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RETENTION BOND AND PERFORMANCE OF CONSTRUCTION PROJECTS IN NIGERIA

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ABSTRACT

Retention bond guarantees that the contractor will carry out all necessary work to correct structural and/or other defects discovered immediately after completion of the contract, even if full payment has been made to the contractor. This research work assesses the effects of retention bond on construction project performance in Nigerian construction industry. Cost data were collected through the distribution of sixty (60) questionnaires of which fifty-seven administered questionnaires were retrieved. Data were analysed using correlation and regression methods of analysis. The findings from the study indicated that there is a significant relationship between retention bond and construction project performance in terms of cost and time. The study recommends that professional bodies should encourage the use of retention bond in the Nigerian construction industry by sensitizing professionals of its importance which is to enable effective delivery of projects within its initial cost and time. Also, contractors should encourage their clients to always include sum to cover up for retention bond in their contract sum.

Keywords: bond; construction project; Nigeria; performance; retention bond.

1 INTRODUCTION

Murdoch and Hughes (2008) asserted that the preparation of a cost estimate is an important part of the procurement process of a construction project because it forms the basis of the price upon which a contract is let. However, in practice, project estimates are not always accurate (Akintoye and Fitzgerald, 2000). Sometimes the cost estimate for a project is calculated by a builder or contractor. At other times, a consulting estimator or quantity surveyor is employed to calculate the estimate (Laryea and Hughes 2008).

Wedlake (2007) concluded that the best guarantee of performance for a construction project lies not in financial leverage but the selection of a properly qualified Specialist Contractor that is able to carry out the required work to a high standard, it is accepted that clients require a form of monetary protection in the event of defects being discovered in their supply chains' works.

However, you can offer substantial security to clients and contractors for the work that you carry out without providing cash retentions. Cash retention used to be the most prevalent form of protection against sub-standard work on a construction project.

2 LITERATURE REVIEW

2.1 Purpose of bonds in the construction industry

The ultimate goal of any construction project is to be delivered in the shortest possible time, at the lowest possible cost and highest quality (Laryea and Hughes, 2011). Emily (2009) asserted that Construction bonding is a risk management tool used to protect project owners and developers. A bond constitutes a legal guarantee that the project will be completed as expected.

The main purpose of retention is in twofold (Wedlake 2007). Firstly, it provides the client with a financial protection fund should the contractor fail to rectify defects and secondly, it provides a mechanism by which to motivate the contractor in completing both defects and outstanding works during the defects liability period. Operation of the system is typically straightforward in that retention of between 3% and 5% is deducted from the contractor's income each month in respect of both temporary and permanent works, and usually until retention limit is reached. Half the retention held is then released once the project is certified as being practically complete, with the other half being released at the end of the defects liability period, or once any and all defects have been rectified.

Similar provisions are usually made further down the subcontracting chain with retention deducted by the contractor from the subcontractor's income each month. The amount and release dates of retention are not necessarily 'back to back' with the contractor and may be more or less favourable (O'Neill, 2007).

2.2 Retention bond

Retention bonds have the dual benefit of providing the same level of protection to the client as the cash retention system in the event of defective work, but without the financial disadvantages to the contractor, and therefore, to the industry generally.

A retention bond represents a commitment by a third party (typically an insurance company or a bank), to guarantee the obligations of the contractor under a contract, up to an agreed limit, which would typically be the same as the maximum cash retention amount. As work is completed on site, the contractor is then paid in full for the works carried out in accordance with the contract and with the client being protected against default by the bond. The system thus provides better value to the contractor during the construction phase but at the same time without being detrimental to the client's concerns regarding sub-standard work at the end of the construction phase. For obvious reasons, retention bonds need to be in the form of on demand bonds, which have the effect of giving the client the same degree of comfort and control over the rectification of possible defects as he would have if he simply withheld 5% cash from the contractor's interim payments.

Retention bonds do not come free of course, and as with all forms of insurance, there is a premium to pay for the level of cover provided.

Albeit the cost of a retention bond would be assessed on its own merits, the cost is nevertheless influenced by factors such as the financial strength of the contractor, the volume of the bond business generally and the guarantors underwriting analysis of the concerned project. Research in Hong Kong indicates that the cost associated with a retention bond can be as low as 0.5% to 1% of the bond value. Research in the UK suggests that funding retention bonds can be up to seven times less than funding cash retentions, albeit the cost of the credit facility is dependent on the contractor's financial strength and performance as well as the contractor's ability to continue to trade both profitably and within their capabilities, and, of course, the prevailing interest rates. If the bond was obtained from an insurance company, a further added bonus is that neither the contractor's working capital nor the contractor's borrowing facilities would be affected, thereby making the arrangement a further attractive alternative to withholding cash.

