Evaluation of Risk Factors in Public Sector Construction Projects and Their Criticality to the Government and Its Contractors in Nigeria

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DOI: https://doi.org/10.51244/IJRSI.2025.12120075

Received: 21 December 2025; Accepted: 26 December 2025; Published: 06 January 2026

ABSTRACT

Accomplishment of the project on time and to specifications is an objective which is mutual to both government and the contractor in public construction project. But the two of them do not have mutuality in interest when it comes to cost of the project. While the government is desirous of completing the project within estimated budget, the contractor aspires to deliver the project under budget to improve his profit margin. This study seeks to enhance the achievement of objectives on both sides of the coin, by overviewing construction project risks and evaluating them in public sector construction environment. Twenty critical construction risks were identified in literature to serve as linchpin for field data collection and subsequent analysis. Structured questionnaires were used for field data collection. Even though analysis using paired t-test indicates no significance difference in the criticality of the identified construction risks to both the government and its contractors, some data in the study proved that some risks which the contractor views as 'very risky', are not actually of 'serious concern' to the government. It is concluded that, 'Traditional Contract' system, the predominant type of contract agreement used in public construction projects, which divorces the government from most financial and site risks, is responsible for this variation of interest between the government and its contractors. Recommendations include among others, government to borne all reasonably substantiated hike in price and to give prominence to capabilities of contractors in bidding processes, rather than selection of the lowest bidder.

Keywords: Construction Risk Factors, Public Construction Projects, Government and its Contractors.

INTRODUCTION

Background of the Study

The construction industry is an indispensable sector of economies all over the world. This is because it provides the infrastructural facilities needed in almost all spheres of human endeavor including agriculture, commerce, education, health, defence, finance, etc (Machina, 2006). The burgeoning impact of the industry is felt more in developing countries, where environmental facilities are mostly in their evolution stage (Ika, 2022). In Nigeria, the rhythm of construction activities is mainly dictated by the government, a situation that can be attributed to total reliance of developing economy on government for the provision of public amenities such as roads, public housing, schools, hospitals, factories, recreational facilities, air and seaports, etc (Okotie, 2021. Notwithstanding, it is quite disheartening that greater part of contracts for the construction of public amenities in Nigeria are engulfed in challenging setbacks that range from poor performance and quality standards of work, through disputes, claims, variations, delays, reviews, abandonments, and re-awards to complete terminations (Amade *et al*, 2015; Ika, 2022; King & Manu, 2020; Olulusi & Otunola, 2021), each of which signifies failure feature in construction project execution. However, the success or failure of construction project generally depends on completing the project on time, within estimated cost, and to quality and performance specifications. Until this is achieved, the project is considered as 'subject of construction risks' (Ward, 2022; Malsam, 2020; Gerardi, 2021; Andony, 2022; Scalis, 2021). Suffice to say that, larger portion of public sector construction projects in Nigeria today are 'subject of construction risks.'

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XII December 2025

Statement of the Problem

The 'Traditional Contract' System is the most prevalent type of contract agreement used in public construction projects in Nigeria (Amade *et al*, 2015; Ika, 2022; King & Manu, 2020; Olulusi & Otunola, 2021; Okotie, 2021; Ika, 2022). The system outlines that the government (i.e the client) designs the project and then appoints a contractor, usually through competitive bidding, to deliver the project. Even though the government retains the designer to provide intermittent services over the course of the project, this type of contract locks the contractor to complete the project on time, within budget, and to specification, the client appears at the end only to turn the key of the completed project. Tradition Contract System apparently divorces the government from most financial and site-related risks in construction projects (Amade *et al*, 2015; Ika, 2022; King & Manu, 2019; Olulusi & Otunola, 2021; Machina, 2006). Therefore, considering how 'traditional contract' system favors the client, there is indeed the need to inject a win-win environment into the prevailing type of contract engaged into by the government and its contractors to foster healthy, productive, and respectful working relationship (Okotie, 2021).

Even though quite a number of literature over the decades, such as Ibrahim & Mosaku (2002), Machina (2006), Nnamdi (2016), King & Manu (2020), Ika (2022), and Machina (2003), tried to proffer solutions to the inherent problems of 'Traditional Contract' System, there is no literature that has ever treasured the solution in the light of creating a win-win scenario in the execution of contracts between government and its contractors in public sector construction projects. This study intends to bridge this study gap by overviewing construction project risks and empirically evaluating them in public sector construction environment.

