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AN ASSESSMENT OF RISK FACTORS IMPACTING COST VARIABILITY IN NIGERIAN CONSTRUCTION PROJECTS

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ABSTRACT:

According to a review of different authors' work, there are numerous risk factors that could impact the final account sums (FAS) of construction projects, causing variations in contract sum (CS). By minimising the variability between the final account sum FAS and CS, a compelling risk study could help resolve this issue. This research is concerned with the variance amidst CS and FAS while assuming that the observed variance is due to risk. The research adopted a convenience sampling technique, non-probability, purposive and definitive. Data was collected through a questionnaire survey from 43 stakeholders that showed interest from the identified 55 experts in the Nigerian construction sector during a conference organised by the Quantity surveyor's registration board of Nigeria (QSRBN). A quantitative investigation identified the critical risk factors that influence the precision of CS. The findings indicated fifteen significant risk causing variance between FAS and CS (cost variability). These check disparities in construction project planned costs during construction and the observed risk factors considered the concern of project advisors. In addition, the study offers practical solutions that suggest creating an effective mitigation plan for the construction sector by using a framework that supports risk management in project delivery. As a result, five highly significant risk variables in traditionally procured construction projects that initiate variance amidst CS and FAS: Poor programme scheduling, other risks, Availability of design information, Fluctuation and Type of client, which will be considered to develop a construction project risk management framework that will encourage sustainability of the Nigerian construction industry.

Keywords: Construction, project risk, cost variability, contract sum, final account sum, Nigeria.

1 INTRODUCTION

Nigeria's construction industry is significant for employment and economic growth. Furthermore, the National Bureau of Statistics (2021) asserts that Nigeria's construction industry provided about 3.21% of the gross domestic product (GDP) in 2021. In Nigeria, the construction industry is one of the significant industries that contribute appreciably to the nation's development (Wibowo, 2004; Khan et al., 2011). This contribution classifies the sector as a critical driver of economic development, having occupied the eighth position in the sectoral contribution to the real Nigeria GDP. Amongst unique attributes that distinguish the construction industry from all other industries include physical nature, organisation of the construction process, and one-off project designs, among others. (Ashworth and Hogg 2007). However, the industry is known as one sector that is vulnerable to risk. Most risk management studies have collected data on risk management from East Asia, Europe, the Middle East, and the United States (El-Sayegh and Mansour 2015). Furthermore, the cost is one of the factors used in measuring construction project success (Ameyaw *et al.*, 2015). It is thus noteworthy that accurate estimation of contract sum continues to pose challenges to project stakeholders.

The primary concern is how risk factors cause variability between the contract sum (CS) and the final account sum (FAS). This study pursues to develop a framework that will influence, support, and promote effective risk management practices in the Nigerian construction industry. There is an observed differences in budgeted costs amidst the CS and FAS in New Zealand (NZ), ranging between - 14% and +16%. (Adafin et al.2015). Adafin (2017), in a follow-up study researched in New Zealand with cost data from completed building projects, observed that the variance between CS and FAS differs significantly. These findings implied that cost variability occurs in the construction industries in developed countries. Cost variability could be due to design and construction risks (Xia et al., 2017). The observed variance between CS and FAS could be reduced if risk items were identified and priced while estimating the contract sum. In addition, cost variability could vary with procurement, project complexity and project types (Adafin *et al.*, 2016).

Primarily, the objective is how these risk factors inherent in construction projects interact to cause variability between CS and FAS. Unfortunately, limited attention has been given to this area in Nigeria. While clients are becoming uncomfortable with seeing their projects completed over budget, this study attempts to assess risk factors impacting the cost of construction projects in Nigeria.

The research outcome will be backed up by developing a practical risk management framework for more accurate cost estimation in the construction industry in Nigeria.

2 LITERATURE REVIEW.

The absence of a cost estimation framework causes cost variability in construction, affecting efficiency and effectiveness from the planning stage through the project's final account stage (Zakaria et al., 2013). Doloi (2011) observed that proper cost estimation is a significant impediment for project stakeholders. Researchers such as Zakaria et al. (2013), Doloi (2011), Ameyaw et al. (2015), Salahi and Ali (2018), and others have acknowledged that cost variability exists in the construction industry and that it is a significant problem in the industry's growth.

