

Factors Influencing Building Materials Price Fluctuation in Abuja, Nigeria

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Abstract:

The rate of fluctuation claims by contractors on materials prices is alarming. This leads to disputes in most building projects and usually affects the cost, time and even quality performance of building projects. The study examined the factors responsible for material price fluctuations in building construction projects and determines the impact of materials price fluctuation claims on cost performance with view to minimising the resultant effects on contractors. The study adopted a survey design approach using quantitative data. Data were collected through well-structured questionnaire administered to 250 respondents; also archival data on cost of material price fluctuation claims on completed building projects in the study area were obtained. A total of 170 questionnaires were retrieved from 250 distributed along with 23 archival data. The collected data were analysed using percentages, Relative Importance Index (RII) and Pearson Correlation Moment. Result reveals that the major factors responsible for building material price fluctuation are; exchange rate of national currency, cost of transportation, inflation of building materials and cost of energy. The results further indicate that materials price fluctuation claim has a direct correlation with total project cost with a significant level (p value) of 0.01. It is recommended that drastic steps should be taken by Government to stabilise naira exchange rate, reduce cost of energy, production and transportation of building materials, also contractors should have appropriate planning, maintain current information, on time payments of funds and understanding of project requirement.

Keywords: Building materials, projects, fluctuation, price, performance

INTRODUCTION

The building sector is very crucial in construction industry of any nation's social and economic development. There are many factors responsible for this. Apart from the sector's potential with respect to employment generation, the various activities undertaken in the sector are very relevant to fostering effective sectoral linkages and sustaining economic development (Mathews, 2015).

Housing is a major component of the sector. Housing is a key input in economic, social, and civic development; many housing-related activities contribute directly to achieving broader socio-economic development goals, and it is a major driver of economic growth. The building sector has provided employment for different types of employees, especially in major Nigerian cities where construction activities have been massive like the Federal Capital Territory (FCT), Abuja. The sector is also vital in sectoral connection as its activities have multiplier effects on the growth of other sectors, especially the building materials sector, real estate transactions, among others (Akanni *et al.*, 2014). Building materials have been playing an important role in erecting or constructing structures. No field of engineering is conceivable without their use (Akanni, 2016; Udosen and Akanni, 2010). Building materials contribute immensely to the quality and cost of housing, from substructure (foundation) to the superstructure including materials for roofing and finishes.

The cost of building materials poses a significant threat to both the building sector and people aspiring to own houses (Anosike, 2009; Mekson, 2018; Mohammed, 2011; Njoku, 2013). Supporting this view, Jagboro and Owoeye (2014) earlier established that increase in the prices of building materials has effects on the industry because building materials alone account for 50 to 60% of project cost and control about 80% of its schedule. While Idoro and Jolaiya (2010) affirmed that many projects were not completed on time due to the cost of materials, which have been on the increase.

A major constraint in the Nigerian construction industry today has been the rapid inflation and fluctuation in the cost of building materials. Windapo *et al.* (2014) observed that the situations arising from the rapid change in the cost of building materials may degenerate to acute shortages of housing

with the millions of middle- and low-income families being priced out of the market for home ownership all across Nigeria. According to Obadan (2011), government policies set the economic environment in which all sectors operate including the building materials sector. Idoro and Jolaiya (2010), concluded that factors such as the change in government policies and legislations, scarcity of building raw materials, fluctuation in the cost of fuel and power supply, inadequate infrastructural facilities, corruption, fluctuation in the cost of plant and labor, seasonal changes, fluctuation in the cost of transportation and distribution, political interference, local taxes and charges, fluctuation on cost of raw materials, fluctuation in the interest rates and the cost of finance, inflation, and fluctuation in the exchange rate of Naira were many of the recipes for the rising cost of building materials in Nigeria.

These frequent changes and increases give rise to claims, cost overruns, housing supply shortage leading to high cost of urban housing accommodation, construction cost estimate losing usefulness within short periods, difficulty in forecasting and planning, and frequent contract price variations, all of which often leads to project abandonment (Ayodele and Alabi, 2011). Other implications such as completion at the expense of other projects, delay in progress of project works, rate of employment of construction workers, other valuable projects not being commissioned, poor workmanship as a result of the use of low-quality local materials and inhibited innovations in construction methods were identified by Idoro and Jolaiya (2010); Oladipo and Oni (2012); and Windapo *et al.* (2014) as the possible implications of the rising cost of materials. Sinclair, Aibinu (2012) noted that increased material cost is primarily due to increased transport charges. Further, high transport and freight costs have been identified as the factors responsible for building material price fluctuation in African countries such as Nigeria, Uganda, and Kenya (Mathews, 2015).

