Modelling the Effects of Time and Non-Time Related Cost Factors on Final Cost of Building Construction Projects in Northern Nigeria

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Abstract

The study assessed the effects of time and non-time related cost factors on final cost of construction projects in Northern Nigeria. Data on the cost of construction projects were collected directly from projects files of 40 completed building projects in Northern Nigeria using well-designed questionnaires administered to clients, contractors and consultants, selected from the studied states, based on proportionate stratified random sampling technique. WARP6 PLS-SEM software was used in the analysis of the collated data. The results indicated High effects between time and non-time related cost factors and the final cost of building projects in Northern Nigeria. Similarly, linear relationships exist between time and non-time related cost factors and the final cost of building projects. Furthermore, the study provided criteria for assessing the effects of time and non-time related cost factors on the final cost. The study suggests ways of mitigating the effects of these factors (time and non-time related cost factors) on final cost of construction projects in Nigeria, which among others; include adequate estimation, prime cost and provisional sums. Primarily, clients should be cautious of variation orders and comprehensive design before project awards.

Keywords: *Cost of Buildings, Northern Nigeria, and Time related, Non time related*

Introduction

Final cost of building project is one of the most important factors for assessing successful delivery of projects in a growing economy like Nigeria, any project completed within the estimated total cost (initial cost), time and of required quality standard is regarded as successful (Gambo, Ilias & Ismail, 2016a). It is difficult to find projects, particularly in developing countries, that was completed within the initial estimated cost or time (Gambo, Ilias & Ismail, and 2016b).

Final costs of building projects are commonly affected by certain factors. It is for these reasons that the Standard Form of Building Contract in Nigeria SFBC 1990, JCT 1998 and other conditions of contract provides the basis and process of adjusting cost variables that affect the estimated cost of a project (SFBC, 1990; Ndekugri & Rycroft, 2014). Elinwa and Joshua (2001) found that sixty four per cent (64%) of building projects in Nigeria exceeded their initial estimated costs and hence lead to abandonments.

Traditionally, estimates for public building projects are made on the basis of initial estimated total cost (BOQ) rather than the final cost, i.e., final account (Elinwa & Joshua, 2001). The final cost of building project is the total sum of the initial estimates and the adjustments of time related and non-time related factors such as variation, fluctuation, prime cost sums, provisional sums, provisional quantities, claims, contingency sums, etc. These variables have effect on the final cost of building projects (Ndekugri & Rycroft, 2014).

The initial estimates of building projects comprise the costs of materials, labour, plants and equipment, profits and overheads (Elinwa & Joshua, 2001). The study conducted by Ibrahim and Kolo (2004), showed that the final cost of a building project more often than not differ from the estimated sums for which the contract was signed i.e. initial estimated cost. In the same study, Ibrahim and Kolo (2004) identified the major factors responsible for the adjustments of initial estimates to include variations, claims, and adjustments of prime cost sums, adjustments of provisional sums, adjustments of contingency sums, and adjustments of provisional quantities. These were regarded as non-time related cost factors (Gambo, Ilias & Ismail 2016c).

In the study of causes and impacts of cost variables in contract sum of building

projects in Nigeria, Ibrahim and Kolo (2004) stated that fluctuations and variations are the major time and non-time related factors that affect final cost of building projects respectively. The study found that cost increased due to adjustments for time and non-time related factors was 88.74% for ten (10) selected building projects in Nigeria. The value for variation was 22.58%, claims were 0.45%, fluctuations were 37.39%, adjustments of prime cost sums and provisional sums were 30.37% and 1.5% respectively.

The cost adjustments for the re-measurement of provisional quantities were minus 0.33%, which indicated that 0.33% of the contract sum was paid back to the client purse. Similarly, Omoniyi (1996) stated that changes in contract prices in Nigeria were principally as results of number of time and non-time related factors. The factors are variations, claims compensations, fluctuations, delayed payments, over payment for political or corrupt motives, disputes, wrong expenditure of provisional sums and quantities, adjustments of prime cost sums and day works. The factors responsible for the adjustment of cost of construction projects also lead to delays or abandonment of building projects, if not properly handled.

Oyemade (2002) reported that the final cost of a building project is the final figure obtained according to the condition of contract after adjustments of all necessary cost factors as indicated in the Standard Form of Contract 1990 edition. Giwa (1988) stated that the average local authorities final cost figure for building projects in United Kingdom (UK) was marginally exceed the tender sums. The same study reported that the standard deviation for those projects varies from 0.03 to 0.05 for three authorities indicating that individual contract varies from the mean value of the contract sum. The private clients recorded about 1.05 mean values, indicating that the final account exceeds the tender sum by 5%.

