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THE IMPACT OF MATERIAL MANAGEMENT PRACTICES ON PERFORMANCE OF BUILDING CONSTRUCTION SITES IN SELECTED TERTIARY INSTITUTIONS IN CROSS RIVER STATE, NIGERIA

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ABSTRACT
This work is titled the impact of material management practice on building construction sites in tertiary institutions in Cross River State. The aim of this study is to evaluate the impact of material management practices on building construction sites in selected tertiary institutions in Cross River State with a view to enhancing effective and efficient management of materials in building construction projects. The objectives are; to identify the causes of ineffective material management process to the construction project delivery; to evaluate the impact of material mismanagement in the building construction sites. The study adopted stratified random sampling techniques, 200 copies of questionnaire were given to respondents drawn from a population of 432. This study adopted survey research design using questionnaire as instrument for data collection and bill of quantities. The findings of the study reveal that the causes of ineffective material management process to the construction project delivery in tertiary institution in cross river state includes; incompetency of the project manager; design error; loss of fiancé; ineffective construction manager; poor planning; lack of pre and post investigation under design and improper supervision; varied labour equipment; lack of legal penalty to offenders and rush work. Finally, the study indicates that cost has a positive effect with construction delivery in tertiary institutions in Cross River state. Time has a positive relationship with construction delivery in tertiary institutions in Cross River state. Quality has positive relationship with the construction delivery in tertiary institutions in Cross River state. This implies that a unit increase in cost, time and quality will lead to increase in construction delivery in tertiary institutions in Cross River state. The study recommends that each management techniques has its own peculiarity in term of the pretender and post tender activities and processes, division of risks between client and contractors, and the effectiveness of project monitoring and control.
Keywords: Material Management, Building Construction, Tertiary Institutions, Project Delivery, Cross River State

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INTRODUCTION

Construction material constitutes a major cost component in any construction project. The cost of materials may be 50% to 70% of the total construction cost depending on type of projects (Patil and Pataskar, 2013, Gulghane and Khandve, 2015). Several researchers provided different definitions for material management, therefore different definitions can be found in different references but Kanimozhi and Latha (2014), define materials management as a process for planning, executing and controlling field and office activities in construction. Zeb, Malik, Nauman, Hanif, and Amin (2015) also define material management as a procedure for executing, planning, and controlling site activities in the construction project(s).

According to Ramus and Birchallin (2020), the causes of losses to contractors may arise from any one of the following: inefficient deployment of resources; excessive wastage and theft of materials; plant being allowed to stand idle or under-utilized; adverse weather or working conditions; and under-pricing of tender documents by assumptions in regard to labour times, types and sizes of plant which do not equate with the realities of the construction work. The success of a project is judged by meeting the criteria of cost, time, safety, resource allocation, and quality as determined by the owner (Viator, 2020). The purpose of construction project management is to achieve goals and objectives through the planned expenditure of resources that meet the project's quality, cost, time, scope, and safety requirements**.** The construction manager must control, deflect, or mitigate the effects of any occurrence or situation that could affect project success. The major tasks in construction management include planning, organizing, scheduling, implementing, managing, monitoring, controlling, and tracking construction projects. It is essential therefore, for construction activities to be accomplished successfully in an effective and efficient way. This requires various strategic and management capabilities such as material management. Material management according to Oyeoku (2011) is defined as a process which involves grouping the business functions relating to the inflow and interplant movement of materials under a head who is in a position to coordinate and correlate individual departmental decisions in a manner which results in the most efficient allocation of organizations resources. Unfortunately, material management in construction process has recently been neglected and this has undoubtedly led to huge amount of material waste while executing construction projects. Obiegbu (2012) lamented that material wastage on construction site has become a canker worm in Nigerian construction industry. This problem according to Obiegbu (2012) has negatively affected the performance of many projects in Nigeria.

In Nigeria, many have expressed concern over poor materials management and its impacts on the execution of construction projects. Onukwube (2010) lamented that poor material management can result in substantial, but avoidable financial loss during construction. It is pertinent to mention that there are grave consequences that could result from poor materials management, which could result in insufficiency of material for production on site, forcing contractors to produce non-conforming products.

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On the basis of the above, this research is an attempt to explain the impact of material management issues on building projects in University of Calabar (UNICAR), Federal College of Education Obudu and Cross River State University of Technology (CRUTECH) and College of Education, Akampka.