The research examined the possible factors responsible for building materials price fluctuation in Abuja, Nigeria and determines the impact of materials price fluctuation claims on cost performance of building projects.

Price Fluctuation

Price fluctuation can generally be defined as the rise or fall of price of goods, materials and services on the markets. Price fluctuation can occur at any market i.e at local market or at the labour market, international markets. Fluctuation reasons are numerous, the major ones being (Stukhart 2012) Shortage or excess supply at market, Government's regulation on oil price and decrease or increase in demand of a certain item. Shortage or excess supply at market: the availability of certain item on market has an inverse relationship with the price of the same on the market. If an item is supplied in excess amount on the market, its price will reduce from its normal price, and inversely, if there is a shortage of the same item, then its price will rise. Increase or decrease in demand of a certain item: the price of a certain item has a direct relationship with the demand of that particular item. If the demand for certain item rises, then its price will also rise and vice versa (Entrusty, 2009).

FACTORS RESPONSIBLE FOR BUILDING MATERIALS PRICE FLUCTUATION

The factors responsible for fluctuations in the cost of building materials have been categorized as economic related factors, building production related factors, stakeholders' related factors and external factors (Mojekwu *et al.*, 2010).

Demand and Supply

According to Lakka (2009), demand and supply interaction has a significant role to play in the price of materials. When the market is working perfectly so that the supply at a given price and demand at a given price is known, the rational and logical conclusion is that the quantity supplied to the market will be exactly the same with the quantity demanded. Hence, price of goods supplied will be the same with that sold. At a particular time, there may be more goods brought to the market and offered at such a price that not all of them are bought by customers, by so doing fluctuation threatens the prices of these materials.

Energy costs

Monetary and non-monetary costs (such as the environmental impact) associated with the production, transmission, and consumption of energy. According to Bureau of Economic Research (BER) (2008), the prices of, electricity bills, gasoline, coal, renewables and other fuels change quickly, and are acute data points for industry professionals and citizens alike. Clients and building contractors are often best prepared to make decisions if they have current price trend information.

Raw materials and input costs

Raw materials costs along with other factors such as gas, oil and energy are the key causes of fluctuation in the prices of building materials such as cement, water proofing and roof members. The cost that goes into production will have effect on the product either by increasing/reducing the price or reducing/increasing the quality of the product (Ramus, 2011).

Inflation

Inflation is the general skyward trend of prices of services and goods within an economy; it is basically a measure of how the prices of goods and services increase over time, the principle behind inflation and how it affects building material prices according to Rakhra and Wilson (2017) is that there is a time lag between an increase in inflation and the effective resulting increase in building material prices.

Crude oil prices

Crude oil is the base for lots of products. These include transportation fuels such as diesel, gasoline and jet fuel; they also include fuel oils used for electricity generation and heating. Crude oil prices measure the spot price of various barrels of oil. Furthermore, Anderson (2011) noted that the global crude oil price is the main driver behind the instability of some building materials such as PVC, which is a polymer whose raw production material is crude oil.

Exchange rates

The exchange rate between two currencies is the amount for which one currency is exchanged for the other, and is used in determining the strength of one currency to another. The degree to which building material prices are affected by exchange rate movements depend on the types and quantities of materials being imported by a country at a specific time, the need to import the raw materials used in the production of building materials locally, and on whether local materials (such as timber, copper and steel) are internationally traded commodities (Busreport *et al.*, 2011)

Import duties

Import duties are put in place to shield local producers from clients trying to outsource cheaper goods from abroad. Import duties on materials have been noted to affect the construction industry and building material prices in countries such as Malaysia, Nigeria, India, Uganda, Kenya and Oman by raising the prices of good imported due to imbalance in export and import rate (Hamsawi, 2011).