Ndekugri and Rycroft (2014) categorised time and non-time related cost factors into fluctuations, adjustments of preliminary sums, loss and expense claims and others such as liquidated and ascertain damages etc. while in the other hand, non-time related cost factors are adjustments of variations, provisional sums, provisional quantities, prime cost sums, claims etc. Therefore, this study assessed the effects of time and non-time related cost factors that cause high costs of building construction projects in Nigeria, The problems of high cost of building projects persists globally despite studies

conducted by Bing, Akintoye, Edwards, and Hardcastle, (2005) which suggested public/private partnership (PPP) procurement as an operative mode to attain value for money (VFM) in public infrastructure projects. The private finance initiative (PFI) in the UK is a system of PPP that pursues to combine the benefits of economical tender and flexible negotiation, and transfer risk away from the public sector. The final risk allocation agreement is reached along with overall contract agreement.

It is important for the public client and the private bidders to assess all the possible risks through the complete project life but this study does not provide the effects of time and non-time cost factors influencing final cost of projects as well as the framework/model. Similarly Kaming, Olomalaiye and Holt (1997) described the influences of factors affecting cost and time overruns on a high rise projects in Indonesia as high and significant but no suggestion for cost control strategy was made. Mansfield, Ugwu, & Doran, (1994) studied the reasons of delay and cost overruns relating to construction projects in Nigeria and the results revealed a considerable cost differences comparative to the initial contract, and unnecessary project overruns, for neither of which is there ample clarification in status reporting. A brief evaluation then follows of contractual systems and project financing arrangements currently in operation the study does not developed a model for the effects as well as categorizing it into time and non-time cost factors. Therefore, the problems of high cost of construction projects continues to affect productivity as well as the Growth Domestic Products (GDP) of developing countries most especially Nigeria through low contribution to GDP growth. Therefore, there is a need to arrange cost factors into time and non-time related and evaluates the effects on the final cost with the view to suggest lasting solutions to the problems.

Literature Review

Costs in Construction Projects

One of the major peculiarities of any public building project is that the works are acquired in a form of contract, the workload for each project is spread over the construction period and the cost of the project is estimated based on the various tasks involved to accomplish the project. Hillebrandt (1985) stated that the cost of a building project is generally divided into the estimated total cost (initial cost) and final cost. The estimated total cost is total

cost of each activity required to achieve an objective while the final cost is obtained as a results of the effects of time and non-time cost factors causing high cost of building projects.

Factors of Estimated Total Cost of Building Projects

Generally, there are four (4) important factors considered in the estimation of the initial cost estimates of a building project, the factors are cost of materials, cost of plants and equipment, cost of labour, cost of profit and overhead to the contractor (Gambo, Said & Inuwa, 2017). In a study conducted by Fletcher (2013) stated that the estimate for the material cost includes cost of delivery to site, loading cost, unloading cost, etc. The cost of each of these items are determined and added to the real cost of materials. Also it was opined in the study that the single cost of material can be one of the largest element in the initial cost of a building project.

Babalola and Jagboro (2001) viewed that the cost of labour is normally contained in the all in-rate which is the basic wage rate plus the cost of some or all of the cost of medical facilities, maternity leave with pay, compassionate or casual leave, public holidays, redundancy pay, sick leave, travel expenses, transport to site, trade union tools allowance, disturbance allowance, protective clothing, employer's liability and third party insurance, supervision, and so on. In other words, the all-in rate is the total cost to the contractor for utilizing the services and retaining the services of plants or trades concerned. In Nigerian construction industry, the all in-rate for labour comprises of four main items which includes: statutory payments, trade requirement, welfare expenses and general expenses (Gambo, Said & Inuwa, 2017)

Similarly, Babalola and jagboro (2001) found that statutory payment includes basic wage plus sixty percent of basic wage for workmen compensation plus fifteen percent of basic wage for social insurance and three percent for industrial training levy. The trade requirement includes cost of tools, safety garment/wears and supervision. The welfare expenses consist of transport and/or traveling expenses, funeral expenses, hospital expenses and leave allowance.