STATEMENT OF THE PROBLEM

It is however fast becoming a norm in construction sites that the allowable waste is far exceeded by the actual waste on construction sites. Theft, vandalism, high interest rates, and improper planning make contractors in the construction industry to fall short of their anticipated profit margins in their projects.

There is no established construction material management system in tertiary institutions in Obudu Cross River State (Okanume, 2021). The materials management practices by the contractors in the institution are performed on a fragmented basis with unstructured communication and no clearly established responsibilities between the parties involved. This fragmentation creates gaps in information flow, which affects the decision making process and lead to delays in material ordering and receiving, among other problems (Thomas and Okanume, 2021).

Current manual materials management and control procedures are unsatisfactory as they are labour intensive, inaccurate, and error prone. The implication leads to waste and surplus of materials, delays, decrease in productivity and lack of up-to-date and real-time information (Navon, 2021).

Considering the construction firms in tertiary institutions in Cross River State, it appears that the managers or perhaps the contractors lack competencies required of contemporary construction firms for effective material management thereby resulting in huge amount of material waste (Viator, 2020). The resultant effect of the poor material management in the construction process by these construction firms leads to poor performance in terms of their service delivery. No research has been conducted to investigate the materials management issues on building project of contracting companies in tertiary institutions in Cross River State. This study, has become pertinent to explore the impact of material mismanagement on construction sites by these firms for objective remedial actions.

Aim and Objectives

The aim of this study is to evaluate the impact of material management practices on building construction sites for improving the performance of building projects executed in selected tertiary institutions in Cross River State.

The objectives of the study are:

1. To evaluate the impact of material mismanagement in the building construction sites in selected tertiary institution in Cross River State.
2. To identify the causes of ineffective material management process to the construction project site in selected tertiary institution in Cross River State.

1.4 Research Question

The following research questions will guide the study:

1. What impact does material mismanagement have on building construction sites in selected tertiary institution in Cross River State?

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2. What are the causes of ineffective material management process to the construction project delivery in selected tertiary institution in Cross River State?

STATEMENT OF HYPOTHESIS

H_0: There is no significant relationship between factors affecting material management and effective building construction project delivery.

LITERATURE REVIEW Conceptual Literature Concept of Construction Industry

Construction industry plays an important role in socio economic development of any nation. The activities of the construction industry have a lot of significance to the achievement of national socio-economic development goals of providing infrastructure, sanctuary and employment. This also includes hospitals, schools, townships, offices, houses and other buildings; urban infrastructure (including water supply, sewerage, drainage); highways, roads, ports, railways, airports; power systems; irrigation and agriculture systems; telecommunications and so on (Kasimu, 2015; Uma and Eboh, 2013). The construction industry holds an immense potential for stimulating growth, boosting project exports and generating employment. The domestic construction segment happens to be one of the fastest growing segments, with an impressive average growth of 7-8 per cent per annum (Ofori, 2010).

The foundation of a higher growth rate rests on a sound and efficient infrastructural development which makes the construction segment a key sector. The rapid expansion of infrastructure by both government and the private sector has triggered off construction activities and fuelled demand in many key sectors like cement, steel, paints and chemicals, glass, timber and earth moving equipment and machinery (Jacobsson and Wilson, 2012). The construction sector is a crucial industry having strong backward and forward growth linkages. It deals with all economic activities directed to the creation, renovation, repair or extension of fixed assets in the form of buildings, land improvements of an engineering nature. Besides, the construction industry generates substantial employment and provides a growth impetus to other sectors through backward and forward linkages.

Building Construction Project

The Building construction industry contributes significantly in terms of scale and share in the development process for both developed and developing countries. The construction products provide the necessary public infrastructure and private physical structures for many productive activities such as services, commerce, utilities and other industries. The industry is not only important for its finished product, but it also employs a large number of people (directly and indirectly) and therefore has an effect on the economy of a country/region during the actual construction process (Aluko, 2017).

