Assessing the Impact of Client Delays on Completion Cost of Public Construction Projects in Niger State

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A major pointer of failure of most projects constructed in Nigeria today is the high costs of construction. The study evaluated the impact of client related delays on completion cost of public construction project in Niger state. It further analysed the qualitative and quantitative factors contributing to client related delays that have influence on completion cost of construction projects in the study area. A well-structured questionnaire was administered to assess the perception and understanding from knowledgeable respondents, which are stakeholders in the construction industry. 120 questionnaires were distributed and 87 were returned which represent 73% of the total distributed. The questionnaires were analysed using descriptive statistical tool and Relative Importance Index (RII). The archival data obtained was analysed to establish the extent of cost overrun as a result of delay. Regression analysis was also conducted to develop a model for predicting the final cost of construction project that may experience delay. The result on client related delay factors revealed that delay in payment, lack of fund by client due to improper planning, change in government, where the top most important client related factors that causes delays in construction project in Niger State. The result of this study will provide insight to any individual involved in construction and implementation of project on the factors that influence project delays in the construction industry. It was recommended that client should ensure that there is sufficient fund to facilitate payment to contractors and also embark on fewer projects which should be completed and executed within their tenor.

Keywords: Client Delays, Completion Cost, Construction project, Public

Introduction

The present state of the Nigeria construction industry falls short of meeting international and national quality standards and performance demands expected from the industry (Ikechukwu, Emoh & Kelvin, 2017). The increasing pace of delays in project delivery is one of the major criticisms the Nigeria construction industry is facing (Mamman, Abdullahi & Isah, 2016). Elinwa and Joshua (2001) noticed that completing projects on the required time and within budget continues to be a customary dilemma in Nigeria. Most of the projects constructed in Nigeria have had problems with time and cost overrun which has caused a lot of concern. According to Odeyinka and Yusuf (1987), seven out of ten construction projects surveyed in Nigeria experienced delays in their execution. A surveyed carried out by Omoregie and Radford (2006), revealed that the minimum average of cost overrun in Nigeria construction projects is 14% every year. Subsequently, many projects are not keeping to cost and budget. A study conducted by Mamman *et al*. (2016) on predicting the final completion cost of construction projects in Niger state, revealed that 76.53% of the projects sampled had an average cost overrun of 43.26%. Saidu and Shakantu (2017) investigated cost overrun for ongoing building projects in Abuja and observed that projects with an average completion of 52.4% had an average cost overrun of 44.46% and time overrun of 91.4%.

A major pointer of failure of most projects constructed in Nigeria today is the high costs of construction (Ijigah *et al.,* 2012). This has resulted in poor construction performance and abandoned projects with severe effects on the country's socio-economic and technological advancement. Generally, construction projects are being carried out at costs far higher than the initial budget which shows that initial estimated cost on projects constructed can barely be relied upon by clients (Kunya, 2006; Ijigah *et al.,* 2012; Mamman *et al.,* 2016). The study of several researchers has revealed that numerous projects are still subjected to delay which results in disputes and claims among clients and contractors or projects abandonment (Aibuni & Jagboro, 2002; Achuenu & Ujene, 2006; Ijigah *et al.,* 2012; Mamman *et al.,* 2016). This has also affected public sector projects construction. Most projects funded by the government still remained at different stages of execution and those projects completed funds are still withheld. This occurrence has stimulated the authors to investigate the performance of past projects in Niger state. Hence, the aim of this study is to investigate the impact of client related delays on the completion cost of public sector construction projects in Niger state. The study had the following objectives: To identify client related delay factors that have the most significant impact on public sector construction projects in Niger state; To evaluate the impact of client delay on completion cost on public project construction and; To develop a cost model for the prediction of completion cost of construction projects in Niger state.