Several studies (Enshassi et al., 2013; Adafin et al., 2018: Adafin et al., 2016, Adafin., 2017 Agyekum-Mensah, 2018) have identified risks that affect construction project budgetary performance. Various causes, evidence, and arguments in construction management research (Adafin et al., 2020: Adafin et al., 2018: Adafin., 2017; Agyekum-Mensah, 2018; Love and Ahiaga-Dagbui 2018; Yap et al., 2018) suggested that it is uncommon to discover a project where the CS matches the FAS. As a result, an effective risk mitigation plan (a deterministic system to risk) for construction projects should reduce budget/cost and schedule/time variability (Hwang et al., 2014). Dosumu et al., (2021), identified between 1-40 risk causing cost variability in Nigeria, which includes Clients change/Changes in owner’s requirements, Client’s brief, Type of client, Defective design, and specification, among others. As a partial solution, this study proposes using risk analysis to reduce the variances between CS and FAS of construction projects. Regrettably, there is a dearth of literature and research on construction project risk in Nigeria, Dosumu et al., (2021), identified 79 authors and only 6 authors from Africa that researched on cost variability, and only 3, (4.48%) authors from Nigeria which Identifies and measures risk variables of Nigerian construction projects, and how these interact to explain the vast range between CS and FAS.

As a result, this study investigates what causes variability between CS and FAS in construction projects from the standpoint of construction stakeholders (consultants, clients, contractors, and regulatory authorities) and how to evaluate the causes of such discrepancies as observed.

3. METHODOLOGY

The methodology followed Fellows and Liu (2015), and a questionnaire containing closed-ended questions was sent to participants drawn from the databases of participants who actively participated in a conference organised by the Quantity surveyor's registration board of Nigeria (QSRBN) in May/June 2021. Based on a review of the literature, 29 relevant risk factors were observed. To analyse the top significant risks from the observed 29 indicators, analysis and ranking were done using a cut-off point of 3.0 and above, according to Adafin et al. (2016). Rating by respondents using a five-point Likert as used by Arif et al. (2015) and Odeyinka et al. (2012) was adopted. As a result, an interval scale, allowing the data to be used in various statistical analyses, was used. Following Naoum (2007), on sampling, the sampling frame was drawn from the databases of participants who actively participated in a conference organised by the Quantity surveyor's registration board of Nigeria in May/June 2021. Only 43 of the 55 complete replies obtained were involved in traditionally procured construction projects (see Table 1), a 78 per cent response rate higher than Simpeh et al. (2015) proposed response rate of 19. 5 per cent for relevant data. The mean score analysis, degree of risk and analysis of variance (Anova) from the stakeholders were also used to analyse the responses as used by (Adafin et al. 2016), (Allahaim, and Liu, 2015), (Odeyinka et al., 2012) and (Offei-Nyako et al., 2016).

4 DATA ANALYSIS AND RESULTS

The responses were sorted to evaluate the extent, impact, and degree of risk, as adopted by Adafin et al. (2016), (2017) and (2020). The degree-of-risk values were determined using mean scores (MS), of risk impact and extent of risk. The "Degree of Risk" metric as shown in Table 3 was used to rank the discovered risk variables. R = P x I (Offei-Nyako et al., 2016). *R* denotes the degree of risk, *P* denotes the extent of risk occurrence, and *I* denotes the perceived impact on a project. Furthermore, the study measured the degree of agreement among participants' rankings in evaluating risk variables using Analysis of variance (Anova)

Analysis of the extent of a risk happening, its perceived impacts and the 'degree-of-risk' scores in traditionally procured projects are summarised in Tables 3,4and 5 (Risk factors' means and rankings). The combined sample's 'degree-of-risk' scores range from 3.73 to 15.08. A few risk variables are in the range of 7.58 to 15.08, demonstrating the complex interaction of the most critical risk factors. The top-five risk factors that could influence cost variability include poor programme scheduling, other risks, availability of design information, fluctuation, and type of client, according to the consequent ranking of the 29 risk factors. In addition to the mean ranking analysis, the study used a 't-test' analysis to determine the stakeholders' concordance, from which opinions were sought. The Statistical Package for Social Sciences 25 (SPSS) software analysed the results presented in Tables 3,4 and 5.