The National Bureau of Statistics (NBS) put Nigeria's post-re-basing contributions of the construction sector to Gross Domestic Product at N5.7 billion in three years. NBS, in its summary report of 2010, 2011 and 2012 fiscal years on the Construction industry and disclosed that in 2010, the sector contributed N1.570 billion, a value which leaped by 21.30 per cent to reach N1.905 billion in 2011.The industry's contributions closed at N2.188 billion in 2012, bringing the total contribution of the sector to GDP to N5.7 billion and 2017 report

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shows that the sector recorded a 13 percent growth. Construction activities captured in the report include construction of buildings, roads, railways as well as civil engineering projects (Fagbeni, 2016). Others are construction of utility projects, demolitions as well as site preparations, among others. The NBS added that part of the increased contributions of the sector to the nation's GDP, was its ability to capture all economic activities in the sector (Harman, 2017).

Building Material

Building material are materials used for constructing building. It comprises of sand chippings/ stone, wood, nails, clay, ladder, 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, 2017). Cost of building materials refers to the money cost of each building materials or cost of acquiring the materials and labor cost.

One obvious problem militating against the ability of the building industry in Nigeria from delivering quality and affordable housings and buildings is costs of building materials (Mekson, 2018). 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.

Concept of Building Material Management

When managing construction waste, it is important that practices reflect the waste hierarchy with waste prevention and minimization being the top priority followed by reuse and recycling. The primary aim is to prevent waste generation in the first place which minimizes the resources required to complete the job. Preventing waste is financially advantageous because it reduces the amount of materials being purchased and removes the need to transport waste off site. Waste prevention should be considered throughout all stages of the project especially during the design stage (Vaidya, 2009). This stage of the project offers the biggest opportunity to reduce waste by prioritizing waste prevention from the beginning of the project. During the construction phase, waste prevention can be carried out by ensuring that large volumes of materials are not delivered to site and through the use of a just-in-time delivery system. On the site waste can be minimized by careful storage, handling and the setting up of a central cutting station for some trades.

Trigunarsyah, Sofyan and Hendi (2006) identifies the three R's in construction waste management as follows: reuse, involving salvaging construction waste for other uses, recycling, involving transforming waste into new

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products and reincorporating them into the construction process and reduction, which involves preventing or minimizing the generation of waste in the first place. (a) Reduce the first and most important step in cutting the amount of waste is reducing the quantity that is actually produced in the first place. There are a number of ways in which waste can „designed out" just by reviewing how works are designed and installed. By planning work properly at the outset of a project, the amount of materials that end up as waste at the end of it can be greatly reduced (NSCC, 2008). (b) Re-use In today's industry, it is simply no longer justifiable to throw away perfectly good materials. As part of managing waste, builders should consider how to make use of common surplus materials arising from projects such as bricks and timber off-cuts either on the same site or at other sites. Where this is not possible, they should liaise with their suppliers about returning the materials to them.

Root causes of ineffective material management

During the past years, various academics researchers have conducted studies investigating to find out the issues causing ineffective materials management in construction projects. Among these studies were:

A study carried out Zakeri (1996) suggested that transport difficulties, waste, improper handling on site, misuse of specification, lack of proper work plan, inappropriate materials delivery and excessive paperwork all have an immense effect on materials management. Another researcher, Dey (2001) emphasized that the common issues regarding material management are as follows:

1. Receiving materials before they are required which may increase inventory cost and may increase the chance of deterioration in quality;
2. Not receiving materials during the time of requirement causing to decrease motivation as well as productivity
3. Incorrect materials take-off from design and drawing documents;
4. Constant design changes
5. Theft or loss of item
6. Choice of type of contract for specific material procurement
7. Vendor evaluation criteria
8. Piling up of inventory and controlling of the same
9. Management of surplus material.

In another study conducted by Sohrab Donyavi (2009) states the common problems in material management are as follows:

1. Failure to order on time which may cause delay in the projects;
2. Delivery at the wrong time which may interrupt the work schedule;
3. Over ordering;
4. Wrong materials or wrong in direction of materials requiring re-work;
5. Theft of materials from delivery into production;
6. Double handling of materials because of inadequate material

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Moreover, a study conducted Kasim (2008) highlighted that problems could emerge due to human error, especially because some construction firms still rely on manual methods for material management which involves paper based techniques. In addition she states that problematic use of paper based reports for exchanging information relating to materials component with supply chain can result misunderstanding and poor coordination.

THEORETICAL FRAMEWORK

Major discussions in theoretical framework includes: Construction Management theory, lean construction theory which could be used to manage projects in order to achieve successful project delivery and best practice. These theories are discussed in detail in this section.