Literature Review
Delays in Construction
Delay is a condition where the contractor and project client or his representative mutually or severally contributes to the non-completion of the project within the original or predetermined or approved contract period (Aibinu & Jagboro 2002). Assaf and Al-Hejji (2006) described delay in construction as the time overrun within specified finish date or time overrun within the delivery of the construction project on

which every single party agreed upon. The consequences of delay are evident in the poor contractor's performance, increase contract disputes, increase in cost of construction, low productivity and total project abandonment (Bajere *et al*., 2016). When the project period is delayed, it implies that the project cannot be completed as originally scheduled. Aibuni and Jagboro (2002) Sambasivan and Yau (2007) and Mamman *et al.,(*2016) illustrated that time overrun; total abandonment and cost overrun are the most frequent impact regarding to delay in construction project. In contract administration time overrun is the contract period, measured by number of days, weeks, months or years (Bajere *et al.,* 2016).

Cost overrun can be considered as the difference between actual cost of a project and its Cost limit (Memon *et al.,* 2012; Saidu & Shakantu, 2016). Cost overrun occurs when the resultant cost target of a project exceeds its cost limits. Cost limit of a project refers to the maximum expenditure that the client is prepared to incur on a completed building project while cost target refers to the recommended expenditure for each element of a project (Olujide & Owoshagba, 2001). In construction, cost overrun increases cost of construction, increases investment pressure, have an effect on investment decision- making and the nations finance is wasted (Abusafiya & Suliman, 2015). This is due to many reasons which could be changes in the scope of work, specifications or any other contract documents. Abusafiya and Suliman (2015) opined that at the initial stage of a project, cost estimated is very important. They explained further that a projects financial fate can be determined through effective cost estimation. This is due to the fact that cost estimate carries far more economic consequences than the limited decisions which can be made afterward.

Previous Studies on Client Related Delay Factor
Client related delay factors are delays caused by the client actions or inactions; delay is caused due to the decisions made by

the client concerning the project. Several studies have been carried out on the subject of the causes of delay. Studies from Assaf and Al- Hejji, (2006) identified the client related delay factors as; delay in progress payments by owner, delay to furnish and deliver the site to the contractor by the owner, change orders by owner during construction, late in revising and approving design documents by owner, delay in approving shop drawings and sample materials, poor communication and coordination by owner and other parties. Sambavisan, *et al.* (2007) identified the client/owner interference, slow decision making, unrealistic contract duration and requirements imposed on contractor contributes to causes of delays. Sweis *et al.* (2007) identified the delays in site preparation, work suspension, too many change orders from owner, slow decision making, interference by the owner in the construction operations, delay in progress payments by the owner.

Odeyinka and Yusif (1997) have addressed the client-related causes of delays in building projects in Nigeria to include variation orders, slow decision-making and cash flow problems. Memon *et al.* (2010) examined factors that are affecting construction cost overrun in Malaysia and discovered that contractors are faced with cash flow and financial difficulties, inadequate experience, poor site management and supervision, inaccurate planning and scheduling, site workers shortage, were the most severe factors that causes construction cost overruns.

Fourteen (14) key client/owner related delay factors were highlighted from the literature reviewed as shown: Delay in progress payments, Change orders, Poor communication and coordination with other parties, Delay in approving shop drawing and sample materials, Slowness in decision making, Lack of funds by client/ owner due to improper planning, Delay in giving possession of site to the contractor by the owner/ client, Client interference leading to award of contract to unqualified contractor, Late in revising and approving design

documents by owner, Change in government, Suspension of work by owner, Government procedure, Lack of incentives for contractor to finish ahead of schedule, Conflicts between joint-ownership.

Previous researches as indicated earlier have pointed out construction projects face problems of delay (Odeyinka & Yusif, 1997; Aibuni & Jagboro, 2002; Achuenu & Ujene, 2006; Kunya, 2006; Assaf & Al-Hejji, 2006; Sweis *et al.* 2007; Sambavisan, *et al.* 2007; Ijigah *et al.,* 2012). However, none of the previous studies study has examined how public projects in Niger state perform in terms of cost, and to eliminate this dilemma, there is need for research on the impact of such delay in building construction projects. Hence the need for the study.