Aim and Objectives

The aim of the study is to evaluate construction risk factors in public sector construction environment and establish their criticality to government and its contractors. Its objectives are:

(i) To identify construction risk factors,

(ii) To evaluate identified risk factors in public sector construction environment,

(iii) To ascertain the criticality of identified risk factors to government and its contractors,

(iv) To determine all high priority risk factors to the government on one hand and to its contractors on the other, and

(v) To recommend strategies for the establishment of win-win scenario in the execution of public sector construction contracts in order to foster healthy, productive and respectful working relationship between government and its contractors.

Research Inference

Risks abound every construction project and therefore, any successful construction project you see is an outturn of properly managed sets of construction risks (Ward, 2022; Malsam, 2020; Gerardi, 2021; Andony, 2022; Scalis, 2021). Suffice to say that, public sector construction projects are not also divorced from risks no matter how thorough they are handled. However, some risks in construction are more critical than others depending on the likelihood of their occurrence and the intensity of their impact when they occur. Therefore, the research inference of the study is that, the government is equally bothered with criticality of risk factors as its contractors. This inference is viewed in the context of the following hypotheses:

Null Hypothesis: There is no significant difference in the pattern of criticality of the risk factors in Government establishments and Contractors' Organizations.

Alternative Hypothesis: There is significant difference in the pattern of criticality of the risk factors in Government establishments and Contractors' Organizations.

$$Ho: Uo = U1$$

$$H1: Uo \neq U1$$

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The 'paired t-test for difference of mean' is the statistical tool employed in testing the above hypotheses.

LITERATURE REVIEW

Risks and Construction Projects

Historically, the construction industry had been proclaimed as one of the 'risky' industries in the world (Paul, 2022). Construction is a top venture due to its inherited high level of unpredictable risks, at times with volatility consequences to the whole business, resulting into a halt or even complete termination of the project. Scalisi (2021) said "while there might be plenty of money for the making, there are also loads of risk that can take a project or construction company out at the knees". In addition, Jones (2020) claimed that, "When risk turns into a reality it can disrupt and derail a project". There is therefore, no gain saying the fact that 'risk' is detrimental to successful completion of construction projects.

Unlike other projects, such as manufacturing project in which the major hindrance could probably be supply shortage or labor problem, or even agricultural project where the biggest worries could likely hinge on weather and pest, a construction project entails a complex lot of known-knowns, known-unknowns and unknown-unknowns (Donald, 2023). This is because construction projects involve dealing with inter-disciplinary work-force; heavy equipment and machinery; crews working under precarious conditions; use of large volume of materials; many participating independent organizations; both foreseen and unforeseen weather and other environmental conditions; complicated supply and logistic chains; safety and hazard issues; etc, each of which could translate into 'risk' in construction process (Paul, 2022; Scalis, 2021).

Risks in Construction

Every construction project is unique and therefore, comes with its own set of opportunities and challenging risks. But risks in its self should not be perceived as a negative uncertain phenomenon. A thoroughly identified and properly managed risk can lead to increased profit margin (Maxwell, 2021), highly established relationship with project owners leading to engagement in more projects (Jones, 2020), and heightened level of reputation. A risk spells doom for the project only if it is improperly managed. Therefore, for a project to attain its objectives, it is imperative to identify, monitor, and properly control all its potential risks. Jones, (2020) said "One of the best ways to manage risk is to know the various types and how you can manage them. If you can identify and categorize risks before you start a project, you can optimize your risk management and avoid any possible losses".

Unfortunately, the identification, compilation and categorization of risks in construction projects have been highly subjective in literature, with each literature portraying its own individual interpretation and presentation pattern of the subject matter (see Ward, 2022; Duncan, 2020; Malsam; 2020; Gerardi, 2021; Charles, 2017; Maxwel, 2021; Jones, 2020). This subjectivity notwithstanding, the common risks that were identified on construction projects for this study are as follows.

Errors, Omissions and Delays in Design and Estimate.