Construction Management theory:

Theory of construction management (2012), proposed a theory of construction management which identifies the actions which help construction projects and companies to be efficient. It takes on the challenge of creating a precise, tightly defined model of construction management (CM), using five clearly differentiated methods for the delivery of building and construction projects. It is an ambitious and intellectually bold attempt to introduce new thinking into the field. What they don't do is draw on any of the many theories of management or production available. On one hand this seems to be an extreme case of exceptionalism - that construction is different from all other industries - school of thought. In their defense, on the other hand, Radosavljevic and Bennett (2002) argue that construction is different, because it is complex: projects have a number of interacting teams where outcomes in the future depend on the number of involved teams, the quality of relationships between interacting teams and their performance variability. In addition there is also unpredictable interference which may arise from numerous external factors.

In the theory of CM the author's aims are to provide a "rigorous theory" based on a "tool kit of concepts and relationships" that will improve the efficiency and quality of "construction products". The distinction between the conventional approach of CM, where contractors deliver projects, and the idea of companies producing a product is an important element in the thinking behind the theory proposed here. A related aim of the book is therefore to raise the viewpoint of

CM from projects to the companies that manage projects. Following that intention they "identify and define the concepts needed to understand CM".

Empirical Review

Studies have been carried out to show the impact of material management in the delivery of construction projects. For instance, Olatunji and John (2013) carried out a study on materials management and waste minimization on construction sites in Lagos State, Nigeria. The random sampling technique was employed in the selection of respondents for the study. The sampling frame consists of professionals in the building construction industry, namely, Architects, Builders, Engineers, Project Managers, and Quantity Surveyors. A total of seventy-two (72) questionnaires were analyzed for the study, using the descriptive statistics statistical tool. Findings include that the main sources of construction waste are rework/improvement, materials handling and storage, damage to work

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by other trades, transportation, last minute client requirements, weather, equipment, and familiarity with construction technology. Conclusions include that materials wastage impacts on the contractor in the form of increased construction duration and cost, and it jeopardizes the chances of a contractor winning further projects. Therefore, the study recommended that contractors should be conscious of the production of qualify products, plan well laid out sites before commencing work, and employ competent and trustworthy workers for their operations.

Adewuyi and Otali (2013) also carried out a study to evaluate the causes of material waste and strategies for promoting material management by indigenous construction firms in Rivers State. The methods employed to collect data include review of relevant literature and structured questionnaire. The statistical techniques used to analyze the data collected were mean scores, ranking method and Man-Whitney U test. The results of analysis showed that the three most important factors contributing to construction material waste generation on building sites in Rivers State, Nigeria are rework contrary to drawing and specification, design changes and revision and waste from uneconomical shapes respectively. It was also discovered that inappropriate equipment contributed least to waste generation on site and there is little bottle neck in obtaining work permit by contractors in Rivers State, Nigeria. The study revealed that all the 74 factors were considered important by the respondents. The study showed that there is no significant difference between the consultants and contractors perception about the factors affecting construction waste generation on building sites in Rivers State, Nigeria. Poor materials management can also result in substantial, but avoidable costs during construction. This could result in contractor's use of insufficient materials and eventually nonconforming to specification, stemming from inadequate quantities of material usage for production.

The study carried out by Ogunlana*, (*2006) on the inappropriate handling and management of materials on construction sites on the project performance. According to the Ogunlana (2006), there are grave consequences that could result from poor materials management, which could result in insufficiency of material for production on site, forcing contractors to produce nonconforming products. Firstly, the use of insufficient quantities of materials could lead to the partial or entire collapse of a structure. Weak spots on a structure are liable to collapse, because of inadequate strength to withstand both the dead and imposed loads. Secondly, it could lead to lack of patronage of the contractor, implying that the contractor cannot secure contracts, and ultimately result in liquidation. This means that both the contractor and his/ her employees will be non-operational and unemployed. Thirdly, it is a measure of a contractor's competence. A collapsed building, which is attributable to inadequate strength of components of a building, could either be as a result of lack of construction knowledge on the part of the contractor, or the contractor use of less quantity of materials for production. Fourthly, it exposes the level of competence of professionals in the industry at the instance of collapse of building, and that the industry is not safe. It must be understood that the infrastructure and development of a nation largely on the construction industry, and then mainly the building sector thereof. Therefore, it is of paramount importance that materials are well managed on site to minimize wastage and its associated problems.