Research Methodology
The research design was descriptive and inferential in nature and it involves the collection of both qualitative and quantitative data. A self-administered questionnaire was distributed to respondents that are construction stakeholders (the client, contractors and consultants) to obtain the qualitative data. The quantitative data were obtained from the record of different projects executed by the selected government ministries and agencies in Niger state, which were completed within ten (10) years. The studied population were taken from stakeholders in the construction industry which consist of architects, builders, quantity surveyors, structural engineers, electrical engineers, mechanical engineers and other building team members from the Agencies and Ministries selected. The research samples were selected randomly from the list of registered consultants and contractors that executed projects in the ministries and agencies. The sample size of the was calculated using the equation as demonstrated by Glenn (2013) as shown in equation (1)

$$n = \frac{N}{1+N(e)^2} \quad \ldots\ldots\ldots\ldots (1)$$

Where; n= sample size
N = size of the population in the sample unit

e = precision rate which is $\pm$ 5% (0.05), at 95% level confidence

Table 1 illustrates the sample size of the study for the six ministries / agencies sampled; professionals= 63+13+15+32+14+15= 152

Data Collection
A questionnaire was developed to assess the perceptions of clients, consultants, and contractors on client related delay factors in Nigeria construction industry. The questionnaire was divided into two parts. The first part requested information about the respondent's background. The second part of the questionnaire focused on the Fourteen (14) key client related delay factors. The questionnaire was based on Likert's scale of 5 ordinal measures from 1 to 5, where (1) = Not very important (2) = Not important (3) = Not sure (4) = Important (5) = Very important.

The historical data were extracted from the records obtained from different projects executed by the selected government ministries/ agencies in Niger state. A format for the collection of data was designed and contains the following information: type of project, original contract sum, final completion sum, estimated duration of project, actual completion duration. The selected government offices were asked to complete the format, which were obtained from budgeted estimated cost of 196 projects.

Distribution of Questionnaire
Table 2 demonstrates the distribution of questionnaire, 120 questionnaires were distributed as follows: 25 to client, 35 to consultants and 60 to contractors. 87 questionnaires were received (73%) as follows: 18 (72%) from clients, 26 (74%) from consultants and 43 (71.7%) from contractor's respondents.

Table 3 illustrates the demographic characteristics of the respondents as shown above. Under type of respondents' organization 48.9% (86) contractors, 20.5% (36) client, 30.6% (52) consultants took part in the set of question. The academic qualification of the respondents as shown in Table 3, the largest groups of respondents were (28.4%) those who possessed higher national diplomas. (13.6%) had obtained bachelor degrees, (26.1%) are Masters Degree holders, (6.8%) are respondents with National diploma, other qualification was 25%.

Under working experience of respondents as indicated in Table 3, the highest number of respondents were 32 (36.8%) those with the working experience of 11yrs – 14yrs. About 23 (26.4%) respondents have 5yrs – 10yrs working experience, while 14 (16.1%) respondents have less than 5yrs working experience and 18 (20.7%) number of respondents having above 15yrs working experience.

Table: 1 Sample size for the research

S/NO	Ministry/Agencies	Population	Sample
1	NSUDB	35	32
2	NSBP	16	15
3	NSUBE	14	14
4	NSHC	16	15
5	NSMW	75	63
6	IBB	13	13

Source: Researchers field work.

Table 2: Distribution of Questionnaire

Respondents	Number Distributed	Number Returned	Percentage Responds Rate
Client	25	18	72%
Consultants	35	26	74%
Contractors	60	43	71.7%
Total	120	87	100%

Table 3: Data on Demographic Characteristic of the Respondents

Organisation Type	Frequency	Percent
Client	18	20.45
Contractor	43	48.86
Consultant	26	30.68
Total	87	100
Academic Qualification	**Frequency**	**Percent**
OND	6	6.82
HND	25	28.40
B.SC	12	13.64
M.SC	23	26.14
Other	21	25.00
Total	87	100
Working Experience	**Frequency**	**Percent**
< 5 years	14	17.05
5-10years	23	26.14
11-14years	32	36.36
Above 15years	18	20.45
Total	87	100

Method of Data Presentation and Analysis

The qualitative data was analyzed using descriptive statistics which involved the use of frequencies and Relative Important Index (RII). The Relative Important Index was used to obtain respondent view point and ranked from the positive ranking and the negative ranking. Client related delay factors were identified by the respondent having the most significant impact on public sector construction projects using a Likert scale of 1-5. Where 1= not very important and 5= very important.

