	Q3	Q4	Q5	Q6	CF
Pearson correlation	Q1	1.000	0.39	0.62	0.74	0.16	0.35	0.49
	Q2	0.39	1.000	0.31	0.15	0.09	0.43	0.78
	Q3	0.62	0.31	1.000	0.24	0.20	0.94	0.89
	Q4	0.74	0.15	0.24	1.000	0.91	0.78	0.49
	Q5	0.16	0.09	0.20	0.91	1.000	0.19	0.91
	Q6	0.35	0.43	0.94	0.78	0.19	1.000	0.56
	CF	0.49	0.78	0.89	0.49	0.91	0.56	1.000
		Q1	Q2	Q3	Q4	Q5	Q6	CF
Sig. (1-tailed)	Q1	.	.000	.000	.000	.000	.001	.000
	Q2	.000	.	.000	.002	.000	.000	.000
	Q3	.000	.000	.	.000	1.223E-5	.000	.000
	Q4	.000	.002	.000	.	.000	.000	5.288E-5
	Q5	.000	.000	1.223E-5	.000	.	.000	.000
	Q6	.001	.000	.000	.000	.000	.	.000
	CF	.000	.000	.000	5.288E-5	.000	.000	.
N		129						

Where:

Q1 = Roles of project team (respondents); Q2= Academic qualification; Q3= Level of experience (in years); Q4= Type of project; Q5= Project funding; Q6= Past project challenges; CF= Cost-factor.

4. CONCLUSION

From the study, it was concluded that the most severe factors affecting project cost in Nigeria construction industries are: Risk and uncertainty associated with projects; Lack of financial power; Weak regulation and control; Project fraud and corruption; Inflation of prices (variations) and Indiscriminate Change in design/works, with severity of 89.5%, 88.5%, 88.2%, 82.6%, 81.3%, and 80.1% respectively. According to the respondents, inadequate planning against risk and uncertainty has been

a serious cause of cost overrun in Nigeria construction industry.

5. ACKNOWLEDGEMENTS

The Researchers thank Prof. C. Arum, Dr. Fdaugba, O. G and Engr. Adeniyi (Retired) who shared their memories and experiences, to support and expand this work. This had given the researcher the courage to challenge the common problem of optimization in the construction industry about minimizing cost.

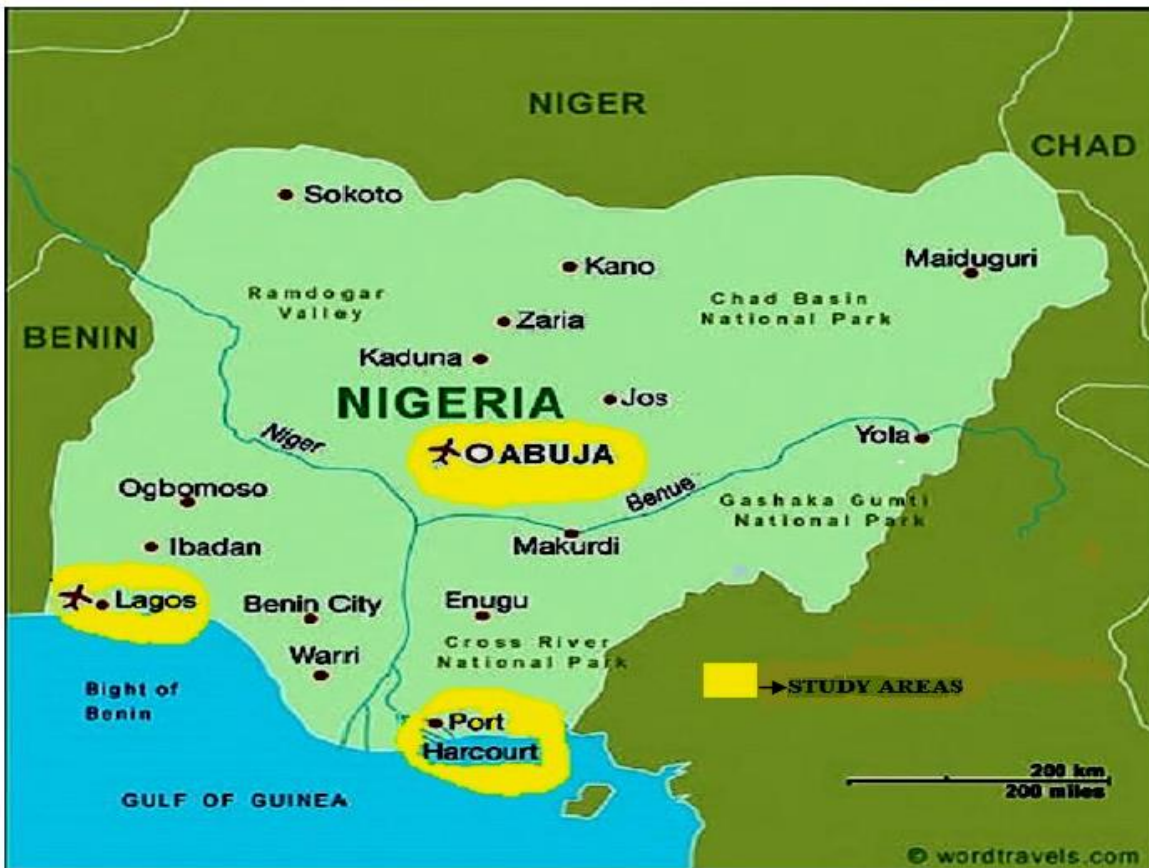


Figure 1: Map of Nigeria showing study areas (Abuja, Lagos and Portharcourt)

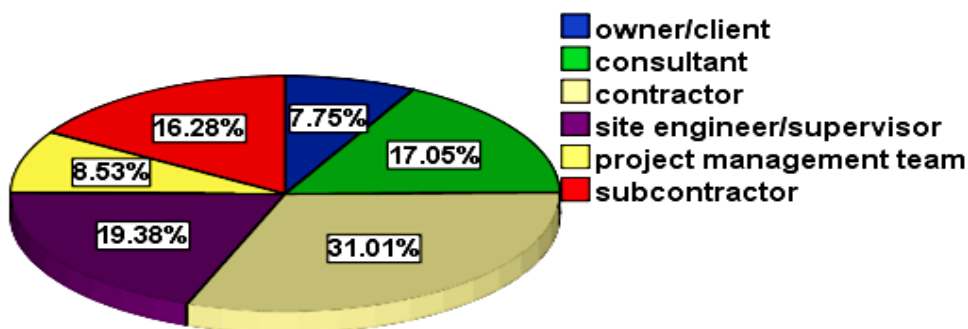


Figure 2: Pie chart representing percentage of Respondents' Role

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