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# Evaluation of Material and Labour Cost Effect on Infrastructure Construction Project Delivery in Akwa Ibom State, Nigeria

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**Abstract**
The reduction of the effect on material and labour cost, becomes imperative to identify the factors, effects and to explore mitigative measures of material and labour cost of infrastructure construction project delivery in Akwa Ibom State, Nigeria. Primary data were employed for the study and were analyzed using a descriptive method, relative important index and mean score. Result revealed that the significant factors causing increase in material and labour cost of building infrastructure are: non availability of material, unionized labour cost, legislation/government policies, transportation cost, while recruitment cost, personnel protective equipment, payroll taxes and conditions. Whereas the cost effect include: devalues of investment, delivery time, delivery quality, non-creation of new opportunities are significance effect affecting material and labour cost. Therefore, adoption of buyer/suppler negotiation, fuel subsidization, technology and innovation, bulk purchase, adoption minimizes the increase effect on materials and labour cost of building project delivery. The study focuses on materials and labour cost effect on infrastructure project delivery within 2019 - 2024 in Akwa Ibom State. The identified factors and effects could be reduced through the application of the mitigative measures provided. It is recommended that constructors in the study area, and world at large should adopt for improvement of materials and labour cost of building project delivery performance.
**Keywords:** Construction, cost effect, infrastructure project, labour, materials,

## Introduction

Construction industry is a major segment in the development of the economy of any nation, that plays a vital role in both developing and developed countries in terms of providing basic infrastructure which promotes socio-economic existence of the country. The construction industry measures the performance of construction projects majorly through cost parameters in addition to time and quality which are also important (Chan & Chan, 2004; Ali & Kamaruzzaman, 2010). Cost performance in particular stands significant in measuring the success or failure of infrastructure (Choge & Muturi, 2014). The production process and delivery of various milestones of construction of infrastructure are highly dependent on cost factors. Despite the importance and emphasis on project cost, the situation of cost performance of construction projects has not improved as expected. According to Azhar, *et al*. (2008) cost overrun is almost associated with nearly all projects in the construction industry. Ramli (2003) observed that cost management in construction industry is less effective compared to time management and other project performance measures. Over the years, construction projects have consistently witnessed increase in cost due to various factors attributed to increase in cost of production inputs (Rahman *et al*., 2013). The challenge of increase in construction cost in the industry is a fundamental issue in both developing and developed countries. Tze (2013) expressed dismay at high annual increases in housing prices in Malaysia as totally out of sync with annual increase in the general population. Osei-Tutu & Adjei-Kumi (2002) revealed that, housing provision in the urban areas in Ghana is characterized by high and ever-increasing cost for both residential and public buildings. Nnadi (2015) pointed out that Nigerian pays more for construction contracts than any other country in the world. Okpala & Aniekwu (1988) earlier investigate the causes of high costs of construction in Nigeria. Comparing the situation then to the present, the cost of construction still remains very high. Researches towards reducing construction cost and improvement on cost performance of construction projects have therefore taken a center stage in literature

and this effort is still ongoing (Omion, 2001, American Institute of Architects, 2007; Memon *et al*., 2010; Amusan, 2011).

Labour cost is the amount of money a contractor has had to pay to have her/his workers complete a job. True labour cost is more than just the hourly wage; it should also include labour burden. Labour burden entails the full cost that an employee incurs on the business by taking into account cost of wages, benefits, taxes, workers compensation, insurance, employer specific taxes (FICA), and other labour-related expenses. All combined this account for a worker's full labour burden (Knowify.com). However, the consideration to labour burden mentioned here, depends whether a labour is employed directly or indirectly. A direct labour is entitled to be paid his actual wages with other benefits as required by law, while an indirect labour is only paid his wages for a defined work done. Moreover, Labour cost of infrastructure construction projects constitutes the cost of skilled labour, unskilled labour, gang and the supervisor.

Several studies have shown that labour which is one of the major production inputs contribute significantly to poor cost performance of construction project (Capano & Karshenas, 2003; Koushi *et al*., 2005; Gambo & Ashen, 2012; & Azis *et al*., 2013). Results of the research undertaken by Windapo & Iyagba (2007) indicate to changes in labour cost out of seven other indicators considered in the study. Labour cost has not only increased the overall project costs but has led to the reduction of construction work especially in the developing countries including Nigeria. In addition, management of construction labour cost has posed a serious concern to project managers since his responsibility is to manage and deliver the project within estimated budget. The Nigerian construction industry like many other developing countries of the world depends on labour for project execution since machine and equipment are not sufficient. Apart from manufacturing companies, the construction industry is the highest employer of labour in any economy. The industry relies heavily on human resource to provide numerous services and products. Soham & Rajiv (2013) described construction workforce as the supreme asset of every organisation that specializes in construction. Labour is dynamic and can be regarded as a driving force in the production of projects and services. Soham & Rajiv (2013) posited that construction workers are the only productive resource in the construction industry. Labour constitutes a significant percentage of construction cost, and the quantity of labour hours in performing a task in construction is susceptible to labour control by management effort through motivation, incentives, performance assessment, and recognition (Geneva, 2001). Construction labour represents the most significant construction variable that attracts a significant percentage of construction cost (Kazaz *et al*., 2008). Having recognized the immense importance of labour in the delivery of construction projects, Olomolaiye & Egbu (2004) remark that the construction industry must consider construction human resources function as the main focus when planning for organisations business strategies with the view to achieve success.