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In another study, Ngwu, Okolie, and Ezeokonkwo (2015) appraised the Effects of Materials Management on Building Productivity in South East Nigeria. Their study highlighted that the problem of material management is one of the key issues facing the building industry in Nigeria. For Ngwu et al, the activities identified in the supply channel (the sourcing and transmission of purchase orders up to control of material wastages) are considered key to materials management because they primarily affect the economy, effectiveness of material movement, productivity, optimization of profit and reduction of materials cost. The aim of their study was to identify the key areas where material management is deficient so that improvement could be made in order to increase productivity. They carried out a survey in ten organized building sites in the South East states of Nigeria using the site engineers, managers and supervisors were engaged through both focus interviews and site to site fact findings by the researchers. The data collected formed the background of the structured questionnaires for proper analysis and recommendations. Eighty seven out of ninety questionnaires launched to the sites were properly completed and returned. In order to rank the severity of the factors, a mean score index was employed. Results showed that lack of provision of material schedule, material scheduling and poor control of material wastages are the most significant areas of material management improvement.

Research Design

The descriptive survey research design was used for the study. Nworgu (2015) defined the descriptive survey research design as one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group. This design was considered appropriate for this study because the study seeks opinions of the construction professionals on the material management and its possible influence on the performance of building construction companies in selected tertiary institutions in Cross River State, Nigeria.

Population of the Study

According to Nkpa in Omoroguiwa (2010), a population refers to all the elements in a welldefined collection or set of values. Population involves not only people, but also events, animals and objects that make up members of the target group of the study as defined by the aims and objectives of the researcher (Akuezuilo and Agu, 2002). The population of this study consists of 432 construction professionals which include architects, builders, engineers, project managers, and quantity surveyors who are currently working with registered construction companies operating in Federal College of Education Obudu, Cross River State.

Table 4.1 Population Distribution of the Classes of the Respondents

S/N	PROFESSIONALS	CONTRACTORS	CONSULTANTS	POPULATION (CONTRACTOR) (CONSULTANTS)
1	CIVIL ENGRS	60	50	110

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2	MECHANICAL ENGR	5	8	13
3	ELECTRICAL ENGRS	4	6	10
4	ARCHITECTS	87	120	207
5	QUANTITY SURVRS	25	19	44
6	PROJECT MANAGER	0	20	20
7	BUILDER	13	0	13
7	SITE MANAGERS	10	0	10
8	LAND SURVEYORS	5	0	5
	TOTAL			432

Source: Field Survey, 2022

Sampling Technique

The judgmental sampling technique and stratified sampling technique was used to choose the participants who were viewed as the best source of information for this study. Stratified random sampling method enables the researcher to ensure a fair representation of each of the identified segments or strata.

Determination of Sample size and Sampling procedure

According to Ugwu (2004) sampling is the act of selecting and observing only a specified subset of the population unit. The researcher based on the above population will determine the sample size by using the statistical formula pro-pounded by Taro Yamani (1964). That is;

$$N = \frac{n}{1 + N(e)^2}$$ Where n = sample size N = finite population e = level of significance 1 = constant

Then using the formula, to calculate the sample size at 0.05 level of significance will be;

N = 432/1 + 432(0.05)2 = 432/1 + 432(0.0025)

432/1 + 1.08 = 432/2.08 = 208

N = 208

Model Specification

According to Jhingan, (1997) an economic model is an organized set of relationship that describes the functioning of an economic identity under a set of assumptions from which the conclusion or set of conclusions is logically derived.

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The specification of the econometrics model is usually based on economic theory and on any available information relating to the phenomenon being studied (Koutsoyiannis, 1977)

This study shall build a multiple regression model and make use of econometrics procedure in estimating the relationship between my economic variables. The functional form of the model is specified as follows.

PBCP = *f* (DMM, CMM)……..3.1

The econometric form of the model is as follows

$PBCP_t = \beta_o + \beta_1 DMM_t + \beta_2 CMM_t + \mu$…….……3.2

Where,

PBCP= real gross domestic product i.e. (constant price GDP) *f* = functional relationship

DMM = Design mismanagement

CMM = Contractual material mismanagement β_o= Constant term

$\beta_1, \beta_2, \beta_3$ and β_4 = parameter coefficients

μ= Error term

t = Time period

Statistical Test of Significance

These are determined by the statistical theory and aimed at evaluating the statistical reliability of the estimates of the parameters of the model, the most widely used statistical criteria is the square of correlation coefficient (coefficient of determination R^2), t-Test and f-Test of significance.