Even though design and estimate constitute an integral part of contract documents and they are prepared before the commencement or in the course of construction projects, yet construction projects cannot be said to be free from risks due to designs and estimates (Ward, 2022). As human beings, we are bound to make mistakes and so designers and estimators cannot be exceptions. At times, changes and modification due to errors and omissions in design or estimate could result in an unimaginable cost increase (Andony, 2022). In addition, there are situations when design changes and their accompanying estimates take longer time than necessary to be accomplished, resulting in project time and cost overrun (Paul, 2022).

Natural Disasters

Natural phenomena such as earthquakes, floods, landslides, hailstorms, rainstorms, windstorms, hurricanes, tornadoes, epidemics, pandemics among others which nature unexpectedly unleashes on the planet earth are

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called 'Natural Disasters' (Malsam, 2020). They are also referred to as '*force majeure'* in the legal parlance (Andony, 2022). Because these 'Acts of God" are highly destructive, they are considered the greatest threats to construction sites as they can cause havoc by damaging the entire site, at times with injures to workers or even loss of life (Duncan, 2020); they make work inaccessible; and they subsequently disrupt construction activities, leading to project overrun with its attendant insurance disputes and more (Paul, 2022).

Poor Weather Conditions

Cold weather has an effect on how materials are used, wet weather is an impediment to foundations, and extreme hot weather causes equipment mal-function (Malsam, 2020). Every-day weather should only be moderately sunny for the sustenance of workers' health and to rule out the likely occurrence of any other weather-related construction risks (Duncan, 2020).

Liquidated Damages

Liquidated damage is a legal provision in construction projects, that sets aside pre-determined amounts as compensation to be paid to the project owner by the contractor for every day beyond the agreed completion date of the project. Project completion deadline is established, agreed and signed for in construction contracts, and liquidated damage serves as motivator for completion of the project within the agreed time schedule (Andony, 2022). Liquidated damages give ways to delay in completion time of the project and also percolate into the already thin profit margin of the contractor, both of which signify failure features (risks) in construction project delivery.

Stop-work Order

Stop-work orders are legally binding instructions issued by statutorily established regulatory agencies to stop a part of, or the entire, construction work for infringement of some construction laws in the course of the project. Just like in other industries, activities in the construction industry are control and regulated by the government to safeguard both human and environmental well-being (Ward, 2022). To this end, construction laws embody issues around environment, human health and safety, court injunction, and land, labour and other permits among others (Andony, 2022). When a stop work order is given, work must stop on either the entire project or the affected section of the project, until the problem is resolved and agreement is met by all parties involved. This results into delay in meeting project schedule, and delay in itself is a risk in construction project execution.

Disputes

Dispute in construction projects is basically disagreement and misunderstanding between the contractor and his client, subcontractors, suppliers or vendors (Ward, 2022; Malsam, 2020; Gerardi, 2021). This dispute frequently arises whenever there is misalignment in contract agreement with regards to payment, time schedules and performance (Andony, 2022; Scalis, 2021).

Poorly Written Contracts

A well-written contract is one in which every plausible unforeseen event and catastrophe are identified, and obligations of each party to the contract clearly and unambiguously spelt out in preparation for these unforeseen situations (Duncan, 2020). A well-written contract is a very powerful instrument in curtailing disputes, unnecessary claims, additional costs, and delay in project completion (Ward, 2022).

Labour Shortage and use of Untrained Workers

Generally, contractors in the construction industry do not hire full-time staff on every task of the project and therefore, workers always bounce back and forth between contractors in the industry (Andony, 2022). The jump ship of some workers from one contractor to another also gives rise to labour shortage (Jone, 2022). Most reasons propelled in literature for labour shortage in a community revolve around social, political and economic parameters. However, if a contractor happened to run short of workers, there will be an inevitable setback to the progress of work with resultant delay in project completion time and a cut into the contractor's profit margin

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(Gerardi, 2021; Scalis, 2021). In addition, there are situations when labour shortage will compel the contractor to engage untrained workers on the project. These new workers need to be provided with skill and safety training, which will also result in additional cost over the project (Ward, 2022; Maxwell, 2021,)

Poor Definition of Project Scope

In construction, project scope is a document that clearly describes how exactly each and every project task is performed, outlining their specifications, costs, completion time, and managerial boundaries (Jone, 2022). In addition, to keep every project participant informed on what the project entails and the expected outcome of every task, project scopes are designed to incorporate unambiguous details of all significant project events including all deliverables, assignments and responsibilities, mode of payments, timelines, etc (Maxwell, 2021). A well-defined project scope will result in effective delivery of the project on time, within budget, and to specifications (Ward, 2022).