Table 1: Participants' Demographic Information

		Frequency	Percent	Valid Percent	Cumulative Percent
Project Location	Lagos	21	48.8	48.8	48.8
	Abuja	22	51.2	51.2	100
	Total	43	100	100	
Nature of Outfit	Consulting	23	53.5	53.5	53.5
	Contracting	8	18.6	18.6	72.1
	Client	6	14	14	86
	Others	6	14	14	100
	Total	43	100	100	
Designation of Respondents	Architect	10	23.3	23.3	23.3
	Quantity Surveyor	11	25.6	25.6	48.8
	Contractor	8	18.6	18.6	67.4
	Builder	11	25.6	25.6	93
	Project Manager	3	7	7	100
	Total	43	100	100	
Highest Educational Qualification	Ph.D.	5	11.6	11.6	11.6
	Masters' degree	12	27.9	27.9	39.5
	Bachelor's degree	13	30.2	30.2	69.8
	Post-graduate	4	9.3	9.3	79.1
	Diploma/Graduate diploma	9	20.9	20.9	100.0
	Total	43	100.0	100.0	
Highest Professional Qualification	MNIA	6	14.0	14.0	14.0
	MNIQS	11	25.6	25.6	39.5
	MNIOB	7	16.3	16.3	55.8
	PMP	3	7.0	7.0	62.8
	FNIA	4	9.3	9.3	72.1
	FNIQS	8	18.6	18.6	90.7
	FNIOB	4	9.3	9.3	100.0
	Total	43	100.0	100.0	
Years of experience in Construction Works	1-10 years	5	11.6	11.6	11.6
	11-20 years	12	27.9	27.9	39.5
	21-30 years	19	44.2	44.2	83.7
	31-40 years	5	11.6	11.6	95.3
	Over 40 years	2	4.7	4.7	100
	Total	43	100	100	
Years of experience in Cost and Risk Management	1-10 years	5	11.6	11.6	11.6
	11-20 years	12	27.9	27.9	39.5
	21-30 years	19	44.2	44.2	83.7
	31-40 years	5	11.6	11.6	95.3
	Over 40 years	2	4.7	4.7	100
	Total	43	100	100	
How long has your firm been in operation?	1-10 years	5	11.6	11.6	11.6
	11-20 years	12	27.9	27.9	39.5
	21-30 years	19	44.2	44.2	83.7
	31-40 years	5	11.6	11.6	95.3
	Over 40 years	2	4.7	4.7	100.0
	Total	43	100.0	100.0	

***Source**: Data Analysis Result 2022*

Table 1 provides a detailed assessment of the respondents and their firms, study locations, educational and professional qualification and experience in cost and risk management, and the projects they manage to attest that the qualifications and experience required for the purpose are available.

The focus was on building projects only with the traditional procurement system adopted for all, as seen in Table 2. The projects were executed between 2015 and 2020, with the highest number of these projects constructed in 2017 (23.3%). In the first three years (2015-2017), the frequency of the projects increased with each year but started dropping in the last three years, from the year (2018-to 2020). The reason may not be farfetched, with the possibility of the country's economic situation that affected all areas, including construction projects and their associated activities. The table also reveals the client type, which included government, with over half of the projects were awarded by the government (69.8%) while others were from private individuals (11.6%) or public (18.6%)

Table 2. Project specific information

		Frequency	Percent	Valid Percent	Cumulative Percent
Project Type	Building	43	100.0	100.0	100.0
Procurement System Adopted	Traditional	43	100.0	100.0	100.0
Year of Project	2015	8	18.6	18.6	18.6
	2016	9	20.9	20.9	39.5
	2017	10	23.3	23.3	62.8
	2018	8	18.6	18.6	81.4
	2019	5	11.6	11.6	93
	2020	3	7	7	100
	Total	43	100	100	
Client Type	Private	5	11.6	11.6	11.6
	Public	8	18.6	18.6	30.2
	Government	30	69.8	69.8	100.0
	Total	43	100.0	100.0	

***Source**: Data Analysis Result 2022*

Considering other project characteristics such as project duration, contract sum, and final account sum, provided data were also grouped to assess and compare the data by group easily.

It is essential to evaluate the stakeholder's perception of risk, correlation of coefficients, using mean value to deduce risk occurrence, risk impact and degree of risk as used by (Adafin et al. 2016), (Allahaim, and Liu, 2015), (Odeyinka et al., 2012) and (Offei-Nyako et al., 2016).and Analysis of variance (Anova) was used to test of agreement/disagreement and the results shown in Table 3,4 and 5.

