Assessment of the Effect of Building Materials Cost On Housing Development in Owerri, Imo State, Nigeria

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ABSTRACT
The effects of increasing cost of building materials have made efforts of Imo State Government towards having enough and adequate housing for all citizens an uphill task. The study is aimed at assessing the effects of building materials cost on housing development with a view to establishing a way of predicting the rate of housing development in Owerrri, Imo State Nigeria. A sample size of 90 was drawn from the population of 420 building construction professionals in the study area. Primary data was collected from construction professionals using structured questionnaire. Yearly number of residential development from 2009 to 2018 was collected from Owerri Capital Development Authority (OCDA) and market prices of four selected building materials were also collected from Building materials merchants' sales books from 2009 to 2018. The questionnaire responses were analyzed and ranked using Relative Importance Index (RII). Time series was used to analyse the trend of residential development for the ten years. Multi Regression analysis was used to analyse the relationship between residential development and prices of the selected building materials. The hypothesis postulated was tested using T –Test. The findings revealed inflation as the most influential factor responsible for increase in the cost of building materials. Secondly, a very strong relationship exists between building materials prices and rate of residential development. However, the general effect of the prices of selected materials on residential development between 2009 and 2018 in Owerri Imo State was found significant. A regression model was developed to predict rate of residential development in Imo State. The study therefore recommended that these identified factors responsible for increase in the cost of building materials should be effectively considered by stakeholders and professionals during building production processes (from design stage through the construction to completion stage) to ensure affordable housing developments are delivered.

Key Words: Building, Materials, Prices, construction, professionals, Owerri, Development.

I. INTRODUCTION

In the last few decades, the influx of people into urban areas, the natural population increase and inadequate responses by the government have contributed to the worsening housing situation in the country, to the extent that economic development and the welfare of the citizens are adversely affected (National Housing Policy, 1991). These problems are more critical in the cities, where huge housing supply deficits, dilapidated housing conditions, high cost of housing as well as proliferation of slums and squatter settlements exist (United Nations-HABITAT,2006b; United Nations - HABITAT,2006d). As a result, a large majority of urban residents, particularly the low-income earners who constitute about 50 percent of Nigeria's 160 million people are forced to live in conditions that constitute an affront to human dignity (United Nations-Population Fund, 2007).

Building materials contribute immensely to the quality and cost of housing, from what is used in the foundation to the materials for roofing and finishes, while the building materials industry

is an important contributor to the national economy of any nation as its output governs both the rate and the quality of construction work (Akanni, 2006; Udosen and Akanni, 2010). However, researchers in building sector have indicated that between 50 to 60 per cent of the total construction input goes into building materials. Building materials constitute the largest single input in housing construction. Adedeji (2010) observed that about sixty (60) percent of the total housing expenditure goes for the purchase of building materials. This is in line with Arayela (2005), who averred that, the cost of building materials constitutes about 65 percent of the construction cost. As a result, there is an urgent need to address the increasing cost of these products which is said to have slowed down the growth of the building developments and construction sector in Nigeria, especially in Imo State.

Ogunsemi (2010) opined that building materials form the main factors that restricts the supply of housing and ascertained that they account for between 50-60 percent of the cost of buildings. Thus, Adedeji (2002) rightly observed that one main barrier to the realization of effective housing in Nigeria as revealed in successive government efforts has been the cost of housing in the country. He argued that in the early periods, shelter in Nigeria was easily affordable as building materials were sourced from the immediate environment at affordable costs. Technology also was readily available with commensurate simple techniques. But contact with the outside world through interregional and international training of professionals in foreign countries as occasioned by colonization, brought changes to tastes and hence outlook to house forms. These changes rendered the undeveloped local building materials inadequate while there was an increased demand for exotic ones. Accordingly, Arayela (2005) posited that the modern building industry lays much emphasis on sophisticated building materials and techniques that are expensive and energy consuming. Though, housing delivery efforts have evidently been inhibited by prohibitive costs of building materials. This problem cannot be reasonably and reliably overcome by merely resorting to the use of locally available materials without due considerations to the applicable initiative, the cost of processing and sustainability of the local materials. According to Arayela (2005) many completed housing estates had remained unoccupied because of the high rental and sale prices attached to them as against the meager income of the average Nigerian workers. He also added that if government can revitalize our industrial base, the cost of building materials will come down and many more people would be able to build houses.

In Imo State where this study covered, the rise in the population especially in the urban areas (Owerri municipal, the state capital) could no longer be matched with corresponding rise in the provision of good shelter for the populace. A look into the areas review that majority of the people finds it difficult to feed let alone saving enough amount to build good houses for themselves. The major consequence of this sorry state of affair is the expansion and development of shanty or slum settlements to meet the housing needs of the urban poor. This study therefore, assesses how cost of building materials affects adequate and effective housing development in Imo State.

1.2 Statement of the problem

Building materials has been observed to be on the higher prices in Owerri Imo State compared to other neighboring cities. A research by Ameh and Osegbo (2011) revealed that there is always about six to seven percent increase in the price of iron rods in Owerri compared to Aba and Onitsha. Also in 2010 when a bag of cement sold for N1450 in Aba and Onitsha Area it is sold at N1550 in Owerri Imo State. This has been attributed to location and other economic influences (Ameh and Osegbo, 2011).

Owerri municipal where this study focuses have witnessed huge housing supply deficit in the recent times such that available residential accommodation could no longer match the population in this area. This has also led to very high increase in the demand for residential accommodation by relocating people. In order to meet this property demand, housing development must be affordable to all and with the use of sustainable materials. However, the problem of rising cost of building materials are predicted to work against this objective of affordable housing development. The consequence of this is an increased housing deficit, delayed building projects, abandonments and development of slum settlement to meet the housing needs of the populace. Hence, the study seeks to assess the effect of building material cost on housing development.