Interest rate

The high interest rate of banks and the unpredictability in the foreign exchange market result in serious depletion of a nation's foreign exchange resources, severely affecting the industry with import dependence of about 60% of its raw materials (Jagboro and Owoye, 2014).

However, Oladipo (2012) opined that across the nation, many construction, housing and profitable real estate projects have either been abandoned half way or put on hold because of the scarcity of capital or because of the sky rocketing cost of borrowing. Aside from the increase in the cost of borrowing, high interest rate also causes reduction in spending as people are more inclined to save. Central Bank of Nigeria interest rate as at April, 2018 was 14%.

Currency devaluation

According Tuffery (2010) Currency devaluation is a tool used by monetary authorities to improve the country's trade balance by boosting exports at moments when the trade deficit may become a problem for the economy. After devaluations, the same amount of a foreign currency buys greater quantities of the country's currency than before the devaluation. This means that the country's services and product are likely to be sold at lower prices in foreign markets, making them more competitive. Devaluation usually takes place when a government notices regular capital outflows (or capital flight) from a country, or if there is a significant trade deficit (where the total value of imports outweighs the total value of exports).

Ordering and delivering process

The order-to-delivery process (ODP) is the principal means by which contractors or customers communicate with suppliers, the final sale transaction is made, and cash is generated for the supplier. The ODP, also known as the OCP (order-to-cash process), is an extremely important core business process in construction industry. It is a contractor-facing process and is the key to operational efficiency and client satisfaction. Can the order processing process create differentiation and competitive advantage? Most certainly yes. Firms should strive to create an ODP that is standard and that results in effective construction (Wahab, 2015).

Human factors

According to Ihuah *et al.* (2015) human factors refer to environmental, organisational, job factors and individual characteristics, which influence behaviour at work in a way which can affect health and safety". This definition includes three interrelated aspects that must be considered: the job, the individual and the organisation:

- i. The job: including areas such as the nature of the task, the working environment, workload, controls, the design of displays and the role of procedures.
- ii. The individual: including his/her competence, personality, skills, risk perception and attitude. Individual characteristics influence behaviour in complex ways. Some characteristics such as personality are fixed; others such as attitudes and skills may be enhanced or changed.
- iii. The organisation: including work patterns, resources, the culture of the workplace, leadership, communications and so on. Such factors are often overlooked during the design of jobs but have a significant influence on individual and group behaviour.

Design changes

Changes in construction projects are always going to happen and cannot be avoided. Changes causes disruption of performance of construction projects, especially cost and time performance. Many factors can be the cause of changes in construction projects; one of the most influential factors is design change (Mansfield *et al.*, 2014). The influential factors of design changes can be classified into two groups; the internal factors consist of owner, construction management consultant, design consultant, and contractor, while the external

factors involve economic and political, the natural environment, the third-party and advance of technology.

Material wastage

Construction waste consists of unwanted material produced incidentally or directly by the construction. This includes building materials such as nails, insulations, shingle, electrical wiring and roofing as well as waste originating from site preparation such as dredging materials, rubble and tree stumps. According to Wahab (2015) much building waste is made up of materials such as concrete, bricks and wood unused or damaged for various reasons during construction. Observational research has shown that this can be as high as 10 to 15% of the materials that go into a building, a much higher percentage than the 2.5-5% usually assumed by quantity surveyors and the construction industry. Since considerable variability exists between construction sites, there is much opportunity for reducing this waste.

Supplier default

Nega (2013) noted that the main factor responsible for supplier default come from the fact that some suppliers control a monopoly of the market by keeping the price high and restricting the output, showing non or little awareness of the needs of the customers. The researchers stressed that because of the high demand of some building materials, some suppliers wait for a high accumulation of orders, thereby generating problems associated with importing raw materials as well as increased exchange rates.

Transportation

Okupe (2010) stated that in the construction industry, transportation and logistics are at the core of implementing supply chain management that will gain you a competitive advantage. An effective transportation and logistics system ensures on time delivery of the right materials to your site, while reducing your costs.

Planning

Eshofonie (2016) noted that planning is one of the most important factors affecting the cost of building materials. Contractors should utilise all resources in effective ways. Proper scheduling is essential in project resource utilisation, as the reverse, inadequate planning, will increase the project cost, suggesting that where there is no effective contractor scheduling and planning on site there will be construction project delays.