2.3 Requirements for retention bond

The information that needs to be inserted when completing the retention bond by the guarantor according to JCT (Barnes and Davies, 2008) standard includes:

1. The date of the retention.
2. The name and address of the surety (that is, the party that guarantees payment of the bond amount).
3. The name and address of the contractor.
4. The name and address of the sub-contractor.
5. The surety's maximum aggregate liability amount under the bond, stated as a sum. This will be the same sum as stated in the sub-contract under item nine of the contract particulars.
6. The surety's address where a demand under the bond should be sent.
7. The surety's address where a copy of the written notice to the sub-contractor of his liability for the amount demanded should be sent.
8. The (default) expiry date of the bond. This will be the date as stated in the sub-contract under item nine of the sub-contract particulars.
9. The bond then needs to be signed as a deed by or on behalf of the surety.

3 RESEARCH METHODOLOGY

The research adopted a cross-sectional and correlation study carried out on a conveniently selected sample, since it cut across some professionals in construction industry. Two sets of data were collected; primary and secondary data. Primary data were collected with structured questionnaires comprising of open and closed-ended questions. Pre-qualified and registered Architectural firms, Quantity surveying firms and Contractors are the population of this field survey. In order to arrive at an accurate sample frame, the lists of these registered firms were obtained from the Ondo State Ministry of Works as shown in Table 1. This was on the premise that most projects where bonds are administered are government owned and only registered firms with the state government can submit bid for such projects.

Table 1: Sample Size

Ref No	Respondents	Population	Questionnaires distributed	Total retrieved and filled	% filled
1	Quantity surveyors	20	20	17	29.82
2	Architects	25	25	13	22.81
3	Contractors	195	40	27	47.37
	TOTAL	240	90	57	100.00

Source: Ondo state Ministry of Work, Akure

Secondary data were collected through records of completed building projects. Cost-data of 47 completed construction projects with retention bond were obtained using convenience sampling method out of which only 19 were fit for analysis. For statistical verification of the relationship and determination of the effect of retention bond on construction project delivery indices, a linear regression analysis was carried out.

$$\longrightarrow \quad Y = B_o+B_1X_1-B_2X_2...B_nX_n + e_1 \quad \ldots\ldots 2$$

Where B_o = Regression constant
B_1 = Regression co-efficient for variable X_1
B_2 = Regression co-efficient for variable X_2
B_n = Regression co-efficient for variable X_n
$_n$ = Number of independent variables
e_1 = Residual error

4 DATA ANALYSIS AND FINDINGS

Table 2 shows the background information of the respondents. The professionals surveyed were Quantity Surveyors (29.8%), Architects (22.8%), and Contractors (47.4%) who had an average of 11.4 years of experience in the construction industry. Using the academic and professional qualifications, years of experience and academic qualification of the respondents in the construction industry, it can be inferred that the data obtained for this research work can be relied upon. This is because all the respondents are highly educated, with recognizable professional qualification and substantial years of professional experience.

Table 2: Characteristics of respondents

Characteristics	Frequency	Percent
Academic qualification of respondent		
B. SC/B. Tech	24.00	41.67
M. Sc/M. Tech	17.00	30.00
HND	13.00	23.33
Ph. D	3.00	5.00
Total	**57.00**	**100.00**
Category of organisation		
Consulting	29.00	50.00
Contracting	27.00	46.67
Not stated	1.00	3.33
Total	**57.00**	**100.00**
Years of experience		
0-4 years	21.00	36.67
5-10 years	22.00	38.33
11-15 years	8.00	15.00
16-20 years	2.00	3.33
above 20	4.00	6.67
Average	**11.40**	

4.1 Cost of retention bond and project cost

Variables

Crb = Cost of retention bond, Icp = initial cost of project, Fcp = Final cost of project, Cor = cost overrun, Csb = cost of securing bond, Tor = time overrun, Dsb = duration in securing retention bond, Idp = initial duration of project and Fdp = final duration of project.