1.3 Aim and Objectives
1.3.1 Aim
The aim of this work is to assess the effect of building materials cost on housing development with a view to establishing a way of predicting rate

of housing development in Owerri Imo state with the following objectives;
1. To identify the factors responsible for increase in cost of building materials in Owerri Imo State.
2. To determine the effects of building materials cost on housing development in the study area.
3. Determine the trend of housing/residential development and the relationship it has with the selected building materials prices over the last ten years (2009 to 2018) in Owerri Imo State.
4. Determine the effects of the selected building materials prices on residential development between the years 2009 to 2018 and provide a means of predicting residential development in Owerri Imo State.

II.   REVIEW OF RELATED LITERATURE
2.1Housing need in Nigeria
Various governments in Nigeria have often expressed interest in housing provision for the masses. A review of past efforts indicates that the achievement level of the various national housing programmes was low. Rapid urban growth associated with accelerated tempo of socio-economic development has seriously aggravated the shortage of dwelling units, resulting in overcrowding, high rent, slum and squatter settlements which are visible features of urban centers throughout the country. Estimate and indicator of the magnitude of housing shortage vary. In summary, they all indicate massive shortages in total housing required.

The total housing needs of the country in urban and rural areas were put to some 8 million units by the year 2000 by Federal Ministry of Works and Housing, and 12-14 million units in 2007 (Akeju, 2007). A more recent estimate puts the figure even higher at 16-17 million units (Aribigbola, &Iranlowo, 2012). At an average cost of 2.5 million naira per housing unit. This indicates that Nigeria will require 35 trillion Naira to fund the housing deficit of 14 million housing units (Onyike, 2007).

A recent study based on the salary structure of public servants in Nigeria conducted by Onyike (2007), showed that no public servant in Nigeria below salary grade level 13 in the federal civil service and salary grade level 16 in the state civil service can afford a property costing N4.75m on a 25 years mortgage at 6 percent if he devotes 50 percent of his salary per annum to housing. At 18 percent mortgage rate, only a federal permanent secretary or his equivalent on grade level 17 can afford the same house. This shows that in the absence of some assistance and affordable

strategies, adequate housing is unaffordable to most law abiding Nigerians.

2.2 Building materials
Building materials are any material which is used for building purposes. Many are naturally occurring substances such as: clay; rocks; sand; wood; branches; and greeneries and others are non-naturally occurring (man-made) materials/products (Ihuah 2015).

Building materialsplay a vital role in the construction industry as they are those materials put together in erecting buildings; construction project is not feasible without the inclusion of building materials (Akanniet al., 2014). Akanniet al. (2014) explained that building materials remain the most substantial input in project development and, because of this, play an undeniably significant role in the delivery of construction projects. According to Adedeji (2012), about 60% of total housing expenditure is spent on building materials. Notably, Karana, Hekkert and Kandachar (2010) indicated that appropriate use of the building materials, in respect of the expertise involved in the building construction process, determines the strength, functionality and quality of the building. Building materials play a crucial role in enhancing sustainability of buildings and contributing to economic wealth of the nation (Akadiri, 2011). However, Donyavi and Flanagan (2011) observed that in order to reduce construction costs, and to improve productivity, quality and timely project delivery, material management effectiveness must be a main concern. The importance of building materials in effective and sustainable housing development cannot be underestimated.

2.3 Factors responsible for increase in the cost of building materials
The cost of building materials has presented a formidable challenge to the construction industry (Akanniet al., 2014). Windapo and Cattell (2013) are in agreement, contending that the preeminent challenge affecting the performance of the construction industry and projects in Nigeria is primarily the increasing cost of building materials. Hence, volatility tends to push the cost of building materials up and transfers a major risk to all parties involved: suppliers, contractors and clients. Alabi (2017) also asserted that local currency devaluation was a factor surging the cost of building materials up. Jagboro and Owoeye (2004); Mojekwu, Idowu, and Sode (2013); and Idoro and Jolaiya (2010), in their respective studies, pointed out many factors – such as the change in government policies and

legislations, scarcity of raw building materials, fluctuation in the cost of fuel and power supplies, inadequate infrastructural facilities, unfortunate corruption, fluctuation in the cost of plant and labour, and seasonal changes – as being factors responsible for the escalating cost of building materials.

Other factors responsible for the increasing cost of building materials identified by researchers are these: fluctuation in the cost of transportation and distribution, political interference, local taxes and charges, fluctuation of cost of raw materials, cost of finance, inflation, and fluctuation in the exchange rate. Moreover, Oladipo and Oni (2012) analysed some macro-economic indicators impacting the cost of building materials, which include the following: exchange rate of local currency to other currencies globally, inflation rate and interest rate charge on loans.

According to Alabi (2017) factors responsible for increase in the cost of building materials fall into four categories:
(i) Economic related factors; (ii) Building production related factors; (iii) External factors; and (iv) Stakeholder related factors.

III. METHODOLOGY
3.1 Population and study Area
For the purpose of this research, the issue to be addressed is the effect of building materials cost on housing development. With that in mind, the population considered is building construction major actors which are the Professionals (architects, builders, quantity surveyors, engineers) in the building construction industry within Imo State. A population of 420 professionals was considered. This comprise of 43 builders, 214 architects, 76 structural engineers, 87 quantity surveyors in Imo State as sourced from their respective professional body secretariats.