Market stockpile

Naveen (2015) pointed out that market stockpile is one of the major causes of fluctuating prices of materials; He attributed the fear of fluctuation to the reserves of materials and reluctance to send large quantities to the market despite surging prices that offer huge opportunity making the price go higher. As the materials are stockpiled, it increases its scarcity causing inflating prices for the available ones.

Force majeure

According to Investopedia (2019) Force majeure is a French term that literally means "greater force." It is related to the concept of an act of God, an event for which no party can be held accountable, such as a tornado or hurricane. Force majeure also encompasses human actions, however, such as armed conflict. Generally speaking, for events to constitute force majeure, they must be unforeseeable, external to the parties of the contract, and unavoidable. These

concepts are defined and applied differently by different jurisdictions. Example is the unforeseen impact of the Covid-19 pandemic in recent time.

Weather conditions

Weather changes contribute a enormous challenge to global warming emission of CO₂ by buildings under in use and under construction, while building materials are a significant component of any building project, climate change indirectly or directly will also have an effect on the price and use of building materials during or before building construction (Ofeogbu, 2017).

Government policies

According to Mansfield *et al.* (2014), governments may also invoke their powers to initiate or halt projects on social, political and environmental grounds which will eventually lead to fluctuation in materials. No construction work happens in a single space; rather it is subject to a group of powers from regulatory control to political intervention.

RESEARCH METHODOLOGY

The study adopted a survey design approach using quantitative data. Data were collected through well-structured questionnaire administered to respondents and archival data were also collected in table form. The population consisted of 250 registered building contractors gotten from the Corporate Affairs Commission (CAC directory, 2020). The population of 250 were broken into sample frame constituting medium and large building contractors. These respondents were selected because they are the key players in building construction. The value of 250 gotten from sample frame was subjected to (Krejcie and Morgan table, 1970) for determining sample size at 5% limit of error and at 95% confidence level. This was reduced to 152, which is the minimum sample size for this research. Therefore, a total of 170 questionnaires were retrieved out of the 250 distributed. 162 were found valid along with 23 archival data for the analysis, as eight (8) were deemed invalid, because of poor responses. The 162 represents an effective response rate of 95.29% and this was considered suitable for analysis.

A simple random sampling technique was adopted in the questionnaire distribution. The questionnaire was designed and contains tables and check-boxes for easy selection of options by respondents; which was divided into two (2) main parts. Part A - is related to demographic information of the respondents and their companies. Part B- asked questions about factors influencing material price fluctuation in Abuja reflecting the major areas of the study interest, thereby providing information relevant to the study objectives and answering the research questions. A 5-point Likert scaled questions and options were designed for data collection. The collected data were analysed using Percentile, Relative Importance Index (RII) and Pearson Correlation Moment Data processing was done with the aid of Microsoft Excel 2010 to determine the impact of materials price fluctuation claims on cost performance.

RESULTS AND DISCUSSION

Demographic information of the respondents

Result in Table 1 shows the characteristics of the respondents. From the table, it shows that the highest number of respondents years of experience is between 11-15 years (30.2%) followed by 6-10 years (24.7%). The highest range of the contract sum handled by most of the respondents was from 51 to 100 Million (27.8%). This indicates that most of the respondent

has handled construction projects involving significant sums. The level of education of respondents was sampled to find out the highest ladder each of the respondents has reached. However, it was not surprising that, majority of the respondents were holders of Bachelor's Degree with 24.1% followed by 19.8% of them being identified in holding a Master's Degree. In term of professional membership, 80% of the respondents are members of their professional bodies while only a lesser fraction of the entire population are none members. As a result, respondents in this study are associated with impressive academic backgrounds, supported by either accreditation of professional status from professional institutes or academic achievement in recognized academic institutions; hence their response to the research questions can be relied upon.

Factors Responsible for Material Price Fluctuations in Building Construction Projects

Table 2 indicates that exchange rate of national currency, cost of transportation, inflation of building materials and cost of energy (fuel, electricity, gas) with RII values of 0.95, 0.93, 0.92 and 0.91 respectively are ranked as the top four important factors responsible for material price fluctuations in building construction projects.