Table 3: Retention Bond and Construction Project Cost and Time

Variable comparison	Ps-value	Remark
Cost of retention bond and initial cost of project	0.898	significant
Cost of retention bond and final cost of project	0.898	significant
Cost of retention bond and cost overrun	-0.388	insignificant
Cost of retention bond and initial cost of project, final cost of project & cost overrun	0.899, 0.898, -0.199	significant
Cost of securing bond and initial cost of project	0.652	significant
Cost of securing bond and final cost of project	0.650	significant
Cost of securing bond and cost overrun	-0.162	insignificant
Cost of securing bond and initial cost, final cost & cost overrun of a project	0.652, 0.650, -0.162	significant
Duration to secure retention bond and initial duration of project	0.280	significant

Duration to secure retention bond and final duration of project	0.103	significant
Duration to secure retention bond and time overrun	-0.013	insignificant
Duration to secure retention bond and initial duration of project, final duration of project & time overrun	0.280, 0.103, -0.013	significant

Correlation of variables to establish relationships using Pearson test analysis

The test to establish the relationship between variables is shown in table 3.

Hypothesis 1

Ho=cost of retention bond has no significant effect on initial cost of a project, final cost of a project and cost overrun construction.

H_1=cost of retention bond has significant initial cost of a project, final cost of a project and cost overrun.

Decision 1: Ps values greater than 0.05. Hence, the null hypothesis is rejected and the alternative which says that "cost of retention bond, has significant effect on initial cost, final cost and cost overrun of a construction project" is accepted. The effect is a very high and positive type.

Decision 2: Ps values less than 0.05. Hence, the null hypothesis is accepted and the alternative which says that "cost of retention bond, has significant effect on initial cost, final cost and cost overrun of a construction project" is rejected.

Pearson test was conducted to determine the significance of the relationship between two variables. It is established that Crb and Icp correlate with each other with significant at the 0.01 level. The higher the initial cost of project, the higher the cost of retention bond. Correlation between Crb and Fcp establishes its relationship to be significant at the 0.01 level, Pearson correlation relationship with a very low significance of 0.898, having equal relationship with Icp. Correlation between Crb and Cor of which establishes a very low significant of 0.388 unlike the previous significance of correlation. Correlation between Crb, Icp, Fcp and Cor variables were conducted to establish a significant of relationship at the 0.01 level.

Crb against Icp and Fcp having significance of 0.000, indicate in the relationship that the higher Crb the higher Icp and Fcp. Icp against Fcp with significance of 0.000, indicate that the correlation moves at same direction. While there are still some weak relationship between some of the variable which include, Crb against Cor with low significant of 0.287and Fcp against cost overrun with low significance of 0.431.

Regression between variables

The relationship between Cost of retention bond and initial cost of projects, final cost of the project, and cost overrun is stated thus;

Crb= 325871.91+0.054Fcp-0.034Cor

(R= 0.899, R^2= 0.808, Adjusted R^2= 0.787)

While, Y= cost of the retention bond, Constant= 325871.91, Fcp= Final cost of project, Cor= cost overrun

Ps value is 0.860 as revealed in table 4 depicting that correlation is significant. It was evident that cost of retention bond which is the dependent variable has no significant impact on cost overrun as an independent variable has 99% significant impact on final cost of projects.

Table 4.11: Effect of Retention Bond on Construction Project; Cost and Time

Variables	R-value	Equation
Cost of retention bond and Initial cost of projects, Final cost of the project, and Cost overrun.	0.899	325871.91+0.054Fcp-0.034Cor
Duration to secure bond and Initial duration of projects and Time overrun.	0.652	12.248+0.064Idp- 0.016Tor
Cost to secure bond and Final cost of projects, Cost overrun.	0.319	343526+0.005Fcp-0.006Cor
Cost overrun and initial cost of projects, Cost of the bond, Cost of securing the bond, No. of days to secure bond and Initial duration of the project.	0.358	2.E7+0.194Cob-0.398Csb-201662Nsb-191535Idp-0.016Icp
Time overrun and Initial cost of projects, Cost of the bond, Cost of securing the bond, No. of days to secure bond and Initial duration of the project.	0.944	15.86858+4.28E-06Cob-2.5E-06Csb-1.60722Nsb+0.353108Idp-1.2E-07Icp

4.2: Cost of securing retention bond and project cost

Correlation of variables to establish relationships using Pearson test analysis

The test analysis on table 3, helped to assess the effect of retention bond in the construction industry through cost of securing retention bond and project cost:

Hypothesis 2

Ho=cost of securing retention bond has no significant effect on initial cost of a project, final cost of a project and cost overrun construction.