Table 3.: Stakeholder's perception of Degree of Risk for Identified Significant Risk Factors causing cost variability

Risk Factors	All		Architect		Quantity Surveyor		Contractor		Builder		Project Manager	
	DoR	Rank	DoR	Rank	DoR	Rank	DoR	Rank	DoR	Rank	DoR	Rank
Poor programme scheduling	15.70	1	13.50	2	16.35	2	16.90	1	16.35	1	15.00	1

Other risk (please state)	15.19	2	14.88	1	16.50	1	16.49	2	13.34	12	15.00	12
Availability of design information	14.33	3	12.47	8	14.73	7	15.75	4	14.95	2	12.99	2
Fluctuation	14.25	4	12.60	7	15.48	3	14.63	8	14.55	3	12.99	3
Type of client	14.13	5	13.05	5	15.48	3	14.49	11	13.75	6	12.99	6
Delay in Resolving disputes	14.08	6	12.76	6	15.48	3	14.09	13	14.15	5	12.99	5
Increase in finance rate	14.08	6	12.15	10	14.73	7	16.34	3	13.75	6	12.99	6
Obtaining construction permits	14.02	8	13.34	3	14.65	10	15.65	5	13.08	14	12.99	14
Under Estimation	13.90	9	12.47	8	15.04	6	14.63	8	13.75	6	12.99	6
Site condition	13.87	10	11.70	15	14.42	11	15.21	6	14.47	4	12.99	4
Act of God	13.67	11	13.20	4	13.67	15	15.05	7	13.24	13	12.99	13
Contractors default	13.51	12	12.15	10	13.96	12	14.63	8	13.47	11	12.99	11
Shortage of materials	13.51	12	11.88	14	14.73	7	13.50	17	13.75	6	12.99	6
Bureaucracy in Tendering method	13.41	14	12.15	10	13.96	12	13.89	16	13.75	6	12.99	6
Accident during construction	11.79	15	10.80	15	12.16	15	13.14	15	10.90	15	12.99	15

***Source**: Data Analysis Result 2022*

Table 3 reveals breakdown of the degree of risk of the identified significant factors causing cost variability between contract sum and final account in construction projects and limited the risk factors to fifteen. With the top five risk factors being Poor programme scheduling, other risk, Availability of design information, Fluctuation and Type of client. Therefore, these identified significant risk factors should not be taken for granted as the consequence of their expression or occurrence can be detrimental if not discovered and curbed on time.

Table 4.: Correlation Coefficient and significance of 0.05 level for risk occurrence and risk impact factors causing cost variability between contract sum and final account in construction projects

Risk Factors	**Mean (RO)**	**Mean (RI)**	**CC**	**Sig**	**Remark**		**% C (A F)**	**ISR**
Other risk (please state)	3.14	4.84	**.382***	**0.012**	**PWC**	**S**	38.2	**SR**
Accident during construction	4.37	2.7	**-.370***	**0.015**	**NWC**	**S**	37.0	**SR**
Expertise of construction	2.67	4.56	**0.346***	**0.023**	**PWC**	**S**	34.6	
Over Estimation	2.72	4.53	**0.302***	**0.049**	**PWC**	**S**	30.2	
Late arrival of materials	2.72	4.53	0.3	0.05	PWC	NS	30.0	
Changes in Clients taste	2.56	4.6	0.287	0.062	PWC	NS	28.7	
Method of construction	2.65	4.56	0.284	0.065	PWC	NS	28.4	
Availability and supply of materials and labour	2.72	4.56	0.259	0.094	PWC	NS	25.9	
Contractors' poor management	2.67	4.47	0.243	0.116	PWC	NS	24.3	
Obtaining construction permits	3.14	4.47	-0.237	0.126	NWC	NS	23.7	**SR**
Site condition	3.14	4.42	-0.231	0.137	NWC	NS	23.1	**SR**
Bureaucracy in Tendering method	3.02	4.44	-0.23	0.139	NWC	NS	23.0	**SR**
Insurance cost	2.72	4.47	-0.23	0.139	NWC	NS	23.0	
Government policy	2.74	4.53	0.219	0.158	PWC	NS	21.9	
Fluctuation	3.21	4.44	-0.204	0.189	NWC	NS	20.4	**SR**
Bad weather	2.7	4.49	0.186	0.233	PWC	NS	18.6	
Use of inappropriate plant	2.74	4.47	0.175	0.261	PWC	NS	17.5	