Non-availability of Construction Materials

In the same way as it happens with other industries, material can be in short supply in the construction industry. For example, the supply chain of every construction material was affected in the aftermaths of the covid-19 pandemic, leading to exponential increase in prices of both materials and products ubiquitously in the construction industry all over the world (Paul, 2022). In addition to natural disasters like the pandemic, other causes of shortage in material supply include labour issues affecting material production line and business closures.

Shortage in material supply can cause disputes between contracting parties. In the long run however, non-availability of construction materials poses hindrance to progress of construction projects with resultant cost and time overrun (Andony, 2022).

Increase in Cost of Materials

Materials often represent at least half of the total contract sum in some types of contracts (Andony, 2022). Prices of materials are never fixed and therefore, construction estimates should factor in a bit of elbow room to cover any likely hike in the cost of materials. Escalation in the price of materials could be due to shortage in supply, stoppage of work in material production, shipping bottlenecks, trade tariffs, etc (Scalis, 2021). Project cost increase is one of the major effects of material price fluctuation (Ward, 2022).

Issues with Transportation Facilities and Construction Plant and Equipment

The risks associated with transportation facilities and construction machinery can stem from quite a number of factors including lack of enough automobiles to cater for day-to-day logistics; non-availability of enough plants and equipment to handle the project; non-availability of certain unique equipment to execute some portion(s) of the project; delay in repairs or replacement of broken down equipment; non-availability of trained labour to operate some specific machinery; non-availability of spare parts for equipment maintenance; fuel scarcity; etc (Duncan, 2020). All these risk elements are bound to encumber the smooth progress of construction projects, giving rise to budget escalation and delay in completion time (Charles, 2017).

Poor Project Management

To underscore the managerial risks pervasively confronting construction businesses world over, Kate (2022), quoting from another source, said *"the greatest risks each company faces are the action of the people in project authority. Their training and attention to planning a project completely and executing according to the company processes is the cornerstone for success"*. This means selection of the project team determines to a large extent, the success of a construction project (Gerardi, 2021). Therefore, before you begin a project, it is important to have sufficiently skilled staff with adequately defined roles and responsibilities (Scalis, 2021). Major quandaries involved in poor project management include unclear definition of scope of work; lapses in scheduling resources; non-availability of standard project procedure; inadequate communication network; poor quality control, etc, all

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of which result in time and material waste and sometimes, leading to ripples and disputes between contracting parties (Duncan, 2020).

Change Orders

Change orders are significant changes and variations in the construction work due to errors and omissions in the original project plan, or due to unforeseen natural and man-made occurrences in the course of the project (Andony, 2022; Maxwell, 2021). Change orders, which can be initiated by the owner, the contractor, or even the sub-contractor, are normally written and documented as addendums or amendments to the original contract agreement (Jone, 2022; Paul, 2022). Maxwell (2021) said "*Naturally, misunderstanding and disagreements over new orders are common"*. Therefore, Scalisi (2021) added that *"When changes come up, which they will, its vital to get them written down and signed"*. Change orders are inevitable source of interruption to progress of work, increased project cost, delayed completion time, and at times imperfect or even unfinished project, all of which are risks to successful completion of construction projects (Gerardi, 2021; Scalis, 2021).

Work-related Hazards

The goal of every construction team is to deliver an accident-free project from inception to completion (Andony, 2022). However, construction sites are unfortunately filled with many hazardous situations ranging from steep objects and sharp items laying around to crews working in hazardous circumstances exposed to trips, slips, falls, crushing, pinching, etc (Jone, 2022). Furthermore, the operation of heavy equipment and movement of automobiles around the site can cause safety hazards to people (Maxwell, 2021). Hazard to health and life is the costliest of all risks in construction projects. After all, what is more precious than human lives?

Accident on construction site retards workers' morale on the project, leading to low productivity with negative consequences to project budget and completion time (Scalis, 2021; Paul, 2022). Although it is not possible to foresee some safety hazards even with full-time safety staff, project managers should always be steadfast in their fallback measures toward health and safety hazards (Gerardi, 2021; Malsam, 2020).