3.2 Sampling Technique and Sample Size
This research adopts stratified sampling techniques, considering the heterogeneous make up of the respondents (Professionals) and the complex nature of the Building construction industry in relation to management, operations, geographical distribution and the often chaotic schedule of these construction stakeholders. As a result, construction stakeholders comprising professionals (Architects, Engineers, Builders, Quantity surveyors) in Imo State were selected as samples for the research population. The population (N) of 420 which was divided into four strata of sizes; Architects (N_1) = 214, Builders (N_2) = 43, Quantity surveyors (N_3) = 87, Structural Engineers (N_4) = 76 Thus, using proportional allocation, the sample sizes for different strata (professionals) were drawn

A sample size (n) of 90 was drawn from the population in the order stated below;
For strata with N_1 = 214, P_1 = 214/420. Hence n_1 = $n.P_1$ = 90(214/420) = 46
For strata with N_2 = 43, P_2 = 43/420. Hence n_2 = $n.P_2$ = 90(43/420) = 9
For strata with N_3 = 87, P_3 = 87/420. Hence n_3 = $n.P_3$ = 90(87/420) = 19
For strata with N_4 = 76, P_4 = 76/420. Hence n_4 = $n.P_4$ = 90(76/420) = 16
The sample sizes for different strata (professionals) are architects 46, Builders 9, Quantity Surveyors 19 and structural Engineers 16 respectively which is in proportion to the sizes of the strata viz., 214:87:76:43, that made up the population.

3.3 Method of data collection
The primary and secondary data collection was used for this work. The primary data for the study were collected through the administration of quantitative questionnaires to survey respondents. The questionnaires were administered to respondents by hand.

The secondary data were collected from textbooks, journals, conference proceedings, thesis, archives, National Bureau of Statistics (NBS), Owerri Capital Development Authority (OCDA), Building material merchants, secretariat of some professional Bodies in the construction industry and records of past projects

3.4 Method of data analysis
The data collected were analyzed using percentage descriptive analysis, relative importance index, T-test and multi - regression using IBM statistical social package for social science (SPSS 23).

IV. DATA PRESENTATION AND ANALYSIS
4.1.1 Economic related factors responsible for increase in cost of building materials
Table 4.1 presents the ranking of responses from respondents on economic related factors affecting the cost of building materials using relative importance index, the greater the index score the higher the rank. Respondents were required to indicate their position on each of the identified factors responsible for rising cost of building materials using a five (5) point Likert scale with values as follows: 5 = Strongly agree, 4 = Agree, 3 = Undecided, 2 = Disagree, 1=Strongly disagree. The main factor identified to be responsible for increase in cost of building material

is 'inflation' which ranked 1st with RII of 0.88, followed by 'exchange rate of naira' ranked 2nd with RII of 0.85. 'Taxes' ranked 3rd with RII of 0.84, 'Market Condition ranked' and 'cost of raw materials' both ranked 4th with RII of 0.82,

'building materials supply and demand' ranked 5th with RII of 0.74, 'scarcity of building materials' ranked 6th with RII of 0.71, 'inadequate production of building materials' ranked 7th with RII of 0.70, while 'interest rate' ranked 8th with RII of 0.66.

Table 4.1: Responses on Economic related factors responsible for increase in cost of Building Material

Economic related factors	Frequency of Response					RII	Rank
	5	4	3	2	1		
Inflation	39	28	3	4	0	0.88	1
Exchange rate of Naira	35	31	2	4	2	0.85	2
Taxes	34	29	6	5	0	0.84	3
Market condition	35	26	2	7	4	0.82	4
Fluctuation in the cost of raw materials	28	31	9	6	0	0.82	4
Building materials supply and demand	30	18	7	12	7	0.74	5
Scarcity of building materials	32	10	5	21	6	0.71	6
Inadequate production of building materials	30	14	10	8	8	0.70	7
Interest rate	24	14	6	21	9	0.68	8

Source: Researcher's field work, 2018

4.1.2 Building production related factors responsible for the increase in cost of building materials

Table 4.2 presents the ranking of the responses from the respondents on building production related factors responsible for increase in the cost of building materials using Relative importance index the greater the index score the higher the rank. Under site related factors, 'wastages of materials on site' ranked 1st with RII of 0.84, 'uneasy materials handling due to poor planning ranked 2nd with RII of 0.82, 'inadequate site facilities' ranked 3rd with RII of 0.80, 'wrong storage of materials' ranked 4th with RII of 0.72,

'materials pilfrey on site' ranked 5th with RII of 0.70, 'materials shortage on site' ranked 5th with RII of 0.67. Then for design related factors; 'changes in design' ranked 1st with RII of 0.82, followed by 'additional work due to changes in design' which ranked 2nd with RII of 0.80, 'wrong estimation by quantity surveyor' ranked 3rd with RII of 0.78, 'design complexity' ranked 4th with RII of 0.77, 'additional works due to errors' ranked 5th with RII of 0.72, 'design team experience' ranked 6th with RII of 0.70, lastly inadequate coordination among design team' ranked 7th with RII of 0.68.

Table 4.2: Responses on Building Production related factors responsible for increase in cost of Building Materials.

Building Production Related Factors	Frequency of Response					RII	Rank
	5	4	3	2	1		
Site Related factors							
Wastages of materials on site	38	25	1	8	2	0.84	1
Uneasy movement of materials due to poor site planning	34	28	0	11	1	0.82	2
Inadequate site facilities	36	18	6	12	2	0.80	3
Wrong storage of materials	24	25	4	16	5	0.72	4
Materials pilfrey on site	17	31	2	23	1	0.70	5
Design related factors							
Changes in design	37	23	3	7	4	0.82	1

Additional work due to changes in design	30	29	4	10	1	0.80	2
Wrong estimation by quantity surveyor	28	25	6	15	0	0.78	3
Design complexity	30	15	4	27	8	0.77	4
Additional work due to errors	21	30	1	18	4	0.72	5
Design team experience	24	17	9	23	1	0.70	6
Inadequate coordination among design team	26	14	3	27	4	0.68	7

Source: Researcher's field work, 2018.