Construction material costs, meanwhile, include amounts paid for materials (i.e. bricks, concrete, clay, lumber, among others) used to build infrastructures. Often, materials must be procured, imported, and transported to job sites, which is also factored into construction material costs (gobridgit.com). Moreso, material cost of construction project constitutes majorly the amount paid for materials, transportation, loading and unloading materials. The cost of construction materials may be 50% to 70% of the total construction expenditure, depending on the type of construction project (Arijeloye & Akinradewo, 2016: 169; Albert, 2014: 2; Patel & Vyas, 2011: 1). For instance, in building construction industry in particular, existing literature affirmed that cost of building materials accounts for over 50% of the total cost of construction in the build industry in Nigeria. According to Ogunsemi (2010), the unprecedented rises in the cost of building material constrain the supply of housing in Nigeria. In the same vein Adedeji (2012) asserted that, escalating cost of building material should be accorded priority in the process of estimating cost of building. Nega (2008), the ever-increasing cost of building material had a negative effect on the quality of infrastructure (building), accounted for the incessant delay in the completion of building project. Consequently, housing and housing delivery is erratic and falling

short of global standard. Nega (2008) also noted that contracted construction work between contractor and project sponsor often result into dispute arising from disparity between estimated and actual cost of construction. It is against the goal of every project that it becomes imperative to identify the causes of high cost of construction materials and its impact on delivery of construction project.

Project delivery costs mean those costs related to the delivery of construction, related services to an eligible applicant that are not included as part of administrative expenditures (lawinsider.com). Contrary to the estimated cost, delivery cost is the actual and final cost of delivering a construction project. The total cost of construction in normal circumstances is expected to be the sum of the following cost; materials, labour, site overheads, equipment/plant, head office and profit. Furthermore, were there are changes in material costs, probably there may cost overruns in construction project (Dominic & Smith, 2014). In addition, Albtoush, (2020) opined that, the cost of construction material and labour should be controlled and managed well. Hence, this study aims to assess the effect of material and labour cost on building construction project delivery in Akwa Ibom State, Nigeria.

It is not history any more but obvious that material and labour cost of construction infrastructure projects delivery in Nigeria has not only increased but is increasing perpetually and getting beyond ordinary and becoming so frustrating to infrastructure's developers and the general public at large in affording shelters. Infrastructure development and maintenance generally experience time delay and cost overrun during their implementation phases. Ulla (2020) investigated that, even small cost changes in labour-related variables and construction material cost related-variables can highly influence the cost of infrastructure delivery. Ashaari *et al,* (2019) observed that material and labour related issues affect contractor's budget. While, Joukar (2016) mentioned that, the price volatility of material and labour is a prominent cause of contractor's budgeted cost and time overruns. Therefore, delays in material supply chain, probably affects the overall project delivery because the construction activities got delayed due to unavailability of material at site as at when due (Wang & Hubbard, 2017). Rashid (2020), listed causes related to labour costs such as; less productivity, shortage of labour and conflict of personal opinion among labours and these can affect project delivery cost and time. According to Choietal (2018), the construction industry in United State (US) is also awfully suffering from labour shortage. A study conducted by Hwang *et al*, (2013) in Singapore revealed that non-availability of labour on site is the significant cause of infrastructure delays and can lead to failure and abandonment of project.

In Nigerian context, studies have been done to address every issue relating to construction project delivery in relation to the influence of material and labour cost. Adu *et al,* (2022) studied on assessment of factors responsible for high cost of labour in construction projects. The study revealed economic climate, shortage of manpower, transportation cost as significant factors responsible for high cost of labour of construction projects. Nkeriuka *et al,* (2020) studied revealed inflation, government policy, dual taxation are factors causing incessant increase in prices of building materials cost on housing delivery in Nigeria' and stated that persistent increase in price will truncate government plan in providing shelter for the citizenry. Therefore, there is need in keeping infrastructure cost within the estimated boundary and this requires sound strategies, good practices, and careful judgement (Memon *et al*, 2014).

Based on the aforementioned studies, there is scanty study on evaluation of material and labour cost effect on infrastructure (building) project delivery in Akwa Ibom state, Nigeria. Thus, considering the time from of year 2019 - 2024, this study seeks to assess the effect of material and labour cost on infrastructure (building) project delivery in Akwa Ibom State, Nigeria, with a view to enhancing material and labour cost of building construction project delivery, using these objectives: to identify the factors affecting material and labour cost on infrastructure construction project delivery; to assess the extent of material and labour cost effect on infrastructure (building) construction project delivery; and proffer mitigative measures in reducing delay in building construction project delivery in in Akwa Ibom State, Nigeria.