Site Security

Construction sites should be properly secured to prevent unauthorized third parties from gaining access into them. The major risks associated with unauthorized people getting access into construction sites are (1) Safety: Unauthorized people are not likely trained on safety measures and therefore, are prone to injuries, accident, or even death on some construction site, and (2) Theft: Theft of construction tools can retard progress of work and also cause disharmony among workers, with adverse consequences on productivity and project cost and timeline. Ever though most construction organizations do insure their plant and equipment, it is advisable to provide site security to all machinery, rather than paying deductible insurance premiums on them, as such payments can eat deep into the organizations profit margin (Scalis, 2021).

Unrealistic payment schedules

In the same way as an automobile cannot be operated without fuel, a construction project cannot also be undertaken without funds. Because cash flow is the life-support of a construction business, some contractors rely on external funding to deliver projects, with interest rate cutting into their profit margin every single day (Paul, 2022). The contractor's dilemma is further compounded with the client's failure to honor the duly agreed contract payment schedules. If this happens, the project may face debilitating delays, disputes between parties, and a hike in the overall project cost, all of which translate into risks in construction project delivery (Charles, 2017). It is, therefore, advisable for payment schedules to be clearly spelt out in construction contracts, and parties concerned should religiously honor all such schedules. Payment notices should be forwarded beforehand for necessary actions (Paul, 2022).

Inflation, Local taxes, and Interest and Exchange Rates

Inflation, local taxes, and high rates of interest and foreign exchange can also eat deep into project cost if wiggle

room is not allowed for them in the contract estimate. The unavailability of loans, guarantees and equity to finance project can also pose risks to construction projects (Duncan, 2020).

Social Unrest and Political Issues

Insurgency and other social unrest are potential setbacks to both completion time and final cost of construction projects. Similarly, objection from the host community or other concerned organization(s) could bring the project to a halt or even its complete termination (Duncan, 2020).

Unknown site conditions

The completion of feasibility studies and design of the project ushers in the award process. And once the contract is awarded, the contractor moves into the site to commence the project. However, there are certain underground geological conditions which are beyond the detection of the builder's feasibility studies, and the process of overcoming these conditions can have huge bearing on the project cost and completion time. Few examples of such unexpected occurrences are buried debris, hazardous wastes, explosives, underground rocks, loose subsoil, and high water-levels (Paul, 2022).

Construction Risks and Their Impacts

Risks on construction projects have different likelihood of occurrence, and their impacts are also different when they occur. Both the probability of a risk becoming reality and its impact on the project are ranked as high, medium or low. With this ranking, high probability risks with high impact on the project are ranked as high priority or most critical than those along the ladder down to the ones with low probability and low impact, which are tagged as low priority or least critical risks. In essence, this type of ranking places every construction risk in one of nine grid fields of the priority grid in figure 1 (Edward, 2023; Kate, 2022).

METHODOLOGY

Data Collection

Data for the study were sourced from the government at all tiers and its contractors. These two entities are the major stakeholders and also the major employers of labour in public sector construction projects. While the government is normally represented by statutorily established organizations including Ministries of works/housing, Works departments, and Housing corporations, its contractors most frequently make use of their own resources in the execution of public construction projects.

It is not physically feasible to cover all states of the federation of Nigeria for field study, more especially in this crucial period of insecurity and financial hardship. Therefore, the study adopted a stratified sampling of states of the federation using the various creation of states in the country as strata, that is, each set of states created in the country represents a stratum. However, after sampling one state from each stratum, one more state is added into some strata where opportunity prevailed as shown in Table 1.