4.1.3 External factors responsible for increase in the cost of building materials

Table 4.3, presents responses of respondents on external factors responsible for increase in cost of building materials using relative importance index. 'Change in government policies' is the most significant external factor ranking 1st with RII of 0.80. 'Government legislation' ranked 2nd with RII of 0.78, followed by 'lack of substitute for products' which ranked 3rd with RII of 0.75, 'level of advanced technology' and poor nature of construction' ranked 4th with RII of 0.71, 'weather condition' ranked 5th with RII of 0.70, 'political interferences' ranked 6th with RII of 0.63, lastly, 'natural occurrences' ranked 7th with RII of 0.62.

Table 4.3; Responses on External factors responsible for increase in cost of building materials

External factors	Frequency of Response					RII	Rank
	5	**4**	**3**	**2**	**1**		
Change in government policies	30	28	3	11	2	0.80	1
Government legislation	32	22	6	9	5	0.78	2
Lack of substitute for products	30	23	1	14	6	0.75	3
Level of advanced technology	26	22	2	16	8	0.71	4
Poor nature of construction	27	19	2	21	5	0.71	4
Weather condition	24	20	3	26	1	0.70	5
Political interferences	17	19	7	21	10	0.63	6
Natural occurrences	19	14	5	27	9	0.62	7

Source: Researcher's field work, 2018

4.1.4 Effects of increase in the cost of building materials on housing development

Table 4.4 presents ranking of the effects of increase in the cost of building materials on housing delivery using relative importance index. Respondents were required to indicate the extent to which each of the identified factors has an effect on housing development using a five (5) point Likert scale with values as follows: 5 = to a very large extent, 4 = to a large extent,3 = Undecided, 2 = to a little extent, 1= not at all. 'Shortage in the Delivery of housing to the populace' was ranked 1st as top most significant effect of increase in the cost of building materials on housing development with RII of 0.87. 'Fluctuation in cost of construction and increase in project abandonment' both ranked 2nd as significant effects of increase in cost of building materials on housing development with RII of 0.85.

Other notable effects include; 'Low income earners are priced out for house ownership due to high cost of building materials' which ranked 3rd with RII of 0.84, 'unemployment of construction workers' ranked 4th with RII of 0.78, 'affect clients expectation on quality of project' ranked 5th with RII of 0.76. Then, 'building collapse due use of poor quality materials' and 'conflicts between clients and contractors due to upward review of contract sum' both ranked 6th

with RII of 0.74, 'delay on progress of project' and 'poor quality of construction products' both ranked 7th with RII of 0.71, 'increase in the final cost of building products; final cost higher than budgeted cost' ranked 8th with RII of 0.66, 'Affect Gross Domestic Product(GDP) contribution to the economy ranked 9th with RII of 0.65, 'increased contractors fraudulent practices' ranked 10th with RII of 0.64, 'Affects the aesthetics value of the building product' ranked 11th with RII of 0.63. 'Increase in the cost of Maintenance due to inferior

materials used' ranked 12th with RII of 0.62, 'investment return on construction projects are delayed' ranked 13th with RII of 0.60, while 'Completion at the expense of other products' which ranked 14th, 'transportation cost e.g. returning substandard products to the supplier' that ranked 15th, and lastly 'hindered adequate implementation of innovation in construction' that ranked 16th are the less significant effects with RII of 0.59, 0.55, 0.54 respectively.

Table 4.4; Responses on the Effects of Building Material Cost on Housing Development

Effects	Frequency of Response					RII	Rank
	5	4	3	2	1		
Shortage in the delivery of housing to the populace	41	26	0	7	0	0.87	1
Fluctuation in cost of construction	43	21	0	4	6	0.85	2
Increase in project abandonment	45	17	1	5	6	0.85	2
Low income earners are priced out for house ownership due to high cost of building	36	28	4	2	4	0.84	3
Unemployment of construction workers	32	28	0	4	10	0.78	4
Affects clients expectation on quality of project	24	35	2	2	11	0.76	5
Building collapse due to use of poor quality materials	31	21	1	9	12	0.74	6
Conflicts between client and contractor due to upward review of contract sum	26	26	3	10	9	0.74	6
Delay on the progress of project works	29	18	3	12	12	0.71	7
Poor quality of construction product	30	18	3	5	21	0.71	7
Increase in the final cost of building products; final cost higher than budgeted cost	27	16	0	13	18	0.66	8
Affect Gross Domestic Product(GDP) contribution to the economy	28	15	1	9	21	0.65	9
Increased contractors fraudulent practices	23	19	0	12	20	0.64	10
Affects the aesthetics value of the building product	19	23	2	11	19	0.63	11
Increase in the cost of Maintenance due to inferior materials used	21	18	4	9	22	0.62	12
Investment return on construction projects are delayed	20	17	2	12	23	0.60	13
Completion at the expense of other products	18	18	0	20	16	0.59	14
Transportation cost e.g. returning substandard products to the supplier	14	15	6	16	22	0.55	15
Hindered adequate implementation of innovation in construction	16	12	3	19	24	0.54	16

Source: Researcher's field work, 2018.

Table 4.5 Prices of selected building materials and yearly number of Residential Development inOwerri Imo State between the year 2009 and 2018.