## Literature Review

### The Concept of Building Material in Construction Project

Construction infrastructure materials comprise of sand chippings/stone, wood, nails, clay, plywood, doors, reinforcement, cement, sharp sand, blocks, soft sand etc. Building and construction are the ore upon which infrastructural development of any nation rest. How much we build is a function of building material available and the quantity of it available. Moreover, the durability and quality of a building also depend on material and its quality. However, the quality and quantity of material used are functions of cost of building materials (Njoku, 2007). Cost of building materials refers to the money cost of each building materials or cost of acquiring the materials and labour cost.

One obvious challenge militating against the ability of the building industry in Nigeria from delivering quality and affordable housings and buildings is costs of building materials (Mekson, 2008). People find it difficult building houses because of cost of materials. The problem has become enigma in the building industry. In the past one or two proactive measure has been taken to address the escalating and uncontrollable rise in the cost of building materials. It was for these reasons the Nigeria Building and Road Research Institute (NBRRI) was established in 1978. The institute was mandated to workout alternative source(s) of building materials that will be cost effective and serve as a perfect substitute to the escalating cost of building materials (Saba, 2018). It is important to note that NBRRI mandate was on how to develop quality and suitable building materials using mineral deposits and agro-industrial waste found in Nigeria at little or no cost. There are reasons why so much concern is expressed in this research concerning the ever-increasing cost of building materials especially in Akwa Ibom State.

Far be it from exaggeration, there are number of abandoned building projects. According to Aluko (2000), the high cost of building material has caused more than proportionate increase in rent passed on to would be tenants in the case of rentable building. Aluko asserts that on average cost of building material increases at the rate of 133.33% annually in Nigeria far back 2000, as 2021, the price rose to 620% using selling price per bag of cement in 1999(N500) and N3600 in 2021as indicators. Presently, the price has risen to 1800% using selling price of 1999(N500) and N9000 in 2024 as indicators respectfully. Similarly, Achuenu & Ujene (2006) observed that price of building material is not uniform across Nigeria. They observed that cost of building material is relatively higher in both south East and South-South of Nigeria despite the huge mineral resources present in the region. They attributed this to nonexistence of manufacturing companies in the region to cover the mineral resources to finished goods. The development poses great threat to people aspiring to own their own houses (Anosike, 2009).

### 2.2 Factors Affecting Cost of Building Materials

Building material is an invaluable input in the development of projects and in the delivery of construction projects, Jagboro & Owoeye (2004), while Idoro & Jolaiya(2010) observed that cost of building material account for between 50% to 65% of any project cost and control over 70% of the project schedule. According to Ogunsanmi, *et al,* (2004) if government fail to make proactive steps in addressing the increasing cost of building materials, the situation may result into acute shortage of housing for both low- and middle-income earners if not checked can degenerate into the low- and middle-income families being priced out of home ownership which the economy is suffering today.

The cost of building material is affected by a number of factors such as: the demand and supply of the materials; the quality; quantity; time; place, and buyers and sellers during construction production; other factors are exchanging rate of the naira to other major currencies; improper material handling at the construction site, dwindling economy and poor government policy **(**Nkeriuka *et al,* 2020). The incessant increase in the cost of building materials makes it difficult in maintaining stable cost estimate, which affects both the building clients and project contractors. The implication of fluctuation in construction cost is overruns in cost. Most times

contractors quote prices that are completely unrealistic due to fluctuation in price (Ahmed *et al*, 2008). Project cost overrun often results into abandon project or project incompletion (Jagboro & Owoeye, 2004).

Poor quality of workmanship results that quite a number of building professional and scholars affirmed that the output of quality building and structures are good evidences that construction industry is developed (Lan, Chan, Wrong 2007). According to construction industry developing boarding (2011) the quality of workmanship is assessed according to the lay down requirement of relevant standard in the construction industry. Oladipo & Oni (2012) observed that continuous increase in the cost of building material account for the increasing cases of building collapse reported in some states, contractor resort to the use of substandard materials in a bid to avoid argument and loss of the job from the owner of the building. Low volume of construction output, the two major studies affirmed that Nigeria record low level of construction output compare to number of developed countries Fagbenie *et al*, (2004). Windapo *et al,* (2012) blamed it on rapid increase in cost of building materials which has led to a number of middle- and low-income earners being priced out of the market for homes. In the same vein Anosike (2009) asserted that Nigeria has more than 17million housing deficit far back 2004. Unemployment, the rate of employment is affected. The construction industry's workforce is extremely diverse and includes different types of individuals working within construction such as unskilled workers, skilled workers, craft, managerial roles, and administrative workers. According to research, maintaining and attracting the right people within the construction industry is a priority due to the scarcity of both skilled people and experienced managers. Ayodele & Alabi (2011) found that inflation in the costs of building material is killing the industry.

**Concept of Labour Cost in Construction Projects**

Labour and manpower stand as important assets during execution in any construction project. The construction industry is regarded as a labor-intensive sector because of its dependency on labour for execution of most projects (Azis *et al*., 2013). Without workmen especially in the developing nations, a project can become abandoned and the contractor will need to terminate the contract. Construction sector`s level of manpower ranges from highly skilled professional to unskilled labour. The trade specializations in construction include but are not limited to Masonry, Carpentry, Tiling, Steel Work, Painting, Electrical, and Plumbing. The labour force can be broadly categorized into two, namely: skilled labour or craftsmen and unskilled labour. Skilled labour ranges from apprentices to trades foremen or supervisors while unskilled labour on the other hand is a category of workers that require no special skill and is defined as any way of making a living with little or no degree of security of income and employment. Labour requires the exertion of body and mind or both to achieve a given task. Labour plays a coordinating role of combining other production inputs such as materials, plant, equipment and finance in order to produce a desirable product. The supply of labour is not fixed but also relatively varies from one location to another.