Table 1: Sampling of States for Data Collection

S/N.	REGIME	REGIME PERIOD	NUMBER OF STATES CREATED	STATE SELECTED	REMARKS
1.	Balewa	1960 – 1966	3 Regions	Kaduna	Formerly Northern region
2.	Gowon	1966 – 1975	12	1. Borno (Formerly North-Eastern state) 2. Plateau (Formerly Benue-Plateau state)	Both were carved out from former Northern region
3.	Murtala	1975 – 1976	19	1. Bauchi 2. Adamawa	Both were carved out from former North-Eastern state

4.	Babangida	1985 – 1993	2	Katsina	Carved out from former Kaduna state
5.	Babangida	1985 – 1993	9	1. Yobe 2. Jigawa	Yobe was carved out from former Borno state and Jigawa from former Kano state
6.	Abacha	1993 – 1998	6	Gombe	Carved out from former Bauchi state

The tolerance boundaries for each of the 20 identified construction risks in the study, were investigated in both the statutory and contractors' organizations. Structured questionnaires were used for data collection in the study. The priority grid earlier explained in Figure 1 was used to sample views on how respondents perceive each risk in their various organizations. As the identified risks were numbered, respondents were advised to indicate on the grid fields, only the number corresponding to each risk. In addition, the use of the priority grid fields and the meaning of each risk were emphatically spelt out to respondents to ease the collection of data. A total of 95 respondents comprising 60 from statutory establishments and 35 from contractions' organizations were contacted for data collection as shown on Table 2.

Table 2: Distribution of Questionnaires to Respondents

S/N	State	No. Of Contractors	No. Of State Ministries of Housing	No. Of L.G Works Depts.	No. Of Works Depts. In Tertiary Institutions	No. Of Housing Coporations	No Of State Offices of Fed. Min. Hou	States Total
1	Borno	7	1	3	2	1	1	15
2	Yobe	6	1	6	2	1	1	17
3	Plateau	3	1	3	1	-	-	08
4	Kaduna	4	1	3	1	1	1	11
5	Katsina	2	1	3	1	1	1	09
6	Jigawa	2	1	2	-	-	-	05
7	Bauchi	4	1	5	1	-	-	11
8	Adamawa	4	1	³	1	-	-	10
9	Gombe	3	1	³	1	-	-	09
TOTAL		**35**	**9**	**33**	**10**	³	³	**95**

Data Presentation

As shown on Table 3, a total of 68 responses, 42 from government establishments and 26 from contractors' organizations, were obtained from the field. This represents about 72% of the total number of respondents sought for data collection. As shown on the table, responses from government establishments were sorted into one group and those from contractors' organizations into another group. This is necessitated by the uniformity observed in responses within each group, which was remarkably too similar. It can be further observed from the table that, although responses were very much similar within a group, a wide range of variation was exhibited between the two groups.

Table 3: Checlist on Risk Priritization

S/NO	VARIABLES	NO. OF RESPONSES							
		PRIORITIZATION FROM GOVERNMENT ESTABLISHMENTS				PRIORITIZATION FROM CONTRACTORS' ORGANIZATIONS			
		High	Medium	Low	**Total**	High	Medium	Low	**Total**
1	Errors, Emissions & Delays in Designs/Estimates	0	1	41	**42**	0	0	26	**26**
2	Natural Disasters	2	40	0	**42**	1	25	0	**26**
3	Poor Weather Conditions	1	1	40	**42**	0	26	0	**26**
³	Liquidated Damages	0	0	42	**42**	0	0	26	**26**

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5	Stop-work Orders	0	0	42	**42**	0	0	26	**26**
6	Disputes	0	0	42	**42**	1	24	1	**26**
7	Poorly Written Contracts	0	0	42	**42**	0	0	26	**26**
8	Labour Shortage and Use of Untrained Workers	0	0	42	**42**	0	26	0	**26**
9	Poor Definition of Project Scope	0	0	42	**42**	1	24	1	**26**
10	Non-availability of Construction Materials	0	0	42	**42**	2	24	0	**26**
11	Increase in Cost of Materials	0	0	42	**42**	26	0	0	**26**
12	Transportation Facilities, Plant and Equipment	0	0	42	**42**	0	25	1	**26**
13	Poor Project Management	0	1	41	**42**	1	25	0	**26**
14	Change Orders	1	1	40	**42**	1	24	1	**26**
15	Safety Hazard	0	1	41	**42**	0	24	2	**26**
16	Site Security	0	1	41	**42**	0	25	1	**26**
17	Unrealistic Payment Schedules	³	38	0	**42**	26	0	0	**26**
18	Inflation, Local Taxes, Interest & Foreign Exchange Rates	1	1	40	**42**	26	0	0	**26**
19	Social Unrest and Political Issues	42	0	0	**42**	26	0	0	**26**
20	Unknown Site Conditions	1	1	40	**42**	1	25	0	**26**
TOTAL		**52**	**86**	**702**	**840**	**112**	**297**	**111**	**520**

Data Analysis

The data on Tables 3 can be transformed into frequency distribution format as shown on Table 4.