Test for Goodness of Fit

To determine the proportion of variation in dependent variable that is attributable to variation in explanatory variable. The value of R^2 ranges between 1 and 0 (ie $0 \leq R^2 \leq 1$). It is a non-negative value. The closer the value of R^2 is to 1, the better the fit, otherwise, the worse the fit. **t-Test of Significance**

The student t-ratio will be used to test the individual statistical significance of the regression coefficient. A two tail test is conducted at 5% level of significance and n-k degree of freedom (df). Where n is the number of observation and K is the parameter estimated.

Decision rule

The computed (t*) will be compared with the critical t-value ($t_{0.025}$). If $t^* > t_{0.025}$, the H_o will be rejected and H_1 will be accepted. Otherwise, H_o is accepted and H_1 rejected.

F-Test of Significance

F-test statistic is used to test the overall statistical significance of the independent variables. A one-tail test conducted at 5% level of significance and (V_1/V_2) degrees of freedom. Where; V_1= degree of freedom (df) for the numerator: v_1=k-1.

V_2= degree of freedom (df) for the denominator: v_2=n-k

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Decision Rule (F-test)

The computed f-ratio (F*) value is compared with the critical f-ratio ($F_{0.05}$). If the $F^* > F_{0.05}$ we will reject the null hypothesis and accept the alternative, otherwise, the alternative hypothesis H_1 will be rejected and null hypothesis H_0 be accepted.

Table 4.2 Sample Size allocated to Classes of Respondents

S/N	RESPONDENTS	POPULATION	SAMPLE
1	CIVIL ENGINNERS	110	53
2	MECHANICAL ENGRS	13	6
3	ELECTRICAL ENGINNERS	10	5
4	ARCHITECHS	207	100
5	QUANTITY SURVEYORS	44	21
6	PROJECT MANAGERS	20	10
7	BUILDER	13	6
8	SITE MANAGERS	10	5
9	LAND SURVEYORS	5	2
	TOTAL	432	208

Source: Field survey, (2022)

DATA PRESENTATION AND ANALYSES OF RESULT

In this chapter, data obtained from survey and questionnaire were analysed based on the research questions, objectives, data collected for this analysis were presented in tables and graphs.

Data Analyses

Analyses of the First Objective

To evaluate the impact of material mismanagement in the building construction sites in selected tertiary institution in Cross River State.

Regression Techniques

Dependent Variable: BCS
Method: Least Squares
Date: 04/26/22 Time: 19:50
Sample (adjusted): 2015 2021
Included observations: 6 after adjustments

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.753414	1.404414	1.248183	0.2219
COST	9.452312	7.581012	2.247616	0.0222
TIME	2.257610	6.893709	3.270861	0.0028
QUALITY	4.230011	2.023312	2.209519	0.0355

R-squared	0.658946	Mean dependent var	4.51E+13
Adjusted R-squared	0.647003	S.D. dependent var	2.33E+14
S.E. of regression	1.88E+14	Akaike info criterion	68.74923
Sum squared resid	1.03E+30	Schwarz criterion	69.05713
Log likelihood	-1230.486	Hannan-Quinn criter.	68.85670
F-statistic	4.099840	Durbin-Watson stat	1.455343
Prob(F-statistic)	0.004245		

Source: Eviews Computations 2023

The signs of some of the variable coefficient from the estimated model are totally in line with a priori expectations. Cost has a positive relationship with construction delivery in tertiary institutions in Cross River State. Time has a positive relationship with construction delivery in tertiary institutions in Cross River State. Quality has positive relationship with the construction delivery in tertiary institutions in Cross River State. This implies that a unit increase in cost, time and quality will lead to increase in construction delivery in tertiary institutions in Cross-River State.

The constant term is estimated at 1.753414 which means that the model passes through the point 1.753414 mechanically, if the independent variables are zero, construction delivery would be 1.753414 (Gujarati and Sangeetha, 2007).

The estimated coefficient for Cost is 9.452312, this implies that if we hold all other variables affecting construction delivery constant, a unit increase in cost will lead to a 9.452312 increase in construction delivery on the average. Likewise, the estimated coefficient of time is 2.257610 which imply that a unit increase in time will lead to a 2.257610 increase in construction delivery on the average. More so, from the result, the estimated coefficient for quality is 4.230011 which imply that unit increase in quality will lead to 4.230011 increases in construction delivery on the average.