The availability of labour seems to be higher in the rural areas compare to towns and cities where demands for their services are on the increase. They reside mostly in the rural areas due to financial constraint in coping with daily demands in the cities. They operate according to the traditional economic model of migration that "people migrate to the city for jobs and higher income, considering monetary and psychic costs" (Rudzitis, 1991). They are mostly known for their usual rural-urban migration from time to time seeking for greener pasture which also contributes to socioeconomic growth of a nation. Rural-urban migration has been referred to as the main driver of urban growth in the past few decades (Sun and Nor, 2015) in which construction labour plays a major role.

However, labour can be problematic to control and this can affect the delivery and overall objectives of construction projects (Soham & Rajiv, 2013). It is also worth mentioning that construction operatives are exposed to risks and other variety of health hazards which include: noise, resulting in noise induced hearing

loss (NIHL); skin diseases from close contact with irritant or sensitizing materials; respiratory irritation from dusts, fumes and gases; as well as developing more serious lung diseases related to exposure to asbestos and other fibro genic materials (Smallwood & Ehrlich, 2001). Cases of low productivity and poor performance of labour have been mentioned as some of the common problems affecting construction site workers. The reason for poor performance of labour is occasionally attributed to the complexity and dynamism involved in the construction environment (Raiden *et al*., 2003, Enshassi *et al*., 2009). Other challenges of labour include poor remuneration, lack of incentives and risk. Construction operatives are equally faced with a lot of environmental uncertainties which affect not only their health but also their productivity.

Labour cost can be referred to as the cost incurred by the contractor in the engagement of services of labour in the delivery of construction projects. Labour cost is a major component of production cost apart from cost of materials, plant and equipment, and other expenses as identified by Chitkara (2006). Labour cost can be direct or indirect to a project such as wages, nonwage benefits, recruitment costs, labour fees, insurance, end of services, energy subsidies, use of public services and infrastructure, security and social risks. Study by Ayeni (1987) on causes of differential in labour cost reveal that the percentage of labour costs varies between 20% and 90% of various trades of building projects. Achuenu & Ujene (2006) established that the average proportions of labour costs vary between 23% and 58% in both public and private projects in Nigeria. The study by Adu & Lamptey-puddicombe (2015) which focuses on public procurement projects in Nigeria reveals that the proportion of labour cost in production varies from 20 to 35%. Similarly, the results of the survey undertaken by Construction Industry Development Board (CIDB) (2015) on factors that impact on the productivity of construction workers revealed that labour cost constitutes wages of 77% and transport of 70%. Labour costs are mostly expressed as wages and salary of construction labour and stands as motivating factors for workers. Job satisfaction is an important tool for employee motivation and retention in any organisation including the construction industry. According to Diaz-Serrano & Cabral (2005), job satisfaction can be described is a strong predictor of overall wellbeing of an individual.

Labour costs in the construction industry are susceptible to many factors which are either internal or external. Basically, factors affecting labour cost are supposedly concerned with the demand and supply of different types of labour services and the operations of different kinds of labour market. Labour market is very significant in the determination of cost of labour operatives. Labour market is viewed as a special market which cannot be analyzed in the same way as the exchange of ordinary commodities (Omotola & Anigbogu, 2004). Increase in demand for labour in other sectors has resulted in shortage of skilled labour in the construction industry; consequently, this has contributed enormously to the problem of increase in labour cost. Due to shortage in labour supply many construction projects were delayed or not able to meet client`s need (Assaf and Al-hejji, 2006). Erkelens & Egmond (2007) identify the major causes of shortage of skilled labour which include: low motivation, varying working conditions, poor public perception that construction artisanship are the preserve of those who cannot cope with the rigor of academic work, and poor government support. Offei Nyako *et al*, (2014) however blame the scarcity of skilled labour on the failure or inability to handle modern technology which forces them out of the market while the few who are still in the system are expensive to hire. Project location has also been noted for its clear influence on project cost and completion time due to mobility of project workers and materials to the site (Adebiyi, *et al*., 2015).

The fact that work situation of construction workers is characterized by uncertainties, both in duration of each job and the number of jobs they can obtain each year (Omotola & Anigbogu, 2004) subjects labour cost to a lot of variation. The usual practice in the industry is to hire labour at commencement of a new project and disband them immediately the work is completed. This one-off nature of the construction industry has been suggested as one of the reasons for the non-participation of construction workers in any trade unionism (Fagbenle *et al*., 2011). This in a way affects their salaries or wages even productivity in work place because

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this situation is disincentive. Some negative factors or incidences are found to reduce the performance and effectiveness of labour (Fagbenle *et al*., 2011). For instance, factors such as age of worker, transportation cost, distance from work, location, time of the year, familiarity with the job, volume of work, skill acquired standard of living, economic climate, taxation, social security, training programme and health services are common factors responsible for high cost of construction labour. Effects of labour cost Increase on construction project delivery are not much different from that of material; however, they are summarized thus: delayed project completion: Increased labour costs can lead to reduced profitability, causing contractors to slow down or halt work. Budget overruns: - Labour cost increases can exceed allocated budgets, potentially resulting in cost overruns. Reduced quality: - To mitigate increased labour costs, contractors might compromise on quality, affecting the structure's integrity. Increased risk: - financial risks may arise from labour disputes, strikes, or project abandonment. *Supply Chain Disruptions*: Labour shortages or increased costs can disrupt supply chain.