The general expenses include firm's administrative expenses and other special facilities given by the firms. Babalola and Jagboro (2001) opined that in the most unit

rates, the cost of labour sometimes is less than the cost of materials. While Fletcher (2013) argued that the cost of plants includes the cost of bringing to site, setting-up and maintenance on site, dismantling and removal from site or cost of hiring. The all-in rate for hired plant consists of hired rates per day, cost of delivery, erection, maintenance and removal with running consumables. The cost of owned plant consists of ownership cost which is fixed cost that includes capital input requirement, interest rate and cost of license. In addition to the ownership and running cost and other costs includes consumables, operations cost and maintenance cost.

Fletcher (2013) found that the overhead cost chargeable to a project consists of many items which cannot be classified as materials, labour or plant. These costs can be divided into job or site overhead and general or office overhead. Gambo, Said and Inuwa (2017) argued that overhead costs are the administrative expenses to the contractor for running his office. The contractor is entitled to administrative expenses such as rent and rate payable on the office premises, staff salaries, office stationary etc. These expenses support indirectly in the execution of building projects.

Factors Causing High Costs of Building Construction Projects

It is generally asserted that final cost of building projects in Nigeria more often than not exceeds the initial cost (Gambo, 2010). Gambo, Said and Inuwa (2017) supported the idea and stated that one of the major problems facing the Nigeria Construction Industry today is the fact that almost all projects are completed at sums higher than their initial contract sums. Similarly, in a study of forty (40) units of four (4) bedroom bungalow houses in Kaduna, Ibrahim and Kolo (2004) revealed about 60% cost differences between the initial and the final costs of building projects in Nigeria at the end of a projects.

The study identified the following factors responsible for the differences between initial and final costs of building projects to include variation order, fluctuations, claims, loss and expense claims, adjustments of prime cost, provisional sums and provisional quantities etc. The term "variation" is defined in the standard form of building contracts in Nigeria (SFBCN, 1990) as any alteration or modification of the design, quality or quantity of the work as shown upon contract drawing and described by or referred to in the contract bills and includes the addition, omission or

substitution of any work, the alteration of the kind or standard of any material or good to be used in the works, and the removal from the site of any work material or good executed or brought there, or by the contractor for the purposes of the work other than work materials or goods which are not in accordance with the contract. It also includes the addition, alteration, omission of any obligations or restrictions imposed by the employer on the contract bills in regard to access to the site, inadequate provision of working space, working hours and the execution or completion of the work in any specific order. The condition also defined prime cost (PC) sums as the sums provided for work or services to be executed by a nominated sub-contractor, or a statutory authority or public undertaking or for materials or good to be obtained from a nominated supplier.

The term provisional sums is defined in as a sums provided for the work or services which cannot be entirely foreseen or defined at the time of preparation of tender documents (SFBCN, 1990). Thus, provisional sums are allowed for the works whose extent and or nature are not precisely known at the time of preparation of bill of quantities. Babalola and Jagboro (2001) asserted that provisional quantities in bill of quantities is a contract work whose actual value cannot be determined during the preparation of bill of quantities and therefore require re-measurement upon completion of the work. This is done by approximately measuring the work in the normal way but keeping it separate in the bill of quantities marking it "provisional" e.g. where the nature of the soil is uncertain, etc., the bill for substructure works might be marked provisional and any additional sub structural works, such as additional excavation or reduction in excavation may be adjusted. The subsequent re-measurement of work covered by provisional quantities more often than not yield quantities that are different from the initial quantities. The cost of such differences in quantities results in differences between initial and final contract sums.

In practice, certain percentages (about 5%) are usually allowed in the bill of quantities for contingent events that might be encountered during progress of the work, depending on the magnitude of the project. Gambo (2010) supported the argument and added that the contingent event includes hazardous event that has a financial significance and is required to be executed before continuing the project e.g. blasting

of rock found during excavation of foundation.

Claims are one of the major factors causing high costs of construction projects globally (Ibrahim and Kolo, 2004). They noted that the standard forms of contract in Nigeria do not specifically use the word "claim" and that the contractor is required to give notice of the occurrence of any certain event which entails extra cost. Claims is a payment made to the contractor for other expenses or loss incurred in the course of carrying out the work by the contractor which is given to the contractor under the terms of the contract e.g. liquidation and ascertained damages, compensations, ex-gratia (sympathy) and interest on delayed payments.