Years	Residential development (numbers)	Cement (50 kg bags) (#)	High tensile iron bar (ton) (#)	Sharp Sand (3.81m^3) (#)	Granite (ton) (#)
2009	654	1850	120,000	10,000	3800
2010	760	1600	122,000	10,000	3800
2011	802	1700	122,000	11,000	3800
2012	651	2200	130,900	12,000	4100
2013	974	2050	126,000	12,000	4200
2014	1194	1800	128,600	13,000	4400
2015	3076	1600	124,400	12,000	4200
2016	1392	2050	167,500	13,500	4800
2017	2353	1500	206,800	13,000	4800
2018	2180	2500	253,800	14,000	5200

Source: researcher's field work (Owerri Capital Development Authority (OCDA) and Building Materials merchants) 2019.

Table 4.5 presents the secondary data collected from OCDA on the number of residential developments in Owerri Imo State between the year 2009 and 2018. It also presents the prices of selected building materials between the year 2009 to 2018 as collected from the various building materials merchants in Imo State.

**Figure 4.1: Time series plot of Residential Development between 2009 to 2018**
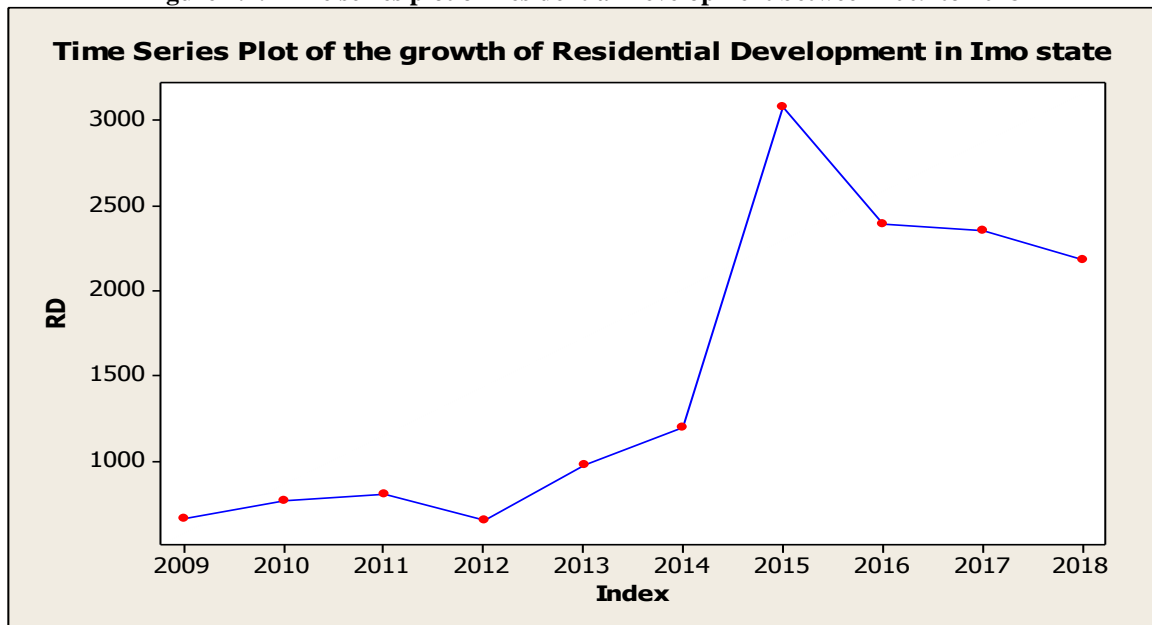
Source: Researcher's spss plot 2019

The above time series plot indicate a positive trend in the growth of residential building in Owerri Imo state. There was a rapid increase in residential building between 2014 and 2015 as shown by the graph but it started dropping down ward in 2016, 2017 and 2018. Residential building in Imo state may keep declining if prices of building material are not brought under control.

Figure 4.2: Time series trend Analysis plot for Residential Development
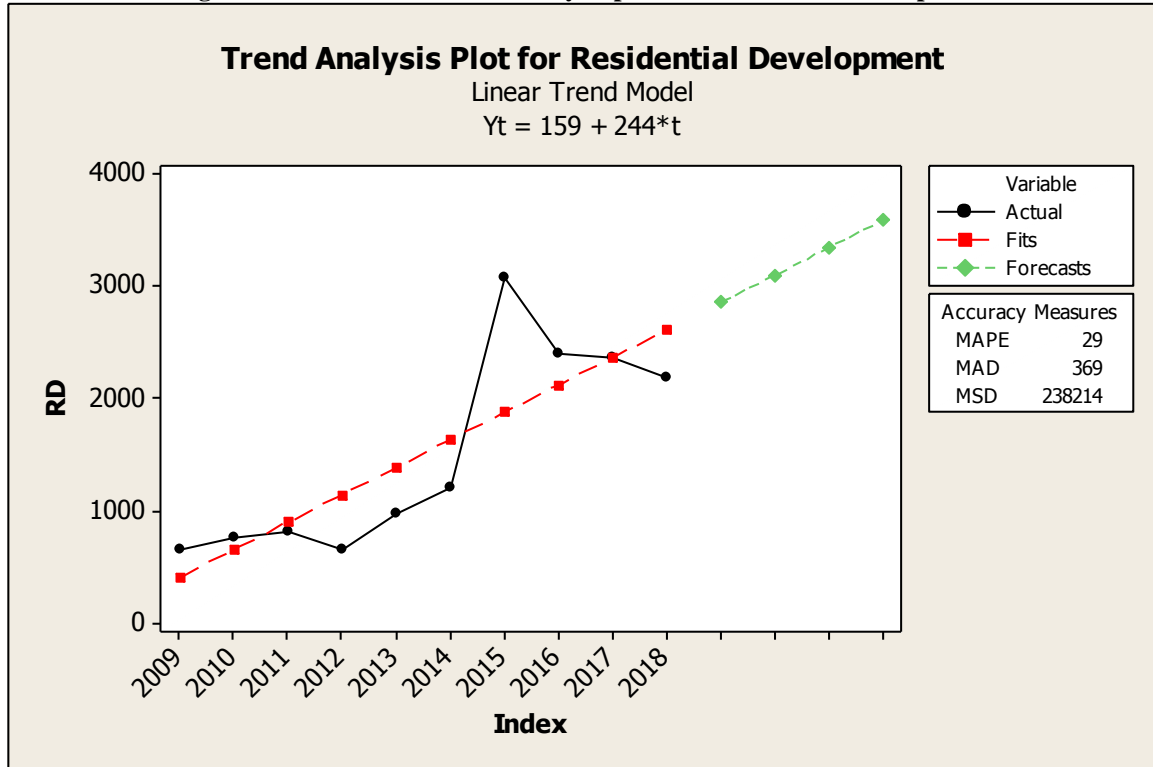
Source: Researcher's spss plot 2019