**Research Methodology**

Survey research involved the use of standardized questionnaires to collect data from the respondent on an ordinal scale. The study adopted a total enumeration procedure with a population size of 43 professionals comprising quantity surveyors, builders, consultants who have been involved in the execution of building construction projects in the study region. The first part of the questionnaire captured bio-data of the respondents. The second part considered factors affecting material and labour cost performance of building project delivery. Five-point liket scale rating of 1-5 were assigned to the options of very low, low, moderate, high and very high to obtain the level of the respondent's ratings of the variables. The questionnaire was validated with an internal consistency reliability test to measure the crombach's alpha coefficient ranges from 0.860 -0.896 among the effectors influencing the material and labour cost performance and assessing the extent of material and labour cost effect on infrastructure (building) construction project delivery.

Data analysis relative importance index (RII) was employed. In data analysis, RII is a statistical method used to evaluate the relative importance of multiple variables in predicting a dependent variable. The RII is to: identify the most influential variables, quantify the relative importance of each variable simplify complex models by eliminating non-essential variables. Formula:

RII = $(\beta * \sigma) / \Sigma(\beta * \sigma)$ RII value ranges from 0 to 1,

*Where:* -RII = Relative Importance Index

- $\beta$ = Standardized regression coefficient
- $\sigma$ = Standard deviation of the independent variable
- $\Sigma$ = Summation of the products of $\beta$ and $\sigma$ for all independent variables.

Mean score (MS) was employed for objective three. The mean score, also known as the arithmetic mean, is a statistical measure that represents the central tendency of a dataset. The formula for calculating the mean score is: $\bar{x} = (\Sigma x) / n$

*Where:*

- $\bar{x}$ = Mean score
- $\Sigma x$ = Sum of all values in the dataset
- n = Number of values in the dataset

MS is used to measure the level of significance of variables. The cut-off points of the MS computed were determined by summing the nominal values and dividing it by the total number of scaling items: (1+ 2+ 3+4 +5)/5 = 3. Thus, the events that have a mean greater than 3.0 and above remain significant; those events equal 3.0 are moderately significant, and less significant are those events below 3.0. Ujene (2014); Ekanem (2019)

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adopted this approach. The expectation that the use of 3.0 as a reference point can adequately cover only essential variables in terms of the substantial effect of delay on cost performance in material and labour cost effect on building construction project delivery.

## Result and Discussions of Findings

### 4.0 Results

Sixty-eight (68) copies of the structured questionnaire were purposively administered to the professionals in the study area. Out of which only 43 copies representing 63.24% were retrieved and were suitable for the analysis, using descriptive tools. The academic qualification of the respondents revealed 57.14% at HND level while 46.45% at M.Sc/MPH portraying that about 79.11% the respondents are literate to understand the questions or the explanations given in the course of completing the questionnaires and this assured confidence in the quality of responses. The professional qualification indicated reliability of the respondent with 85.67%. Working experience of 76.33% ranging between 5 - 25 years of experience, thus, possess their considerable working experience in building construction projects. Moreover, the respondent's distribution at substantive strategies of the projects reveals that, respondents served in one capacity or the other in the execution of building construction projects in the study area; hence their managerial experiences were regarded to be of value, appropriate and suitable for the study.

### Factors Affecting Material Cost of Building Construction Project Delivery

In order to explore the factors affecting cost of building material and labour, some factors based on the existing literature were listed and these factors either affect cost of building materials and labour positively or negatively. With regard to the research problem the negative impact of these variables was deemed to be assessed. Therefore, the respondents were asked to rate based on their perceptions the extent to which each factor have impacted on the escalating cost of building material and labour between the period of 2019-2024. RII was used to analyze these variables based on the response of the respondents. The results are presented in Table 1. and Table 2.