The ranking method is a form of statistical scale where subjects are rated in accordance to some precise measure or on operationally defined features. The relationship between variables are identified by this method, the effect of each individual responses is presented.

When using the ranking technique, scores or weights of 1…………n are assigned to the factors to be measured. That is:

$$S = \sum n\, W \qquad (2)$$

Where: S = the rank sum, N = number of respondents,   W   =   corresponding weight/score of rank category, RI = relative index

The relative index is calculated as S/4n
The relative index ranges from 0 − 1. The item with the highest relative index is considered the first in the rank order.

The quantitative data was analyzed using inferential statistics this included regression analysis. These analyses were done with Statistical Package for Social Science (SPSS) version 21 and Microsoft Excel (spreadsheet). The simple linear regression analysis utilizes the least squares technique to fit a new line through observations. This study employed the following mathematical expression.

$$Y = a + b\,x \qquad (3)$$

Where: Y = dependent variable, a = intercept, X = independent variable, b = coefficient of X

From the research works X is the mean of the number of projects executed by various organisation (project cost) while Y is the number of recorded projects executed which were affected by delay (cost overrun and % cost overrun).

Results and Discussion

This segment comprises of results and discussion of factors affecting client delay.

Each factor of delay was computed using the relative importance index (RII) to identify the most the important delay factors in construction projects. The ranking of delay factors which were examined by the researcher from the view point of all respondents as shown in the table below.

Table 4 illustrates ranking of client related delay factors by all respondents' views point. Delay in progress payments with RII=0.89%, was ranked first in term of client related delay factors. The results of Aibuni and Jagboro (2002); Assaf and Al-Hejji, (2006); Sambasivan and Soon (2007) and Alaghbari et al. (2007) are in line with this result, that client delay in releasing contractor financial payment is one of the most important causes of delay. Lack of fund by client and change in government was second position with importance index RII=0.87%, and the less significant factor was change order with RII=0.71%.

Table 5 demonstrates the percentage cost impact of delay on construction projects by practitioners; the impact was grouped into six categories. As shown, the highest percentage cost delayed projects were 21-30% with a frequency of 41 and percentage difference of 46.6%. Second in line was 15-20% with percentage difference of 25.3% having a frequency of 22. Next was above 30% with percentage difference of 13.8% having a frequency of 12. Percentage cost delay of 10-14% with a frequency of 7 and percentage difference of 8.1%. Percentage cost delay of 9-5% with a frequency of 3 and percentage difference of 3.5%. The least percentage cost delayed projects were 0-4% with percentage difference of 2.3% having a frequency of 2.

Table 6 illustrates the impact of delay factors on completion cost of public projects. As shown, the 196 projects sampled were grouped into three categories: cost below actual estimated cost, projects completed at actual estimated cost (at cost) and cost overrun. 7 projects had cost below actual estimated cost with -23.05% which represent 3.57% of the sampled size, 37 projects were projects completed at actual estimated cost (at cost) with 0.00% which represent 18.88% of the sampled size and 150 projects had cost overrun with 43.26% which represent 76.53% of the sampled size.

Table 7 demonstrates the regression analysis of initial cost and percentage cost difference. As revealed in the linear regression a positive correlation existed, with a fair R^2 value of 51.4%. The P-values was lower than 0.005 (0.000< 0.005). The deduction drawn from the result indicates that significant relationship existed between the initial cost of construction and percentage cost difference, the R^2 was above 50% implying that the influences of initial cost of construction to total cost existed, and can be used for cost prediction purpose. The p-value was 0.00 and was less than 0.05, as a result the null hypothesis (Ho) was rejected and was concluded that there is a significant relationship between initial cost and percentage cost difference. Therefore, the equation can be used for the prediction of final completion cost of construction of projects at the point of contract award at 95% confidence level of significance

$Y = 2.791 + 0.154x$ ……………eq 1

Where: Y is the final completion cost of project and x is the initial cost of project.