The payment for claims usually partly accounts for the difference between initial and the final costs of building projects and reasons for high costs of building projects in Nigeria (Gambo, Said & Ismail, 2016). Ibrahim and Kolo (2004), in their study of ten (10) selected building projects in Nigeria found that 22.58% of differences were due to variation order account, 30.37% due to prime cost sums account, 1.5% due to provisional sums account, and - 0.33% differences were due to provisional quantities account while 0.45% were due to claims and 37.39% were for other cost variables accounts.

In a study conducted by Elinwa and Joshua (1993), it was found that projects in Nigeria overrun their initial contract sum by between 8 to 133%. Similarly, Omoniyi (1996) said that the differences between initial and the final cost of building projects in Nigeria are principally as results of a number of factors which include variation order, claims compensations, fluctuations, delayed payments, over-payment for political or corrupt motives, disputes, expenditure of provisional sums and prime cost sums and day-work. These factors are responsible for high cost of construction projects in Nigeria and hence lead to delays or abandonment of some projects in Nigeria.

Ndekugri & Rycroft (2014) listed the variables responsible for high costs of construction projects to include: variations, adjustments of costs after re-measurement of provisional quantities, nominated sub-contractors account, nominated suppliers account (P.C sums), adjustment of provisional sums account and fluctuation rates of labour and materials. In a study of the causes and solutions of the variables that cause differences between initial and final

costs for twenty (20) building projects in Nigeria based on contract drawing issued. Oyemade (2004) explained that almost eighty percent (80%) to ninety (90%) of the projects experienced both delays and cost overruns, thus indicating a wide margin between initial and final costs of the projects.

The study suggested that if adequate information are to be given on a contract drawing at tender stage, the contract sum would probably be the same as the final account figure. However, Nwuba (2010) argued that government policies and program have strong impacts on the cost of building projects because of its high level of involvement in the construction industry and the fact that Nigerian economy is public sector driven and found that there was a difference between initial cost and the final cost of building projects in Nigeria from 2000 to 2010, because of inflation, corruption and government policies.

Based on the concepts presented on the background information, objectives of the study and literature reviewed, the following hypotheses were developed. The hypotheses are presented as non-directional and alternate as follows:

H_{A1}: There is a substantial effect of non-time related cost factors towards high cost of building construction projects in Northern Nigeria

H_{A2}: There is a substantial effect of time related cost factors towards high cost of building construction projects in Northern Nigeria

Figure 1: indicated the conceptual framework for the effects of time and non-time related cost factors on the final cost of construction projects. The concepts was developed based on the theory and models developed by studies of Gambo *et al.,* (2016a-c) and theory of production i.e. cost theory which relates cost associated with production which is the result of the outcome of fixed and variable cost of some factors. Therefore theory of production linked the relationship between cost of production (final cost) with the fixed (non-time related factors) and the fluctuating variables (time related cost factors)

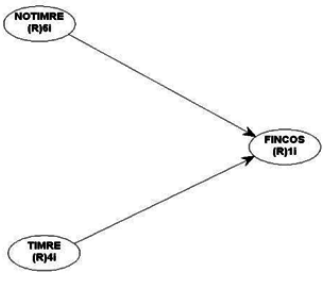

Figure 1: Conceptual Framework

Research Methodology

This study is quantitative in nature; Survey of completed project files were carried out through stratified random sampling technique of medium scale building projects in Northern Nigeria with building initial estimates between N20, 000,000.00-N50, 000,000.00 in the study area. The building projects considered cut across various public projects that includes: educational, health, offices etc. In order to realize the study objectives, the cost factors that are causing high cost of construction projects identified by Ibrahim *et al.,* (2004) were adopted as follows: variations, fluctuations, adjustments of prime cost, provisional sums and quantities, claims, adjustments of preliminaries and contingencies, loss and expense claims and others such as liquidated and ascertained damages, etc.

Sample Size

For the purpose of this study, Stratified random sampling was used to select forty (40) completed building projects. Ten (10) completed building projects were selected from each state of Bauchi from northeast zone, Kano from northwest zone, Plateau from north central zone and Federal Capital Territory, Abuja. The three (3) states and Abuja were chosen so as to enable effective management of this study and also because of regular activities of building projects being executed in the study area.

Methods of Data Collection

The data for this study were collected from the clients, contractors and consultants' through a well-structured questionnaires administered to the three major stakeholders in the study area. In addition, the questionnaires were administered to twenty clients, twenty contractors and twenty consultants in each of the chosen states and the Federal Capital Territory, Abuja. A total of sixty questionnaires were administered in the study area and WARP 6 PLS-SEM was used for data analysis because the software assumed non-parametric effect (1). The data collection forms were given directly to the offices of clients, contractors, and consultants and the forms were collected back after the required information was completed. A total number of forty two completed forms were returned and forty of these forms were used for the analysis.