**Table 1: Factors Affecting Material Cost of Building Construction Project Delivery**

| Factors | N | Sum | RII | Ranked |
|---|---|---|---|---|
| Non availability of material | 43 | 204.00 | 0.949 | 1st |
| Legislation/government policies | 43 | 175.00 | 0.814 | 2nd |
| Seasonality | 43 | 173.00 | 0.805 | 3rd |
| Transportation cost | 43 | 171.00 | 0.795 | 4th |
| Importation cost | 43 | 170.00 | 0.791 | 5th |
| Economic factors (like exchange rate and so on) | 43 | 159.00 | 0.740 | 6th |
| Market condition | 43 | 157.00 | 0.730 | 7th |
| Insurance cost | 43 | 155.00 | 0.721 | 8th |
| Price variations between suppliers | 43 | 153.00 | 0.712 | 9th |
| Quantity and volume of purchase | 43 | 152.00 | 0.707 | 10th |
| Storage costs | 43 | 149.00 | 0.693 | 11th |
| Location of site | 43 | 148.00 | 0.688 | 12th |
| Government Regulatory policy | 43 | 144.00 | 0.670 | 13th |
| Specification changes | 43 | 143.00 | 0.665 | 14th |
| Wastage and spoilage | 43 | 139.00 | 0.647 | 15th |
| Logistics and packaging | 43 | 139.00 | 0.647 | 15th |

| | | | | |
|---|---|---|---|---|
| Handling costs | 43 | 135.00 | 0.628 | 17th |
| Contractor markups | 43 | 135.00 | 0.628 | 17th |
| Loading and unloading cost | 43 | 131.00 | 0.609 | 19th |
| Type and quality of materials | 43 | 120.00 | 0.558 | 20th |

The result of the findings analyzed and presented in Table 1 using RII portrays that, non-availability of material which relate with market supply and demand stands as the most significant factor impacting on the escalating cost of building material out of 20 factors taken into consideration. legislation/government policy ranked second most significant factor, followed by transportation cost, importation cost, economic factors, market condition, insurance cost, price variation between suppliers, quantity and volume of purchase. These emerged the first ten most significant factors affecting the escalating cost of building materials. Meanwhile, the least five significant factors affecting the escalating cost of building materials are; type and quality of material, loading and unloading cost, contractors' markup, handling cost, logistics and packaging as shown in Table 1.

Table 2 contains a list of 22 factors affecting labour cost of building construction identified based on the existing literature. The negative impact of factors escalating labour cost was achieved using RII, the analysis revealed unionized labour cost, cost of living adjustments, availability of labour, seasonality and weather condition, wages and hourly rates, project scheduling. While payroll taxes and conditions, lack of personnel protective equipment and recruitment cost. The comprehension is that, the ranking of these factors influential to the perpetual increase in the cost of material and labour revealed the level of inadequacies associated with these factors.

**Table 2 Factors Affecting Labour Cost of Building Construction Project Delivery**

| **Labour** | **Sum** | **RII** | **Ranked** |
|---|---|---|---|
| Unionized labour cost | 175.00 | 0.814 | 1st |
| Cost of living adjustment | 170.00 | 0.781 | 2nd |
| Availability of labour | 168.00 | 0.781 | **3rd** |
| Seasonality and weather condition | 153.00 | 0.712 | 4th |
| Wages and hourly rates | 153.00 | 0.712 | 4th |
| Project scheduling | 146.00 | 0.679 | 6th |
| Regional wage variations | 145.00 | 0.674 | 7th |
| Overhead costs | 144.00 | 0.670 | 8th |
| Labour productivity | 144.00 | 0.670 | 8th |
| Project length | 144.00 | 0.670 | 8th |
| Subcontractor markups | 142.00 | 0.665 | 11th |
| Contractor fees | 141.00 | 0.656 | 12th |
| Contractual terms and condition | 141.00 | 0.651 | 12th |
| Idle time | 140.00 | 0.651 | 14th |
| Training and certification cost | 140.00 | 0.651 | 14th |
| Employee benefits (health insurance, retirement etc) | 139.00 | 0.647 | 16th |
| Overtime and extra hours | 135.00 | 0.647 | 17th |
| Safety training | 132.00 | 0.609 | 18th |
| Payroll taxes and conditions | 131.00 | 0.609 | 19th |
| Lack of personnel protective equipment | 130.00 | 0.605 | 19th |
| Recruitment cost | 127.00 | 0.591 | 21st |

**Effect of Material and Labour cost on Building Construction Project Delivery**

Here, various parameters used in measuring project delivery success, mainly delivery cost, delivery time, and delivery quality in addition to other measures or parameters identified based on the existing literature were being considered and listed. The respondents were asked to rate based on their perceptions, the extent to which the increasing cost of building material and labour faced in the building industry have negatively impacted on building project delivery. These project delivery success measures and outcomes are listed in Table 3.

Table 3: **Project Success Measures and Outcome**

| Project success measure | Sum | RII | Rated |
|---|---|---|---|
| Value of investment | 181 | 0.842 | 1st |
| Timely delivery | 180 | 0.837 | 2nd |
| Delivery quality | 180 | 0.837 | 2nd |
| Creation of new job opportunities | 178 | 0.828 | 4th |
| Professionals' satisfaction | 178 | 0.828 | 4th |
| Delivery within budgeted cost | 177 | 0.823 | 6th |
| Contractor's satisfaction | 176 | 0.819 | 7th |
| Job referral | 172 | 0.800 | 8th |
| Consultants' satisfaction | 172 | 0.800 | 8th |
| Attractiveness of building industry | 171 | 0.795 | 10th |
| Statutory compliance | 169 | 0.786 | 11th |
| Payment remission | 166 | 0.772 | 12th |
| Work valuation processes | 166 | 0.772 | 12th |
| Variation management/rectification | 161 | 0.749 | 14th |
| Certification and documentation | 160 | 0.744 | 15th |
| Delivery relationship | 160 | 0.744 | 15th |
| Clients' satisfaction | 160 | 0.744 | 15th |
| Professionals' confidence and integrity | 159 | 0.740 | 18th |
| Final account processes | 156 | 0.726 | 19th |