Table 4.6 Time series forecast for residential development in Imo State for 3 years (2019 – 2021)

Years	Forecast Values
2019	3092.36
2020	3336.78
2021	3581.21

The forecast Values Above indicate a sluggish upward increase in their values, this due to the influence of the mean of the observation within the period under estimation. The actual data of the trend plot above showed that residential building started decreasing from 2016 to 2018.

4.2 Regression Analysis

Table 4.6 indicates that there is a very high positive relationship between among the variables under estimation; that is the prices of cement, high tensile iron bar, sharp sand and granite used to measure the rate of residential development between 2008 - 2017. There is 66.5% explanatory power of the independent variables (cement, high tensile iron bar, sharp sand, and granite) over the dependent variable (Residential development). This indicates a good model fit, and implies that about 66.5% of the dependent variable was explained by the independent variables. Durbin – Watson statistic of 2.6 > 2 indicates the absence of serial correlation. Hence, one of the linear regression model assumptions is satisfied.

Table 4.7 Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin - Watson
1	.815[a]	.665	.396	700.370	2.595

a. Predictors: Cement, High tensile iron bar, Sharp sand, Granite
Source: Researcher's SPSS analysis 2018.

Table 4.7 shows the individual effects of the selected building materials on residential development between 2009 and 2018. Thus, the regression line **RD = - 5136.08 - 1.29 CE - 0.01 HTS - 0.18 SS - 2.94 GR.** The mean value(-1.29) of cement in the regression line indicates a negative effect of cement prices on residential development. This implies that a unit increase in the price of cement will cause an average decrease of 1.29 in residential development of Imo state.The value of the mean of iron bar (-0.01) in the regression line indicates a negative effect of iron bar prices on residential development. This implies that a unit increase in the price of iron bar will cause an

average decrease of 0.01 in residential development in Imo state.

The mean value(-0.18) of sharp sand in the regression line indicates a negative effect of sharp sand prices on residential development. This implies that a unit increase in the price of sharp sand will cause an average decrease of 0.18 in residential development in Imo state. The value of the mean of Granite(-2.94) in the regression line indicates a negative effect of granite prices on residential development. This implies that a unit increase in the price of granite will cause a decrease in residential development in Imo state.

Table 4.8 Coefficients of the regression Model

Model	Constant	Cement	Higher Tensile/ Iron Bar	Sharp Sand	Granite
B	-5136.08	-1.29	-0.01	-0.18	-2.942
Std. Error	4143.26	0.087	0.002	0.069	0.394

Source: Researcher's SPSS analysis 2018.

4.3 T –test analysis
T- Test was adopted to test the significance of the individual effects of the selected building materials (for the period under consideration 2009 -2018).
H_0: There is no significant effect of building material prices on residential development in Owerri Imo state.

H_1There is significant effect of building material prices on residential development in Owerri Imo state.
Rule 1: If P – value>0.05; accept H_o; then there is no significant effect.
Rule 2: If P – value <0.05; accept H_1; then there is significant effect.

Table 4.9 T – test distribution for individual significance

	Constant	Cement	High tensile Iron Bar	Sharp Sand	Granite
t-value	-12.40	-14.80	-5.72	-2.53	-9.60
p-value	0.0270	0.0199	0.0292	0.0810	0.0381

Source: Researcher's SPSS analysis 2018.

Table 4.9 indicates there is effect and meaningful contribution as shown in regression line by all the variables under estimation and since the P – values < 0.05 they are significant. Based on the above data there is enough evidence to reject the null hypothesis. So we accept the alternative hypothesis. This means that the general effect of the four selected building materials is significant and indicatesthat increase in prices of these materials between 2009 – 2018 affected residential developments rate negatively.

4.4 Discussion of Results
4.4.1 Factors responsible for increase in the cost of building materials
The first objective of the study is to identify the factors responsible for rising cost of building materials, the factors were identified and

classified into three categories; Economic Related Factors, Building production related factors(Site related factors and Design Related factors) and external factors. The factors in each category were ranked using Relative importance index.

4.4.1.1 Economic related factors
"Inflation", "Exchange rate of Naira", "Taxes", "Market condition", "Fluctuation in the cost of raw materials", were found to be very significant (Table 4.1). While "Building materials supply and demand", "Scarcity of building materials", "Inadequate production of building materials", "interest rate", were found to be significant (Table 4.1). This indicates that inflation contributes immensely to high cost of building materials in the market. The construction industry is exposed to inflation in cost of building materials

since it involves a truly excessive use of building materials for erecting building (Oghenekevweet al., 2014). One of the principal goals in any economy is price stability (Oyediran, 2003). However, with the rate at which inflation is presently ravaging global economies, particularly in developing countries like Nigeria, this seems to be an uphill task (Monye-Emina, 2007). Kaminget al. (1997) indicated that inflationary increases in building material cost are the main cause of construction cost overrun. The finding also indicated that exchange rate of Naira, taxes and market condition are among additional factors responsible for increase in the cost of building materials (Table 4.1). The findings of Agene (1991) further supported that changes in imports and exports of any country will immediately affect the rate of exchange for its currency.