Data Analysis Method

A Warp6 Partial Least Square (PLS) algorithm is a second generation statistical software for data analysis that is used to develop a model and also it provides P_{value} based on the structure of the model. This

was used to perform the regression analysis of the collected data on time related and non-time related cost factors causing high cost of building construction projects in Northern Nigeria. Partial Least-Square Structural Equation Modeling (PLS-SEM) analysis has the ability to helps researchers in making proper interpretation of results and guides in making right decisions (Awang, Afthanorhan, & Asri, 2015; Kock, 2014).

The collected data was bootstrapped to generate confidence intervals. Bootstrapping approach generated an empirical representation of the sampling distribution of the effect by treating the original sample size as a representation of the population in miniature; this is repeatedly resampled during analysis as a means of copying the original sampling process (Hayes, 2009). The bootstrapping is used to obtain the accurate estimates of parameters and standard errors (Awang, Afthanorhan, & Asri, 2015). The resampling analysis generated up to 999 from the original data with replacement.

Analysis and Results

Table 1: shows the assessment of the model by Warp 6.0 PLS-SEM analysis which typically follows two steps, namely: the assessment of structural model (Chin 2010; Hair, Ringle & Sarstedt, 2011; Hair et al., 2011) and reflective measurement model. The assessment of the measurement model examines the validity and reliability of the measurement instrument and relationship among the constructs. The model for this study has three reflective constructs namely: Final Cost, Time related Cost Factors and Non-Time related Cost Factors.

All the three constructs are first order constructs. The reflective measurement model evaluates reliability and the validity of the model. The two criteria are composite reliability (CR) and the average variance extracted (AVE) (Chin, 2010; Hair et al., 2011). On the other hand, the indicator and construct reliability were assessed to evaluate the reliability of the reflective measurement model for the structural equation modelling. The indicator reliability was evaluated by cross checking the loading of each indicator variable on its associated latent construct and the loading should be higher or more than 0.70 before accepting the reliability of the indicator variable (Hulland, 1999; Hair *et al.,* 2011).

The assessment of construct reliability, two coefficients are considered i.e. composite reliability (CR) and the Cronbach's alpha (CA) (Bagozzi & Yi, 1988; Cohen 1988;

Chin, 2010). Hair *et al*., (2011) recommended CR for PLS-SEM. Table 1shows the results of the measurement model of this study which indicated high internal consistency and reliability. The indicators loadings were all well > 0.70 and both the CR and CA ranged from 0.895-1.000 and 0.793- 1.000 respectively. The reason for the value 1.000 on loading, CA, CR and AVE of final cost was that only one indicator was considered that is the final cost which was the only indicator of high cost of many projects in this study. Therefore, this shows that all the indicators and constructs reliability were acceptable.

The convergent and discriminant validity are also considered in the validation of the reflective measurement model (Hair *et al.,* 2011). The average variance extracted (AVE) values of the constructs must be higher than 0.5 for an accepted convergent validity (Bagozzi & Yi, 1988; Hair *et al,.* 2011). Average variance extracted measures the total variance of a construct through its indicators (Chin 2010). The AVE values for this study were higher than 0.50 as well as the loadings of the indicators. Therefore, the convergent validity of the measurement model is highly acceptable.

Table 1: Results of the measurement model evaluation

CONSTRUCT	ITEMS	FACTOR LOADING	CR	CRONBACH'S ALPHA	AVE
FINAL COST (FINCOS)	FC	1.000	1.000	1.000	1.000
TIME RELATED COST FACTORS (TIMRE)	Flu	0.938	0.945	0.921	0.812
	Aprs	0.930			
	Lec	0.922			
	Oth	0.807			
NON-TIME RELATED COST FACTORS (NOTIMRE)	VR	0.882	0.895	0.793	0.599
	APC	0.768			
	APS	0.633			
	APQ	0.648			
	ACS	0.582			
	OC	0.683			

FC = final cost, Flu = fluctuations, Aprs = adjustment preliminary sums, Lec = loss and expense claims, Oth = Others, VR = variations, APC = adjustments of prime cost, APS = adjustments of provisional sums, APQ = adjustment of provisional quantities, ACS = adjustments of contingency sums, OC other claims

Table 2: indicates the discriminant validity of measurement model. The discriminant validity is the extent to which construct is distinguished from other constructs in the model (Chin, 2010). This is achieved through checking of the AVE of each construct and must be higher than the highest squared correlation of the construct of any other construct in the model or alternatively the loading of an indicator with its associated construct must be higher than that with other construct (Chin, 2010; Hair *et al*., 2011; Fornell & Lacker, 1981). The results indicated that the square root of AVE for each construct with its correlation to another construct is acceptable discriminant validity of the measurement model. Base on the results of the measurement model the data collection form (format) was reliable and valid in the assessment of the three study constructs.