Variations (Technical)	2.63	4.6	0.173	0.267	PWC	NS	17.3	
Type of client	3.16	4.47	-0.171	0.274	NWC	NS	17.1	**SR**
Act of God	3.09	4.42	-0.153	0.327	NWC	NS	15.3	**SR**
Mode of financing	2.67	4.49	0.148	0.345	PWC	NS	14.8	
Availability of design information	3.28	4.37	-0.145	0.354	NWC	NS	14.5	**SR**
Shortage of materials	3.07	4.4	-0.143	0.359	NWC	NS	14.3	**SR**
Under Estimation	3.16	4.4	-0.142	0.365	NWC	NS	14.2	**SR**
Delay in Resolving disputed	3.19	4.42	-0.123	0.432	NWC	NS	12.3	**SR**
Contractor's default	3.07	4.4	-0.088	0.576	NWC	NS	8.8	**SR**
Fluctuation in market demand	2.79	4.49	0.034	0.827	PWC	NS	3.4	
Increase in finance rate	3.19	4.42	-0.012	0.938	NWC	NS	1.2	**SR**
Poor programme scheduling	3.14	5	No Result				0.0	**SR**

NWC - Negative Weak Correlation; PWC - Positive Weak Correlation; CC - Correlation Coefficient; %C - % of Correlation; S – Significant; NS - Not Significant; ISR - Identified Significant Risk

***Source**: Data Analysis Result 2022*

Table 4 revealed that both negative and positive correlations existed between the observed risk factors' occurrence and impact. The proposition from this result is that a positive correlation connotes a direct relationship while a negative correlation connotes an inverse or transposed relationship.

The risk factor with the highest positive correlation was other risk, with a correlation coefficient of 0.382. This result implies a 38.2% correlation between the occurrence of this risk and its impact, which indicated that this risk factor, amongst others, had the highest measure between its occurrence and impact. This result denoted that an increase in the occurrence of this risk would cause a 38.2% increase in its impact; also, a decrease in the occurrence of this risk would result in a 38.2% decrease in its impact. On the other hand, the risk factor with the most negligible positive correlation was Fluctuation in market demand with a correlation coefficient of 0.034; this means there was only a 3.4% correlation between the occurrence of this risk and its impact. It is also worth noting that this risk factor, amongst others, had the lowest positive correlation between its occurrence and impact. This result implied that an increase in the occurrence of this risk would cause a 3.4% increase in its impact; similarly, a decrease in the occurrence of this risk would result in a 3.4**% decrease in** its impact**.**

Table 5. Respondents' perception on occurrence of Risk Factors causing cost variability between contract sum and final account in construction projects