4.4.1.2 Building production related factors responsible for increase in the cost of building Materials
Site Related Factors
"Wastages of materials on site", "Uneasy movement of materials due to poor site planning", "Inadequate site facilities", were found to be very significant (Table 4.2). while "wrong storage of materials", "Materials pilfrey on site", were found to be significant (Table 4.2). The lack of planning of construction activities contributes to material waste (Polat and Ballard, 2004).

Design Related Factors
"changes in design", "additional work due to changes in design", "wrong estimation by quantity surveyor", "design complexity", were found to be very significant (Table 4.2).   while "additional work due to errors", "design team experience", "Inadequate coordination among design team", were found to be significant (Table 4.2). Design changes may well contribute to additional works (Han et al., 2013). Change in construction design is inevitable and can arise for a number of reasons. However, these design changes do require extra time, extra cost and extra materials. This concurs with Al-Dubaisi (2000) who determined that a change in design will have an impact on the material cost, schedule and cost of labour.

4.4.1.3 External Factors responsible for increase in the cost of building materials
These are factors responsible for increase in the cost of building materials that are not attributed to individual participants in the construction sector. "Change in government policies", "Government legislation", were found to

be very significant (Table 4.3). Adekoya (2003) noted government fiscal policies as one of the factors affecting the cost of building materials. "Lack of substitute for products", "Level of advanced technology", "Poor nature of construction", "Weather condition", were found to be significant. While "political interferences" and "natural occurrences" were found to be fairly significant (Table 4.3). Natural occurring factors (outbreak of war, hostilities, uprisings, for example) received a low rank (Table 4.3) because they rarely distort the construction industry in Nigeria.

4.4.2 Effects of increase in the cost of building materials on housing development.
The second objective of the study was to determine the effects of building materials cost on housing development. The analysis of quantitative data collected for this research and reviewed literature depict that increase in the cost of building materials has effect on housing development in Owerri Imo State. The findings of the study shows that 'Shortage in the delivery of housing to the populace' as the most notable effect of increase in the cost of building materials on housing development in Imo State (Table 4.4). Other effects found very significant includes; 'fluctuation in cost of construction', 'increase in project abandonment', 'low income earners are priced out for house ownership due to high cost of building', 'unemployment of construction workers', 'Affects clients expectation on quality of project' (Table 4.4). The findings of the study also indicated 'Building collapse due to use of poor quality materials', 'conflicts between client and contractor due to upward review of contract sum', 'Delay on the progress of project works', 'poor quality of construction product', as significant effects of increasing cost of building materials on housing development in Imo State (Table 4.4). Other effects found to be fairly significant are; 'increase in the final cost of building products; final cost higher than budgeted cost', 'affect Gross Domestic Product (GDP) contribution to the economy', 'increased contractors fraudulent practices', 'investment return on construction projects are delayed', 'completion at the expense of other products', 'transportation cost e.g returning substandard products to the supplier', 'hindered adequate implementation of innovation in construction' (Table 4.4). The client and project contractors have been facing serious trials in trying to maintain steady cost projection on construction projects (Akanniet al., 2014). Clearly, cost control

during the construction process is important to ensure the success of a project (Nega, 2008).

4.4.3 Determine the trend of housing development for the last ten years (between 2009 and 2018) in the study area.

The time series plot indicate a positive trend in the growth of residential building in Owerri Imo state. There was a rapid increase in residential building between 2014 and 2015 but it started dropping downward in 2016, 2017 and 2018. Residential building in Owerri Imo state may keep declining if prices of building material are not brought under control (Figure 4.1).

4.4.4 The relationship between selected building material prices and housing developments in Owerri Imo State.

In the regression model summary in with r = 0.815 (81.5%), indicates a very high positive relationship among the variable under estimation. This implies that there is a high positive relationship between the prices of cement (50kg bags), high tensile iron bar, sharp sand and granite the rate of residential development in Owerri Imo state between 2009 – 2018 (Table 4.7).

4.4.5 Determine the effects of some selected building materials prices on residential development between the years 2009 to 2018 in Owerri Imo State.

The mean value(-1.29) of cement in the regression line indicates a negative effect of cement prices on residential development. This implies that a unit increase in the price of cement will cause an average decrease of 1.29 in residential development in Owerri Imo state (Table 4.8). The value of the mean of iron bar (-0.01) in the regression line indicates a negative effect of iron bar prices on residential development. This implies that a unit increase in the price of iron bar will cause an average decrease of 0.01 in residential development in Owerri Imo state (Table 4.9).The mean value(-0.18) of sharp sand in the regression line indicates a negative effect of sharp sand prices on residential development. This implies that a unit increase in the price of sharp sand will cause an average decrease of 0.18 in residential development of Owerri Imo state (Table 4.9). However, the value of the mean of granite(-2.94) in the regression line indicates a negative effect of Granite prices on residential development. This implies that a unit increase in the price of Granite will cause a decrease in residential development in Imo state (Table 4.9).

V.   SUMMARY OF FINDINGS

1. The major economic related factors responsible for increase in cost of building materials are Inflation, Exchange rate of Naira, Taxes, Market condition, Fluctuation in the cost of raw materials (Table 4.1).