Table 4: Frequency Distribution on responses from both Government and Contractors' organizations

PRIORITAZATION	**RESPONSE**		d = x-y	d^2
	Government Establishments (x)	Contractors' Organizations (y)		
HIGH	52	112	-60	3,600
MEDIUM	86	297	-211	44,521
LOW	702	111	591	349,281

It is observed from Tables 3 that some risk factors are more critical than others and also that, risks that are critical to government establishments may not necessarily be equally critical to the contractors' organizations. However, the question here is "Is there any significant difference in the patten of criticality of these risk factors in Government Establishments and Contractors organizations?" To this question, we set up two Hypotheses as follows:

Null Hypothesis: There is no significant difference in the pattern of criticality of the risk factors in Government establishments and Contractors' Organizations.

Alternative Hypothesis: There is significant difference in the pattern of criticality of the risk factors in Government establishments and Contractors' Organizations.

Ho: Uo = U1

H1: Uo ≠ U1 (Two-tailed)

We shall therefore use "paired t-test for difference of means" for the analysis and the data on Table 4 can be analyzed as follows:

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$\Sigma d=320$, $\Sigma d^2=397,402$

$\bar{d} = \Sigma d/n = 320/3 = 106.667$

$S^2 = 1/n\text{-}1\ [\Sigma d^2 - (\Sigma d)^2/n]$

$= ½\ [397,402 - 320^2/3]$

$= ½\ [397,402 – 102,400/3]$

$= ½\ [397,402 – 34,133.333]$

$= 362,268.667/2$

$= 181,134.334$

$|t| = |\bar{d}| \div \sqrt{S^2/n}$

$= 106.667 \div \sqrt{181,134.334/3}$

$= 106.667 \div \sqrt{60,378.111}$

$= 106.667/245.720$

$= 0.434$

Degree of freedom = (3-1) = 2 and at 5% level of significant the tabulated two-tailed test is 0.816. However, analysis as presented above shows that the calculated t-test = 0.434. This means calculated value of t-test is less than its tabulated value. The implication of this result is discussed in the next section.

RESULTS AND DISCUSSION

Analysis in the foregoing section indicated that the calculated value of t-test is less than its tabulated value. We therefore accept the null hypothesis and conclude that "There is no significant difference in the pattern of criticality of risk factors in both government and contractors' organizations". This means, the government is equally bothered with criticality of construction risks as its contractors, although the type of risks faced by each may differ. This result collaborates Machina's (2023) assertion that, "*Public construction project are failing in Nigeria 54due to myriad of construction risks prevalently faced by both the government and its contractors."* Earlier in 2021 Okotie also said, "……*most public sector construction projects in Nigeria do not succeed because both government and those entrusted with execution of projects are engulfed in multitude of construction risks*." These multitude of construction risks, according to Olulusi & Otunola (2021), "*are the cause of endless project abandonment, reviews and re-awards in Nigeria."* Ika (2022) buttresses this later claim when he said: *"There are about 4000 uncompleted or abandoned public projects to the tune of about ₦300 Billion littered all over Nigeria and that it would take about 30 years to get them completed."*

However, notwithstanding the result of the t-test, it can be observed from Tables 3 that, there are risk factors that are of high, low or medium criticality to the government which are not of the same criticality to its contractors and vice-vasa. This differential allocation of risks between government and its contractors, according to King & Manu (2020), Olulusi & Otunola, (2021) and Machina (2023), is due to 'traditional contract' system, the type of contract arrangement predominantly employed by the government in the execution of construction projects.