The coefficient of determination R^2 from the regression result, the R^2 is given as 0.658946 this implies that 65.8946% of the variation in construction delivery is being explained by the variation in cost, time and quality on the average.

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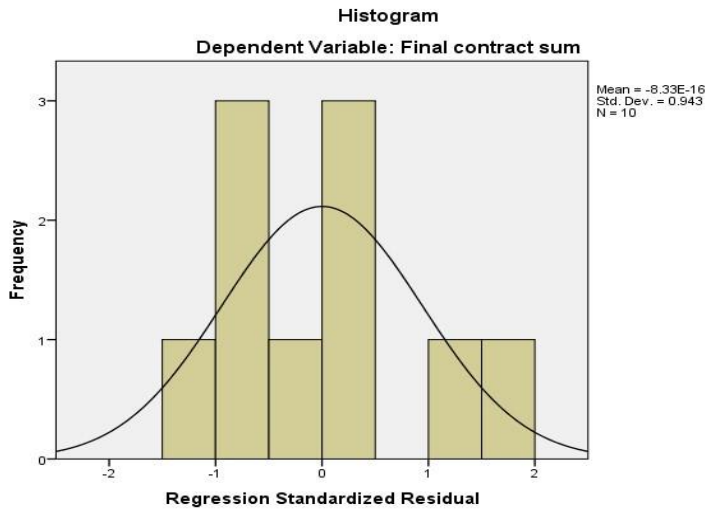
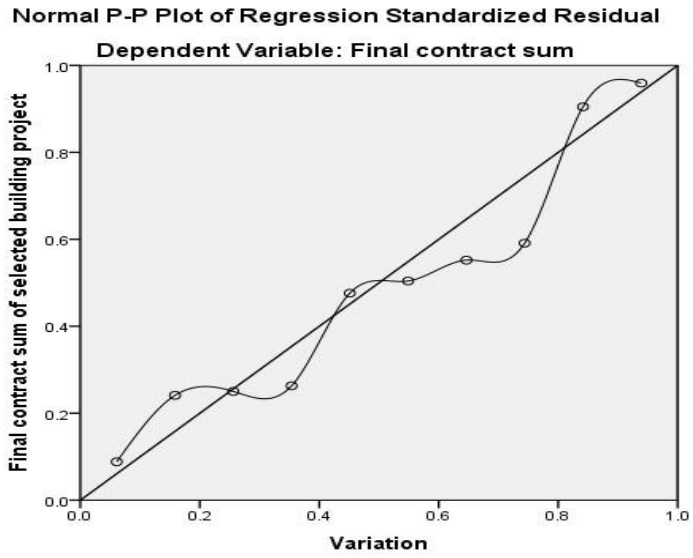
Plot 5.1 Histogram Plot showing how the residual are normal distributed around the mean value



From the result of the histogram plot which shows how the residuals are evenly spread around the mean value. The table shows that the mean value of the residual is -8.33E-16; the standard deviation is 0.943 and the total number of the observed projects was 10. From the histogram plot, we can firmly believe that the residuals are evenly spread around the mean value of -8.33E-16.

Plot 5.2 Normality P-P Plot of regression standardized residual



The normal P-P plot of the regression standardize residual is confirmation of the normality of the residual as rightly indicated by the histogram plot. As we can see from the plot, the series of the residuals are fluctuating

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around the residual mean value which shows that the output the of the regression output is a true representation of the reality. More so, it shows that the estimated parameters can be used for future making future forecast.

Analyses of the second Objective

To identify the cause of ineffective material management process to the construction project delivery in selected Tertiary Institution in Cross River State?