Table 2 : Results for discriminant validity

	FINAL COST (FINCOS)	**TIME RELATED COST FACTORS (TIMRE)**	**NON-TIME RELATED COST FACTORS (NOTIMRE)**
FINAL COST (FINCOS)	**1.000**		
TIME RELATED COST FACTORS (TIMRE)	0.747	**0.901**	
NON-TIME RELATED COST FACTORS (NOTIMRE)	0.676	0.580	**0.706**

Figure 2: indicates the R-square (R^2) measure of variables (constructs) and the path coefficients of the model. The model is evaluated as a part of preliminary assessment of structural relationship i.e. inner model (Chin, 2010, Hair *et al.,* 2011). The path coefficient must be significant for valid relationship and is the coefficient of determination i.e. highly dependent on the research area. Chin (1998) suggested 0.67, 0.33, and 0.19 as substantial, moderate and weak measures for R^2 respectively. The R^2 for this study was 0.647 which indicated almost a substantial relationship between criterion and predictor variables with p_{value} between final cost of construction projects (FINCOS)

and non-time related cost factors (NOTIMRE) as 0.001which was significant at p = 0.05 level of significance and had a path coefficient β_{value} of 0.535, also significant with a P_{value} of 0.001, similarly the path coefficient between FINCOS and time related cost factors (TIMRE) was p=0.039 which was significant at p = 0.05 level of significance with a β_{value} of 0.366 also significant at p= 0.04 respectively.

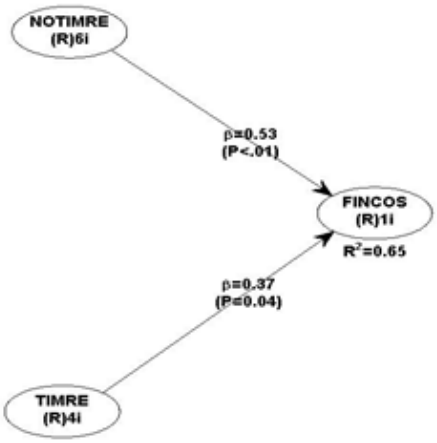

Figure 2: Assessment results for the structural model

The effect size (f^2) in table 3 is a measure that verifies whether the effects indicated by the path coefficient are low, moderate or high for the values of f^2 0.02, 0.15 and 0.35 respectively (Cohen, 1988). The effect sizes f^2 indicated the effect of a certain construct on the dependent variable is substantial (Chin 2010). The f^2 between FINCOS and TIMRE was 0.400 which indicated a high effect exists. While that between FINCOS and NOTIMRE was 0.247 which was regarded as moderate effect exists.

The predictive competency of each construct in the model was determined by Stone-Geisser's Q^2 (Hair *et al.,* 2011; Hair *at al.* 2012). The predictive skill of this model was 0.659 and Warp PLS-SEM automatically generates Q^2 (Kock, 2012). Therefore, this model exhibit predictive relevance because the $Q^2 > 0$ and hence the prediction capability of the model was high (Chin, 2010; Hair *et al.,* 2011).

Table 3: Hypotheses-Testing Results

Hypotheses	Path Coefficient	P value	Effect size	Stone-Geisser's Q^2	Supported
NOTIMRE ? FINCOS	0.535	0.001	0.400	0.649	Yes
TIMRE ? FINCOS	0.366	0.039	0.247		Yes

Figure 3: presents a graph of FINCOS and NOTIMRE. The graph shows a linear relationship exists between FINCOS and NOTIMRE. The relationships impliedly indicated positive relations which mean that an increase in NOTIMRE yields increase in FINCOS and subsequently high cost of building construction Projects. The coordinate's points (x_o, y_o and x_1, y_1) and the regression line of the graph (FINCOS VS NOTIMRE graph) were (-3.06, -0.56 and 0.98, 0.18). The coordinates of the second graph (PHCFAC and POLFAC graph) were (-0.91, -0.48 and 3.00, 1.60).