Out of 19 parameters that were considered to measure the effects of the perpetual increase in cost of material and labour on building construction project delivery, the analysis was carried out using RII. The result revealed the first ten project success parameters to include: value of investment, timely delivery, quality delivery, creation of new job opportunities, professional satisfaction, delivery within budgeted cost, contractor satisfaction, job referral, consultant satisfaction, attractiveness of building industry. The analysis on the other hand, reveals that the perpetual increase in the cost of building material and labour have the highest negative influence on value of investments, meaning that it has greatest impact on securing a good value for investment made by clients on building construction. The second highest negative impact of this escalating cost of building construction material and labour is revealed to be on delivery time and delivery quality of building construction projects. Project success measure in regard to creation of new job opportunities for construction stakeholders is ranked as the fourth being affected. Followed by professional satisfaction, delivery cost, contractor's satisfaction, job referral, consultant satisfaction, and attractiveness of building industry. The result of the analysis also shows that the perpetual increase in the cost of construction material and labour

faced in the construction industry has a lesser negative impact on final account process, followed by professional confidence and integrity, client satisfaction, delivery relationship, certification and documentation.

**Mitigative Measures of Material Costs on Building Construction Project Delivery**

Mean score (MS) was used to rank the level of adoption of the various mitigative measures of material and labour cost on building construction project delivery. The mitigative measures proffered by various authors as contained in the existing literature to the effect of material and labour cost were listed and analysed and the results is presented in Table 4.

**Table 4: Mitigative Measures of Material Cost on Building Construction Project Delivery**

| Material cost Mitigative Measures | Max | Sum | Mean | Rating |
|---|---|---|---|---|
| Buyer/suppler negotiation | 5.00 | 178.00 | 4.1395 | 1st |
| Fuel subsidization | 5.00 | 161.00 | 3.7442 | 2nd |
| Technology and Innovation | 5.00 | 160.00 | 3.7209 | 3rd |
| Bulk purchase | 5.00 | 160.00 | 3.7209 | 3rd |
| Detailed planning and design | 5.00 | 159.00 | 3.6977 | 5th |
| Waste reduction (e.g, recycling and reuse) | 5.00 | 158.00 | 3.6744 | 6th |
| Quality control | 5.00 | 156.00 | 3.6279 | 7th |
| Local material production and sourcing | 5.00 | 151.00 | 3.5116 | 8th |
| Efficient inventory management | 5.00 | 145.00 | 3.3721 | 9th |
| Timely delivery of project | 5.00 | 136.00 | 3.1628 | 10th |
| Adequate cost control | 5.00 | 133.00 | 2.9300 | 11th |
| Material insurance | 5.00 | 121.00 | 2.8140 | 12th |
| Government economic policies (e.g tax free policy) | 5.00 | 119.00 | 2.7674 | 13th |

Out of 13 mitigative measures considered, 10 emerged the highest level of adoption, while three have low level of adoption. Buyer/supplier negotiation has the highest level of adoption, followed by fuel subsidization, technology and innovation, bulk purchase, detailed planning and design, waste reduction, quality control, efficient inventory management, material substitution, and timely delivery of projects as shown in Table 4. The result however means that, buyer/supplier negotiation, fuel subsidy by government for economic purpose are the two main material cost mitigative measures which could reduce high level of material and labour cost of building project delivery in the study area. Meanwhile, the last three include: adequate cost control, material insurance and government economic policies for instance tax free policy. This result only reflects these low significant measures could emerge the most significant measures in other location of study.

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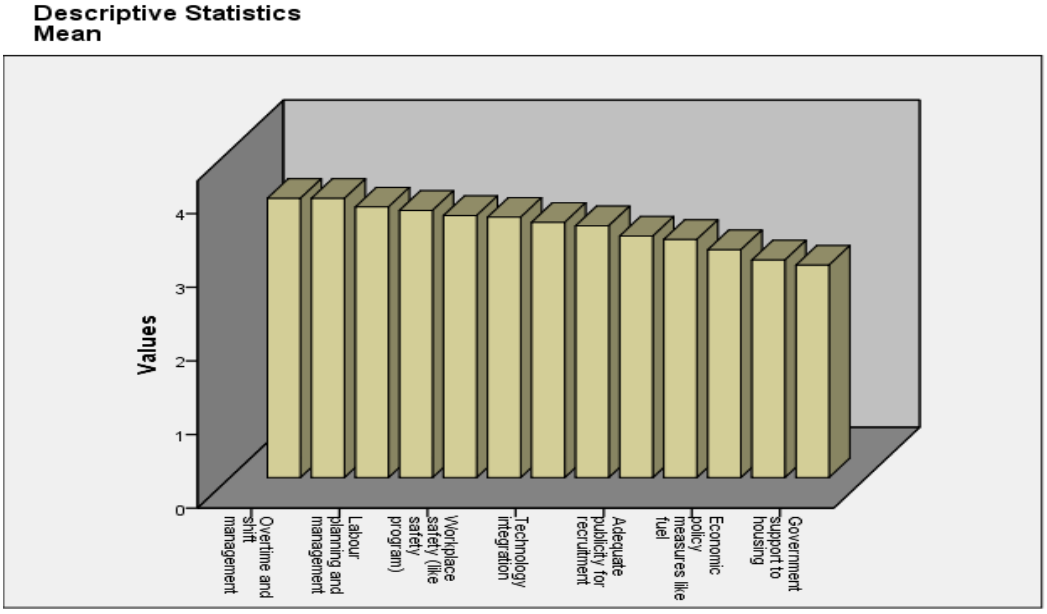