S/N	**Causes of ineffective material management process to the construction project delivery**	W	SA----------SD 4	 3	 2	 1	∑FX	$\bar{X}$	DECISION
1	Incompetence of the project manager	F WF	90 360	80 240	20 40	10 10	200 650	3.25	ACCEPT
2	Design error	F WF	88 352	78 234	22 44	12 12	200 642	3.21	ACCEPT
3	Loss of finance	F WF	86 344	76 228	20 40	18 18	200 630	3.15	ACCEPT
4	Inefficient construction management	F WF	84 336	74 222	22 44	20 20	200 622	3.11	ACCEPT
5	Poor planning	F WF	82 328	72 216	20 40	26 26	200 610	3.05	ACCEPT
6	Lack of pre and post investigation, under design and improper supervision	F WF	80 320	70 210	22 44	28 28	200 602	3.01	ACCEPT
7	Lack of pre and post investigation, under design and improper supervision	F WF	78 312	68 204	22 44	32 32	200 592	2.96	ACCEPT
8	Varied labour equipment	F WF	76 304	66 198	20 40	38 38	200 580	2.90	ACCEPT
9	Lack of legal penalty to offenders	F WF	74 296	64 192	22 44	40 40	200 572	2.86	ACCEPT
10	Rush Work	F WF	72 288	62 186	20 40	46 46	200 560	2.8	ACCEPT
	Grand Total							3.10	ACCEPT

The table above shows the opinion of the respondents on the causes of ineffective material management process to the construction project delivery in tertiary institution in cross river state includes; incompetency of the project manager; design error; loss of fiancé; ineffective construction manager; poor planning; lack of pre and

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post investigation under design and improper supervision; varied labour equipment; lack of legal penalty to offenders and rush work. This goes with a mean index value of 3.25; 3.21; 3.15; 3.11; 3.05; 3.01; 2.96; 2.90; 2.86 and 2.80 respectively. Based on the result, the researcher firmly concludes that the identified items are the causes of ineffective material management process to the construction project delivery in tertiary institution in Cross River State.

TEST OF HYPOTHESES Hypotheses One

H_0: There is no significant relationship between factors affecting material management and effective building construction project delivery.

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
Null Hypothesis	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
There is no significant relationship between factors affecting material management and effective building construction project delivery.	0.013	200	.041	0.00130	0.12	0.34

Source: SPSS Computation 2021

From the test of hypothesis above using one sample test t-statistics, based on the decision rule, accept null hypothesis if the value of the t-statistics is greater than 0.05, from the result; the value of the t-statistics (0.013) is less than 0.05 hence we reject the null hypothesis and conclude that there is no significant relationship between factors affecting material management and effective building construction project delivery.

Discussions

In the result of the first objective, the result indicate the result indicates that the there is a contractual practice of material management in the building construction sites in tertiary institutions in cross-river state with a mean score of 3.17 which has the highest index value. Whereas processing management in tertiary institution in cross-

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river state has the lowest index of 2.62. From the result, the researcher firmly concluded that there is a current practice of material management in the building of construction sites in tertiary institutions in Cross-River state.
The result of the second objective indicates that on the causes of ineffective material management process to the construction project delivery in tertiary institution in cross river state includes; incompetency of the project manager; design error; loss of fiancé; ineffective construction manager; poor planning; lack of pre and post investigation under design and improper supervision; varied labour equipment; lack of legal penalty to offenders and rush work.
The result of the third objective indicates that Cost has a positive relationship with construction delivery in tertiary institutions in Cross River state. Time has a positive relationship with construction delivery in tertiary institutions in Cross River state. Quality has positive relationship with the construction delivery in tertiary institutions in Cross River state. This implies that a unit increase in cost, time and quality will lead to increase in construction delivery in tertiary institutions in Cross River state.

Conclusion

From the findings of the study, the research concludes that there is a contractual practice of material management in the building construction sites in tertiary institutions in Cross River State. Also the researcher concludes that the causes of ineffective material management process to the construction project delivery in tertiary institution in Cross River State includes; incompetency of the project manager; design error; loss of finance and several others. Finally, the study concludes that Cost has a positive relationship with construction delivery in tertiary institutions in Cross River State. Time has a positive relationship with construction delivery in tertiary institutions in Cross River State. Quality has positive relationship with the construction delivery in tertiary institutions in Cross River State. This implies that a unit increase in cost, time and quality will lead to increase in construction delivery in tertiary institutions in Cross River State.

Recommendations:

Based on the findings of the study the researcher recommends

1. It is very important at the very outset of the project to carefully consider all factors when selecting the most appropriate management techniques for a construction project. This is because each system has its own feature and peculiarity that will have effect on the cost, time and quality of the project i.e. the project performance.
2. Each management techniques has its own peculiarity in term of the pretender and post tender activities and processes, division of risks between client and contractors, and the effectiveness of project monitoring and control.

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