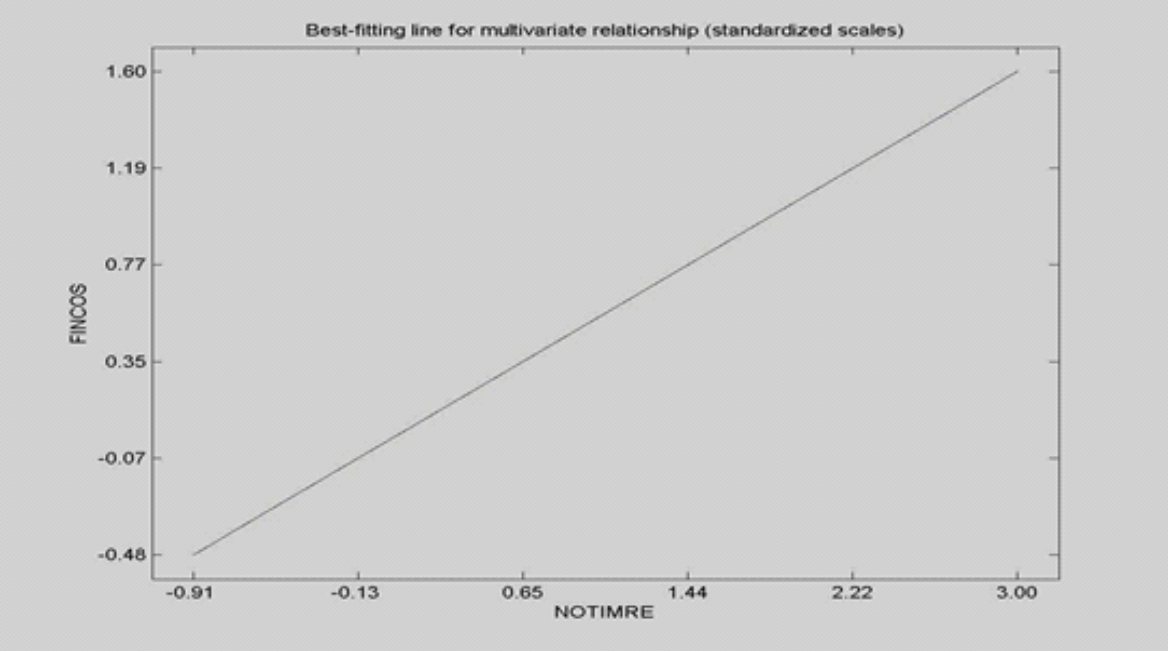

Figure 3: Relationship between FINCOS and NOTIMRE

Figure 4: presents a graph of FINCOS and TIMRE. The graph indicated a linear relationship exists between FINCOS and TIMRE respectively. The relationships indicated a positive increment such that, as TIMRE increases FINCOS also increases, the coordinate's points (x_o, y_o and x_1, y_1) and the regression line of the first graph (FINCOS and TIMRE graph) were (0.97, -0.08 and -2.43, 0.20). The coordinates of the second graph (PHCFAC and STRUFAC graph) were (-0.67, -0.24 and 4.23, 1.55).