Table 1: Demographic information of the respondents

Category	Classification	Frequency	Percentage
Years of experience	1-5	24	14.8
	6-10	40	24.7
	11-15	49	30.2
	16-20	26	16.0
	Above 20	23	14.1
	Total	162	100.0
Highest range of contract sum involved	1-10 Million	35	21.6
	11-50 Million	40	24.7
	51- 100 Million	45	27.8
	101- Above	42	26.0
	Total	162	100.0
Academic qualification	OND	18	11.1
	HND	30	18.5
	PGD	28	17.3
	B.Sc./B.Tech.	39	24.1
	M.Sc./M.Tech.	32	19.8
	PHD	15	9.3
	Total	162	100.0
Professional Qualification	MNIA	35	21.6
	MNIOB	31	19.1
	MNSE	36	22.2
	MNIQS-	36	22.2
	None	24	14.8
	Total	162	100.0

Source: Researcher's field survey (2020).

Among the least ranked factors responsible for building materials price fluctuation includes: frequent weather condition change, force majeure (An act of God), and material wastage on site, each with RII of 0.61, 0.56 and 0.53 respectively.

Table 2: Factors Responsible for Material Price Fluctuations in Building Construction Projects

S/N	Material Price Fluctuations Factors	RII	RANK
1	Exchange rate of currency	0.95	1
2	Cost of transportation	0.93	2
3	Inflation of building materials	0.92	3
4	Cost of energy (electricity, gas)	0.91	4
5	Government policies on materials	0.86	5
6	High import duties rates on materials	0.81	6
7	Raw materials and input costs of building materials production	0.80	7
8	Increasing interest rate	0.80	8
9	Political instability of the nation	0.77	9
10	Rapid devaluation of national currency	0.77	10
11	level of supply and demand	0.77	11
12	Unstable crude oil prices	0.76	12
13	Ordering and delivering process of building materials	0.75	13
14	Suppliers default to make materials available at the needed time	0.75	14
15	Availability of substitute product	0.74	15
16	Ineffective planning	0.72	16
17	Market stockpile of needed materials	0.71	17
18	Human factors	0.71	18
19	Frequent design changes	0.71	19
20	Frequent weather condition change	0.61	20
21	Force majeure (An act of God)	0.56	21
22	Material wastage on site	0.53	22

Source: Researcher’s field survey (2020).

Impact of Materials Price Fluctuation Claims on Cost Performance of Building Projects

Table 3 shows the correlation analysis performed to determine the relationship between materials price fluctuation claim sum and total project cost.

Table 3: Impact of Materials Price Fluctuation Claims on Cost Performance of Building Projects

Project No	Initial project cost (₦)	Final project cost (₦)	Material Fluctuation claims (₦)	Percentage Contribution
1	36,890,000.00	42,732,000.00	1,480,000	3.46
2	92,000,000.00	100,300,272.00	480,000	0.48
3	40,977,574.08	46,099,770.84	2,355,087.4	5.11
4	46,083,600.00	51,844,050.00	1,500,000	2.89
5	45,512,288.00	49,201,324.00	1,800,300	3.66
6	213,648,783.60	250,000000	6,080,073	2.43
7	276,931,365.20	301,500467	3,120,000	1.03
8	87,300,000.00	116,100,000.00	5,168,000	4.45
9	14,200,000.00	19,800,000.00	1,254,000	6.33
10	20,100,000.00	25,789,000.00	268,000	1.04
11	6,785,230.00	8,991,694.40	397,163.7	4.42
12	87,377,000.00	106,136,000.00	2,560,000	2.41
13	142,000,000.00	150,125,200.25	6,800,000	4.53
14	130,610,025.63	155,625,000.00	8,088,001	5.20
15	48,255,650.00	66,755,548.22	4,200,020	6.29
16	35,000,000.00	40,045,850.00	2,000,000	4.99
17	1,380,000,000.00	1,500,000,000.00	36,280,021	2.42
18	22,226,680.20	28,226,365.55	1,680,000	5.95
19	19,233,000.00	31,325,225.21	2,200,009	7.02
20	100,000,000.00	145,000,000.00	8,320,000	5.74
21	500,000,550.00	523,700,000.00	12,004,540	2.29
22	1,600,800,000.00	1,790,000,400.25	28,000,605	1.56
23	740,090,000.00	760,000,350.42	18,550,000	2.44

Source: Researcher’s field survey (2020).