2. The main production related factors responsible for increase in the cost of Building materials are Wastages of materials on site, Uneasy movement of materials due to poor site planning, Inadequate site facilities, changes in design, additional work due to changes in design, wrong estimation by quantity surveyor, design complexity (Table 4.2).

3. The notable external factors responsible for increase in the cost of Building Materials are Change in government policies, Government legislation, Lack of substitute for products, Level of advanced technology, Poor nature of construction (Table 4.3).

4. The findings revealed major effects of Building Materials cost on Building Developments to be Shortage in the delivery of housing to the populace, fluctuation in cost of construction, increase in project abandonment, low income earners are priced out for house ownership due to high cost of building, unemployment of construction workers, Affects clients expectation on quality of project, Building collapse due to use of poor quality materials, conflicts between client and contractor due to upward review of contract sum, Delay on the progress of project works, poor quality of construction product. (Table 4.4) Other effects revealed are increase in the final cost of building products; final cost higher than budgeted cost, affect Gross Domestic Product (GDP) contribution to the economy, increased contractors fraudulent practices, investment return on construction projects are delayed, completion at the expense of other products, transportation cost e.g returning substandard products to the supplier, hindered adequate implementation of innovation in construction (Table 4.4).

5. There is a high positive relationship between the prices of cement, high tensile iron bar, sharp sand, granite and the rate of residential development in Owerri Imo state between 2009 and 2018 (Table 4.7).

6. The prices of cement, High tensile iron bar, sharp sand and granite has negative effect on residential development in Owerri Imo Sate; that is for every unit price increase in these materials there is a decrease in the rate of residential development between the years 2009 to 2018 (Table 4.8).

7. The general effects of these selected materials were significant on the rate of residential

development between the years 2009 and 2018 (Table 4.9).

8. A regression (mathematical) model that can be used to predict the rate of residential development was developed thus; $RD = \alpha + \beta_1 CE + \beta_2 HTS + \beta_3 SS + \beta_4 GR + \varepsilon$

Where, RD = Residential Development (the dependent variable), CE = Cement (50KG BAGS), HTS = High Tensile/Iron Bar, SS = Sharp Sand, GR = Granite.

α

= the intercept parameter of the regression equation

$\beta_1 \cdots \beta_4$

= the slope(mean) parameter of the regresion equation

ε

= error from the estimate, known as the disturbance term

5.1 Conclusion

The identification of factors responsible for increase in cost of building materials was achieved. All the identified factors attracted more than a 50% agreement rate from respondents. Therefore, it can safely be concluded that the majority of the identified economic related, building production process related factors, and external factors are significant factors responsible for increase in the cost of building materials that hinder adequate and quality housing developments Nonetheless, the most influential factors responsible for increase in cost of building materials should be noted, if improvement in cost effectiveness is to be achieved in the provision of housing in Imo State.

The effects of increase in Building material cost was identified and examined thereby fulfilling the second objective of the study. Among all the identified and assessed effects 'Shortage in the delivery of housing to the populace' stood as the most significant effect of increase in building material cost on housing development in Imo State.

The study of effects of cement, high tensile iron bar, sharp sand and granite prices on residential developments between the years 2009 and 2018 revealed that there is a very strong positive relationship between these materials prices and residential development. It indicated that there are individual effects of the prices of these selected materials on residential development in Imo State within the period under consideration. However, it was discovered from the test of hypothesis that the general effect of these selected materials was significant on the rate of residential development in Owerri Imo State for the 10 years (2009 – 2018) period considered.

5.2 Recommendation

1. These identified factors responsible for increase in the cost of building materials should be effectively considered by stakeholders and professionals during building production processes (from design stage through the construction to completion stage) to ensure affordable housing developments are delivered.

2. Most of the economic related factors identified can only be abated through robust national economic policies, therefore Government should develop and implement favourable economic policies that will reduce inflationary rate, improve exchange rate of naira, regularize tax regimes and market conditions.

3. Wastages of building materials by workers was identified as a site related factor responsible for escalating costs of building materials. This could be as a result of the lack of communication between the involved stakeholders and site workers and lack of material management. Construction stakeholders and professionals should always incorporate practical knowledge acquired in the industry and intelligent management skills to effectively communicate about the project with site workers. Additionally, effective material procurement management is required to avoid wastage of building materials during building production process.

4. Change in design is the identified top design related factor that is responsible for increase in the cost of building materials. A change in design could result from design specification obscurity, errors, omissions and changes ordered by client. This could be avoided through the procurement of experienced architects and engineers from as early as the conceptual phase. To achieve effective design, objectives must be clearly presaged by the client to the designer at the conceptual phase, ensuring that client requirements are met while still maintain timely project delivery.

5. The study advances that the Nigerian government should provide a good platform through provision of infrastructures, empower small and medium enterprises and evolve table policies that encourage the use of locally produced building materials while playing down the over-dependence on imported materials.

5.3 Contribution to Knowledge

The research has basically and scholastically added to the information available on the effect of building materials cost on housing development. It will be beneficial to stakeholders of the building construction industry in numerous ways;

1. The research has provided a model for predicting residential development rate in Owerri Imo State.
2. The research enlightens the stakeholders in housing development of the factors responsible for increasing cost of building materials in Owerri Imo State.
3. It has provided knowledge on the effects of building materials cost on housing developments.
4. It has provided knowledge on the relationship that has existed between building materials prices and residential developments in Imo State between 2009 and 2018.
5. It has provided insights into the individual effects of the prices of cement, high tensile iron bar, sharp sand and granite on residential developments in Imo state.
6. The study has provided the basis for further research study on this area in future.

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