Extent of Risk	All		Architect		Quantity Surveyor		Contractor		Builder		Project Manager		f value	p value
	Mean	R	Mean	R	Mean	R	Mean	R	Mean	R	Mean	R		
Accident during construction	4.37	1	4.50	1	4.18	1	4.38	1	4.45	1	4.33	1	.648	.632
Availability of design information	3.28	2	2.90	4	3.45	5	3.50	3	3.36	2	3.00	2	.780	.545
Fluctuation	3.21	3	2.80	9	3.55	2	3.25	8	3.27	3	3.00	2	.868	.492
Delay in Resolving disputed	3.19	4	2.90	4	3.55	2	3.13	12	3.18	5	3.00	2	.701	.596
Increase in finance rate	3.19	4	2.70	10	3.45	5	3.63	2	3.09	7	3.00	2	1.473	.230
Type of client	3.16	6	2.90	4	3.55	2	3.13	12	3.09	7	3.00	2	.741	.570
Under Estimation	3.16	6	2.90	4	3.45	5	3.25	8	3.09	7	3.00	2	.509	.729
Other risk (please state)	3.14	8	3.10	2	3.36	10	3.38	4	2.82	15	3.00	2	.488	.745
Obtaining construction permits	3.14	8	2.90	4	3.36	10	3.38	4	3.00	13	3.00	2	.525	.718
Poor programme scheduling	3.14	8	2.70	10	3.27	12	3.38	4	3.27	3	3.00	2	.884	.483
Site condition	3.14	8	2.60	16	3.45	5	3.38	4	3.18	5	3.00	2	1.112	.365
Act of God	3.09	12	3.00	3	3.27	12	3.25	8	2.91	14	3.00	2	.285	.886
Shortage of materials	3.07	13	2.70	10	3.45	5	3.00	17	3.09	7	3.00	2	.914	.466
Contractor's default	3.07	13	2.70	10	3.27	12	3.25	8	3.09	7	3.00	2	.610	.658
Bureaucracy in Tendering method	3.02	15	2.70	10	3.27	12	3.00	17	3.09	7	3.00	2	.433	.784
Fluctuation in market demand	2.79	16	2.60	16	3.00	16	3.13	12	2.45	18	3.00	2	1.345	.271
Government policy	2.74	17	2.50	22	2.91	17	3.00	17	2.55	17	3.00	2	.807	.529
Use of inappropriate plant	2.74	17	2.40	26	2.82	20	3.13	12	2.64	16	3.00	2	1.105	.368
Availability & supply of materials & labour	2.72	19	2.70	10	2.82	20	3.00	17	2.36	23	3.00	2	.856	.499
Over Estimation	2.72	19	2.60	16	2.82	20	3.00	17	2.45	18	3.00	2	.670	.617
Insurance cost	2.72	19	2.50	22	2.91	17	3.00	17	2.45	18	3.00	2	1.186	.332
Late arrival of materials	2.72	19	2.50	22	2.82	20	3.13	12	2.45	18	3.00	2	1.166	.341
Bad weather	2.70	23	2.40	26	2.91	17	3.00	17	2.45	18	3.00	2	1.308	.285
Contractors' poor management	2.67	24	2.60	16	2.82	20	3.00	17	2.27	27	3.00	2	1.265	.301
Expertise of construction	2.67	24	2.60	16	2.82	20	2.88	27	2.36	23	3.00	2	.804	.530
Mode of financing	2.67	24	2.50	22	2.82	20	3.00	17	2.36	23	3.00	2	1.156	.345
Method of construction	2.65	27	2.60	16	2.73	28	2.88	27	2.36	23	3.00	2	.838	.509
Variations (Technical)	2.63	28	2.40	26	2.82	20	3.00	17	2.27	27	3.00	2	1.799	.149
Changes in Clients taste	2.56	29	2.40	26	2.64	29	2.88	27	2.27	27	3.00	2	1.373	.261

***Source**: Data Analysis Result 2022*

Table 5 revealed the result of ANOVA on the occurrence of risk factors causing cost variability between contract sum and final account in construction projects in Nigeria indicated that there was no significant difference in respondents' perceptions of the occurrence of all the identified risk factors associated with cost variability between contract sum and final account in construction projects in Nigeria based on their designations. Their f-value reveals this result at sig>0.05. These risk factors include Accident during construction (f-value = 0.648 @ p = 0.632); Availability of design information (f-value = .780 @ p = 0.545); Fluctuation (f-value = 0.868 @ p =0.492); Delay in Resolving disputed f-value = 0.701 @ p = 0.596); Other risk (f-value = 0.488 @ p =0.745); and increase in finance rate (f-value = 1.473 @ p = 0.230) amongst others. The result implies that all the surveyed respondents perceived the occurrence of these risk factors the same way.

5 CONCLUSION AND FURTHER RESEARCH

The current study examined the risk factors causing variability between CS and FAS and appraised the magnitude of agreement from stakeholders' perspectives. Findings revealed fifteen significant risk factors causing variability between CS and FAS within. From the data collected, the mean score analysis, degree of risk analysis and analysis of variance(ANOVA) revealed the top five risk variables in traditionally procured construction projects that impact variability between CS and FAS: Poor programme scheduling, other risks, Availability of design information, Fluctuation and Type of client, which was in concordance with some previous authors like (Odeyinka et al., 2012), (Offei-Nyako et al., 2016) and (Adafin et al. 2016, 2017 and 2020),but for other risk that includes insecurity, social vices and corruption/abuse of office and power.

Furthermore, the study observed a high concordance of participants with the factors identified. As a significant contribution, this study expands researchers' views of the construction community universally regarding the relationship between various risk variables and the attending result on costs in the construction industry in Nigeria and other countries where this issue is under-researched, and framework to be developed as the research is still on going.

The knowledge also provides proper risk analysis (guidelines) that could assist construction stakeholders in measuring cost risks and managing risk practically.

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