Figure 1: Bar- Chat: **Mitigative Measures of Labour Costs on Building Construction Project Delivery**

**Mitigative Measures of Labour Costs on Building Construction Project Delivery**

As presented in Figure 1 Bar-chart, the result of the analysis reveals 13 mitigative measures to the effect of labour costs on building construction project delivery , identified from the existing literature and encompassed in the questionnaire administered to various respondents to explore the mitigative measures to be adapted. On ranking, over time and shift management, labour planning and management, cost tracking and control, workplace safety, productivity improvement, technology integration, effective project scheduling emerging the most significant mitigative measures that may help minimise nagative on labour cost on building project ddlivery. while adequate publicity for recruitment, competitive tendering process remain the least measures in reducing the effect of labour cost on building project delivery in the study area which may be adopted as significant measure in other area of study.

**Summary, Conclusion and Recommendation**

The research was designed to assess the effect of material and labour cost on infrastructure (building) construction project delivery in Akwa Ibom state, Nigeria, with regard to the perpetual increase observed in the cost of building material and labour in the building industry. This was achieved through the objectives of this research, the study used survey method as a research design suitable for the study. A sample size of 43 was drawn. The questionnaire was the instrument used for data collection. From the result of the data analysis the following findings were made with regard to the objectives of the research:

Availability of materials, legislation/government policies are the first two significant factors affecting material costs negatively out of 20 other factors considered in the study. With regard to the severity of the problem on building project delivery in Akwa Ibom state, value of investment made by client, project delivery time and delivery quality are the first three project delivery success measures mostly affected by the problem out of 19 others considered in the study.

Buyers/supplier negotiation, fuel subsidization, technology and innovation are the first three most adopted mitigative measures in practice. Whereas adequate cost control, Material insurance, Government economic policies measures are the main neglected measures in practice with lowest level of adoption out of 13 other

measures considered in the study. Meanwhile, overtime and shift management, labour agreement and contracts are the most adopted labour cost mitigative measures. Whereas, government support on housing/accommodation, economic policies measures like fuel subsidies are the main two labour established mitigative measures with lowest level of adoption in practice.

In conclusion, even though there are many cost variables related to construction costs, the material and labour costs remain significance project cost variables that influence the delivery of building construction projects. Based on the findings of this study, it is concluded that, the general fuel subsidization of the country and government policy are the two main most significant factors that generally affect the cost of material and labour among other factors, and the greatest severity is on project delivery time and quality among other project delivery success measures and outcomes. From the findings, the following recommendations were made: The construction stakeholders should allocate their efforts appropriately in addressing the issue of the escalating cost of building material and labour base on schedule of priority and hierarchy of significance, meaning that economic-related issues should be prioritized. Inadequacies associated with availability of material, which is revealed as the most significant factor impacting on the escalating cost of building material should be accorded priority and addressed adequately. Since availability of material relates with market demand and supply force, quantity surveyors and other construction consultants should diversify into manufacturing and importation of building material to ensure adequate availability of material and create a competitive market condition that will in turn reduce the market price of building material.

The Nigerian Institute of Quantity Surveyors (NIQS) in particular, as a professional body of cost consultants should go extra mile in her efforts and also diversify into the manufacturing of building material in Nigeria at low cost, to promote the availability of building materials in Nigeria. If building materials are also manufactured by the body especially with the logo of NIQS used for the branding as her own economic strategy to address the problem, it will encourage even the government and other construction professional bodies, and in turn promote the integrity of quantity surveying profession, create more public awareness to the profession and secure the marketability of its members. Economic policies that will reduce inflation rates, improve exchange rate of Naira, regularize tax regimes and market condition should be made and adopted by government.

Government should put more effort to diversify from oil-based economy to other productive engagements like manufacturing of finished goods and raw materials to boom the economy and also give more support to housing/accommodation. Considering the severity of this problem on value of investment, delivery time and quality revealed in the study, prospective building owners should go for affordable projects they can finance effectively till delivery at a time to avoid the risk of being pushed by the general economic climate to the use of substandard materials for their building projects, or the risk to abandon their projects due to inadequate fund to cope with the problem. Generally, economic mitigative strategies proffered in this study should be accorded priority by construction stakeholders without neglecting to adequately adopt other mitigative measures such as detailed planning and design, bulk purchase, buyer/supplier negotiation, material substitution, efficient inventory management, effective project scheduling, labour productivity improvements, labour planning and management over time and shift management, cost tracking and control, and many others.

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