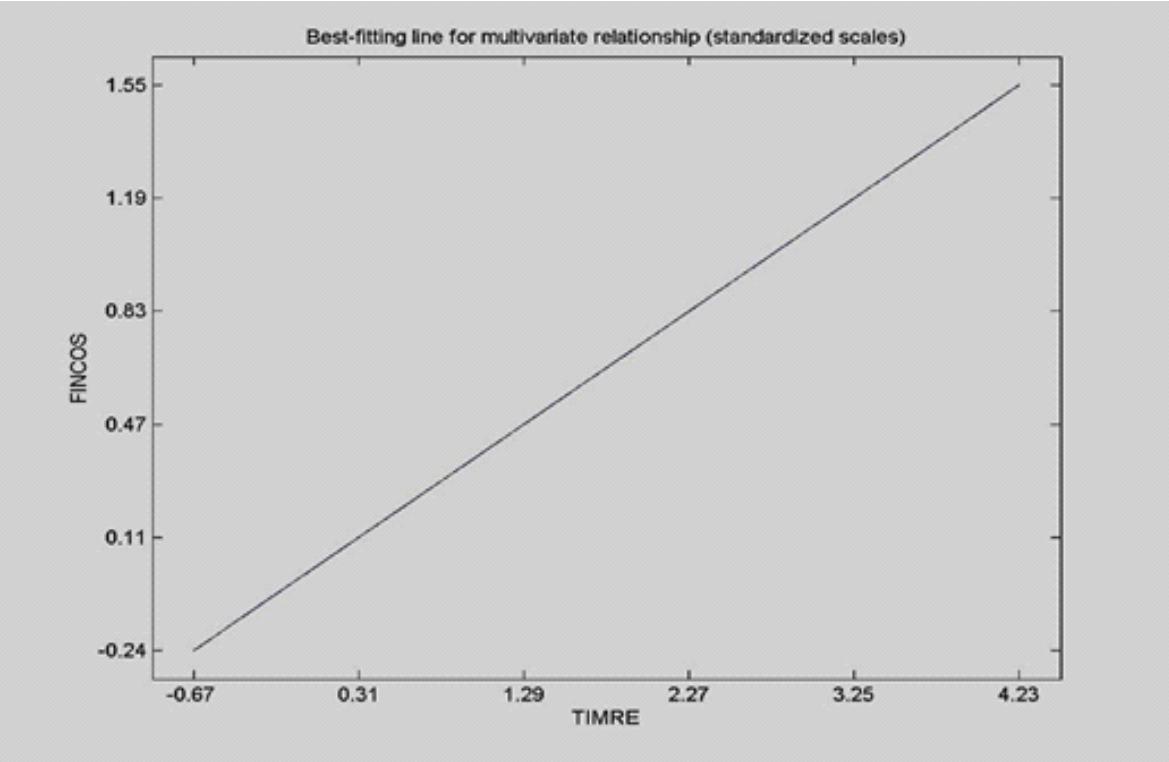

Figure 4: Relationship between FINCOS and TIMRE

Discussion

This study assessed the effects of factors causing high costs of construction projects in Northern Nigeria. Two main constructs were considered as predictor or independent variables that predict the effects of factors causing high cost of building construction projects. The constructs were Non-time related factors and time related factors. The Non-time factors include variation orders, adjustments of prime costs, provisional sums, etc. (Bala *et al.,* 2004). On the other hand, Time related factors include fluctuations, adjustments of preliminaries, etc. (Bala *et al.,* 2004). The dependent variable, i.e., final cost of building construction project, which is the indicator of high cost of construction project was also identified (Gambo, 2010). The study of Elinwa and Buba (2001) found that the differences between initial and final cost of construction projects in Nigeria was almost 64%, this contradicted this study with categorised the factors affecting final cost into time and non-time related factors and all the two factors have significant influence on the final cost of projects. This study found that both time and non-time

cost factors contributes significantly to final cost of construction projects in Nigeria, in this way the study supported the assertions from the studies of Gambo *et al* (2016a), (Gambo *et al.,* 2016b) Gambo *et al*. (2016c) Ndekugri & Rycroft (2014), Omoniy (1996) and contradicted the study of Giwa (1988), Oyemade (2002).

The measurement model indicated a consistent, reliable and valid data collection form format. The results of the analysis indicated substantial effects of both non-time and time related factors on the final cost of building construction projects in Northern Nigeria. This implied that both time and non-time related cost factors are the major factors causing high cost of building construction projects in Northern Nigeria. This work supported the findings of Gambo (2010) and contradicted the findings of Bala et al., (2004) on the modelling of final cost of building projects and cost of construction projects in Kaduna State respectively. All the two hypotheses developed for this study were supported. The graphs show that linear relationships exist between the independent and the dependent constructs. There were also positive and linear relationship between the independent constructs and the dependent construct.

Conclusion

The study aimed to assess the effects of factors causing high costs of building projects in Northern Nigeria with a view to suggests control measures towards achieving value for money (VFM) as well as timely completion of projects. The model coefficient of determination was 0.65 which indicated that 65% of the cost factors were explained by the model (65% of the factors causing high cost of projects).

The assessment of the effects is valuable for future improvement in the controlling of high cost of construction projects globally as well as timely completion of particularly public projects. The results identified that non-time related cost factors had high effects on final cost of construction projects than time related cost factors, but all the two hypotheses developed were supported by the study. The study suggested adequate provisions of prime cost sums, provisional sums and contingency to cover excess during constructions. Secondly, adequate estimation of initial cost should be achieved before project award. Thirdly clients should be very cautions of variations because of cost implications. Lastly all materials specified for the project should readily available in the market and affordable within project estimate.

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