H_1=cost of securing retention bond has significant initial cost of a project, final cost of a project and cost overrun.

Decision 1: Ps values greater than 0.05 on table 3 and 4. Hence, the null hypothesis is rejected and the alternative which says that "cost of securing retention bond, has significant effect on initial cost, final cost and cost overrun of a construction project" is accepted. The effect is a very high and positive type.

Decision 2: Ps values less than 0.05 on table 3 and 4. Hence, the null hypothesis is accepted and the alternative which says that "cost of securing retention bond, has significant effect on initial cost, final cost and cost overrun of a construction project" is rejected.

Variables include;

Icp= initial cost of project, Fcp= Final cost of project, Cor= cost overrun, Csb= cost of securing bond.

Establishing relationship between Csb against Icp and Fcp by correlation gives a significance of 0.001 levels. Correlation between the CSRB and difference in cost of project include 0.483 of no significance in relationship. Correlation was conducted to establish relationship between Csb and Icp, Fcp & Tor. Csb form correlation with significance of 0.001 with Icp and Fcp. Correlation of Icp against Cor gave an insignificant valve of 0.483.

Regression equation between variables.
From the model shown on table 4, it is clear that the dependent variable does not have any significant impact on its independent variable. The cost of securing retention bond which is the dependent variable has no significant impact on cost overrun as an independent variable but has significant impact on final cost of projects.

Model design;
Y= 343526+0.005Fcp-0.006Co
(R= 0.319, R^2= 0.102, Adjusted R^2= 0.002)
Ps value is 0.436 shows that correlation is significant 95% level of significant. The model design equation for cost of securing the retention bond is 99% efficient in estimation of final cost of a project and cost overrun. It was evident that difference in cost of project known as cost overrun cannot be significant in any of the independent variables that, the initial cost of projects, cost of retention bond, Cost of securing the bond, No. of days to secure retention bond and initial duration of the project.

4.3 Duration to secure retention bond and project time

Correlation of variables to establish relationships using Pearson test analysis
The test analysis on table 3 was used to assess the effect of time to secure retention bond on project time in the construction industry:
Hypothesis 3
H_o= duration to secure retention bond has no significant effect on initial duration of project, final duration of a project and time overrun.
H_1= duration to secure retention bond has significant effect on initial duration of project, final duration of a project and time overrun.
Decision 1: Ps-values greater than 0.05 on table 3 and 4. Hence, the null hypothesis is rejected and the alternative which says that "duration to secure retention bond has significant effect on initial duration of project, final duration of a project and time overrun" is accepted. The effect is a very high and positive type.

Decision 2: Ps values less than 0.05 on table 3 and 4. Hence, the null hypothesis is accepted and the alternative which says that "duration to secure retention bond has significant effect on initial duration of project, final duration of a project and time overrun" is rejected.
Correlation between duration to secure retention bond and Idp, Fdp, Tor is to be significant at 0.01 and 0.05 levels while time overrun is not significant at -0.013 values.

Designed model from table 4 shows that, Y= duration to secure bond, Constant = 12.248, Idp = Initial duration of project and Tor = Time overrun
Y=12.248 + 0.064Idp - 0.016Tor
(R= 0.652, R^2= 0.425, Adjusted R^2= 0.361)

Ps value is 0.436 depicting that correlation is significant as shown in table 4. From the model, it is clearly that the dependent variable does not have any significant impact on its independent variable.

It could also be deduced that time to securing retention bond which is the dependent variable has no significant impact on time overrun as an independent variable but has significant impact on final time of projects.

5 CONCLUSION AND RECOMMENDATION

In other to assess the effect of retention bond on construction project performance, the analysis of this research was based on the relationship between retention bond and cost and time of construction projects. It could be observed that there is a significant relationship between retention bond and construction project in terms of cost and time. This implies that usage or non-usage of retention bond can significantly affect cost and time performance of construction projects positively and negatively respectively. Clients, contractors and other construction experts are therefore encouraged to ensure usage of retention bond in construction projects in order to provide security for clients' investment. This will also ensure that contractors are paid as appropriate after the practical completion of the defect liability period.

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