Table 4: Data on Client related delay Factors

S/N	Client related delay Factors	Overall RII	Rank
1	Delay in progress payments	0.89	1
2	Change in government	0.87	2
3	Lack of fund by client/ owner	0.87	2
4	Delay in giving possession of site to the contractor	0.84	4
5	Government procedure	0.84	4
6	Client interference leading to award of contract to unqualified contractor	0.83	6
7	Conflicts between joint-ownership	0.80	7
8	Poor communication and coordination with other parties	0.78	8
9	Slowness in decision making	0.77	9
10	Suspension of work by owner	0.75	10
11	Late in revising and approving design documents	0.74	11
12	Delay in approving shop drawing and sample materials	0.74	11
13	Lack of incentives for contractor to finish ahead of schedule	0.74	13
14	Change orders	0.71	14

Table 5: Data on Construction Practitioner's Experiences on Project Cost Delay

Percentage cost delay	Frequency	Percent
0-4%	2	2.30%
5-9%	3	3.50%
10-14%	7	8.10%
15-20%	22	25.30%
21-30%	41	47%
Above 30%	12	13.80%
Total	87	100%

Table 6: Analysis of Percentage difference between costs of construction of public projects.

Category	% cost under run/overrun	Projects in category		Total of all projects sampled
		Nr	% of sample	
Cost under run	-23.05	7	3.57	196
At cost	0	37	18.88	196
Cost overrun	43.26	150	76.53	196

Source; Researcher's field work

Table 7: Regression analysis of initial cost and percentage cost difference

Variables		Observations			Inferences	
X	Y	R^2	Adjusted R^2	R	P_{value}	Remark
Initial cost	Cost diff	51.40%	0.51	0.717	0.00	SS

Key: SS = Statistically Significant, NS = Not Significant

Discussion of Result

Fourteen client related delays factors were identified through literature review. 120 questionnaires were distributed 87 were returned making (73%) of respondents' responses. This study established that among the various factors of client related delay that, Delay in progress payment, Change in government, Lack of fund due to inadequate planning, Delay in giving possession of site to the contractor, Government procedure were the five top most important factors affecting delay as agreed by all respondents, client, contractor and consultant. It was revealed by all respondents that the highest percentage cost delayed projects were 21-30% with a frequency of 82 and percentage difference of 46.6%.

A total of 196 projects were sampled and analysed, result revealed that 7 projects had cost under run with -23.05% (3.57%) of the sampled size. 37 projects at cost with 0.00% (18.88%) of the sampled size. 150 projects had cost overrun with 43.26% (76.53%) of the sampled size. The result from the regression analysis disclosed that construction cost was statistically significant with P-value of 0.00. This led to the development of a model for predicting the final completion cost of construction projects as Y = 2.791 + 0.154x.

Conclusion and Recommendation

The study evaluated the impact of client related delays on completion cost of public construction project in Niger state. The study revealed that among the various factors of client related delay that, Delay in progress payment, change in government, and Lack of fund due to inadequate planning were the most important factors affecting delay and was agreed by all respondents. Result on the impact of client delay on completion cost reveals, that the average ratio of actual completion cost to the planned contract cost is 43.26% this implies that the actual completion cost of public sector projects executed in Niger state was 0.4 time higher than the initial estimated cost. The result from the linear regression showed that construction costs were not statistically significant this facilitated the researcher to develop a mathematical model for predicting the final completion cost of the project at the point of contract award.

It was recommended that client should make payment without delay to the contractors so as to strengthen their ability to finance the project and government should embark on fewer projects which would be executed and completed within their tenure period in other words projects should not be extended to the next dispensation to avoid disputes and litigation. Before awarding any contract, client should ensure that there is sufficient fund to avoid unnecessary time and cost overrun. The result of the study on impact of delay in building project will provide insight to any individual involved in construction and implementation of project on the factors that influence project delays in the construction industry.

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