Traditional contract in construction, also referred to as 'design bid build', 'bid build' or 'employer designed', is a type of contract agreement in which the client designs the project and then appoints a contractor, usually through competitive bidding, to do the physical work on site (King & Manu, 2020; Olulusi & Otunola, 2021; Machina, 2023). Since the design is finalized before the contractor is appointed, there is clarity about preciseness of what is to be expected as finished product on the site and its monetary value. Once the contract is awarded, apart from retaining the designer to provide intermittent services over the course of the project, the client only comes to the site to turn the key of the completed project, in readiness for operation. This type of contract therefore relieves the client from most finance and site related construction risks.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Results and discussions in the study indicated that, the 'Traditional contract', the most frequently used contract system in public bureaucracies in Nigeria, severs the government from most risks in public construction projects, and clasps the contractor to deliver the project amid myriad of construction risks, some of which are unjustifiable. In addition to surmounting these handles, the contractor is also saddled with strategies of delivering the project under budget to boost his profit margin. These partly explained why public construction projects often crumble in Nigeria. The situation further suggests that the government in Nigerian has lost sight of the fact that, the contractor it engages in construction is the linchpin upon which the success or failure of the project rests. Burdening the contractor with more construction risks than justifiable therefore, tantamount to receding the project from its success horizon. However, the situation can be salvaged if the contractor is relieved from most unjustifiable risks through risk sharing and transfer with the government as recommended in the next section.

Recommendations:

The following are recommendations to salvage both the government and its contractors from their critical risks in public sector construction project executions.

1. Flexibility in Contract Documents

The 'traditional contract' essentially locks the contractor to deliver the project on time, within budget, and to specifications. The project owner only needs to turn the key when the project is completed. The contractor therefore, bears the greater junk of the risks in projects. As the business environment is highly volatile in Nigeria, financial risks such as reasonably substantiated hike in price should be borne by the client. Hence, construction contracts in public construction projects should be made flexible enough to allow moral justification in risk sharing or transfer between the government and its contractors.

2. Establishment of Risk Agencies.

To salvage public construction projects from frequent failure, Amade *et al* (2015) recommended the establishment of Risk Management Agencies in Nigeria. Eight years later, because these agencies were not yet established, Machina (2023) further proposed their establishment in his submission. This study also wishes to proffer the establishment of statutory agencies at all levels of government to oversee the risks management strategies of both the government and its contractors in public construction projects. These agencies should be in constant touch with Ministries of Justice to synchronize and vindicate all mechanisms of risk allocation, sharing and transfer between the government and its contractors in public construction projects.

3. Clarity in Contract Documents

Machina (2023) opined that contract documents should be clearly written to prevent contractors from ignorantly shifting most construction risks to themselves. This means, the used of optional auxiliary verbs should be avoided on mandatory actions. Therefore, if a provision is intended to be mandatory, such words as 'must' and 'shall' should be used instead of 'should' or 'may'.

4. Realistic Source of Project Finance

The unenthusiastic adherence to scheduled contract payments by the government is not quite healthy to the construction business climate in Nigeria. Therefore, a realistic and forthcoming source of finance should be established before commencement of any public construction project.

5. Lower Interest Rates on Loans, Guarantees and Equities

There is the need for the government to swing-in to lower the interest rates on loans, guarantees and equities, to enhance the contractor's profit margin in public construction projects. To accomplish this, the jurisdictional risk agency concerned should be brought into the same page.

6. Insurance Needed in the Event of Natural Disasters

If, as Abraham Lincoln stated, democracy is government of the people, by the people and for the people, then why shouldn't the government assume complete responsibilities of all risks that are 'Act of God'. They are beyond the organizational 'will' of the contractor. Therefore, 'force majeure' clauses in 'Traditional' public construction contracts should compel the government to assume complete responsibilities for any risk due to Natural disaster.

7. Public Participatory Approach in Project Conception

In addition to embarking on new crusade toward providing Nigerians with good education, skill training and job opportunities, the government should imbibe the spirit of gathering consensus opinion of the people before embarking on any public construction project.

8. Change Order Management

Some 'Change Orders' can affect the overall cost and time of construction projects. Public construction contracts should be written to ensure contractors of adjustment in both time and cost of the project in the event of any 'Change order'.

9. Appointment of Contractors

To salvage both the government and its contractors from the remaining other risks, the competitive bidding process inherent in 'traditional contract' system of public construction projects should lay emphasis on capabilities of contractors, rather than selecting the lowest bidder as they might not always be the best choice. After all, Johnson (n.d) claimed that, selection of the lowest bidder in most cases is prone to: (i) More Change Orders, (ii) Reduced Quality of Work, and (iii) Costly Delays.

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