Journal of Contemporary Research in the Built Environment ISSN: 2636-4468
Volume 8, Number 1, March 2024

ASSESSMENT OF SYSTEMATIC RISK MANAGEMENT PRACTICES ON BUILDING CONSTRUCTION PROJECTS IN NIGERIA

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ABSTRACT

Purpose: The purpose of this study is to examine the prevailing risk management practices in building construction project delivery within the Nigerian construction industry, considering its significance in economic value creation, employment generation, and GDP contribution.
Design/methodology/approach: Quantitative data were obtained through questionnaire survey. Purposive sampling was adopted and data was collected using close ended questionnaire that were self-administered. 117 questionnaires were distributed and 61 were received, filled and used for the analysis. Descriptive statistics was used to analyse the data collected using statistical package for social science (SPSS V29). Respondents were chosen from one construction firm each classified under the highest building construction class.
Findings: The study revealed that risk management in construction projects is not systematically, deliberately, proactively, or continuously implemented. Instead, risks are addressed in an ad hoc manner, deviating from internationally recognised risk management standards/best practices. This highlights weaknesses within project management practices in Nigeria.
Research limitations/Implications: Limitations of this research include the focus on a specific segment of the construction industry in Nigeria and the reliance on data from Building construction firms, which may not fully represent the entire industry. However, the implications of these findings underscore the need for enhanced risk management practices in construction project delivery to ensure value for money.
Practical implications: The study suggests that project managers within construction firms in Nigeria would benefit from comprehensive training and knowledge in internationally recognised systematic risk management practices. Implementing such practices could lead to better project outcomes and increased efficiency in resource utilisation.
Originality/value: This study contributes to the existing literature by shedding light on the current state of risk management practices in the Nigerian construction industry. By highlighting the deficiencies and advocating for improved risk management methodologies, the research emphasises the importance of aligning project management practices with international standards to enhance project success and economic development.

Keywords: Building Construction Projects; Construction Industry; Constructor; Risk Management; Risk Management Practices; Systematic Risk Management.

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1. INTRODUCTION

The successful execution/construction of building projects is one of the objectives/goals of the construction industry. The construction industry (CI) is one of the fore-most important industries of any nation. It contributes significantly to the growth of any nation's economy by creating value, labour, and contributing to the gross domestic product (GDP) (Owoo & Lambon-Quayefio, 2018; Urbanski *et al*., 2019), in particular, and plays a pivotal role in driving the global economy (Shishehgarkhaneh *et al*., 2024 citing Ahmad *et al*., 2020), in general. Construction refers to the creation, repair, maintenance, alteration, and demolition of buildings, highways, streets, bridges, roads, sewers, railways, telecommunication systems (Owoo & Lambon-Quayefio, 2018), and many more. CI is susceptible to risks due to the involvement of complex and uncertain activities that may affect construction project scope, budget, and timely achievement (Hassan *et al*., 2023, quoting Pinto *et al*., 2011). Despite the inclusion of health and safety and environmental sustainability as factors for determining success (Zhao, 2024) and other scholars and clients, the iron triangle of quality, cost and time (Oyekunle, 2024 citing Unegbu *et al*., 2022) are the long-ago established parameters, and still very valid, for measuring project success at construction stage. The 100% achievement/attainment of these parameters is only possible with the complete absence or elimination of all risks.

However, due to the challenging, dynamic and complex nature of the industry, no construction project is free of risks. In other words, risks are inherent in every construction projects. Risk is multi-faceted, and in the context of the construction industry, it could be the likelihood of the occurrence of a definite event/factor or combination of events/factors which occur during the whole process of construction to the detriment of the project (Ajayi *et al*., 2022 citing Mhetre *et al*., 2016). Research has indicated that both practitioners and scholars in the industry are unanimous in their agreement that construction projects are exposed to more risks compared to other industries as a result of the complex nature of the industry (Mills, 2001; Serpell *et al*., 2015; Shojaei & Haeri, 2019; Taofeeq *et al*., 2019). However, not all risks are detrimental to project success. According to Project Management Institute (PMI) (2017), risk is any uncertain event or condition that, should it occur, has either a positive or negative impact on one or more project objectives/parameters. Risk Management (RM), on the other hand, according to the British Standards BS31100 cited in Shibani *et al*. (2022) is the mechanism by which resolutions are taken to consider a recognised or measured risk and to undertake steps to minimise the effects or the occurrence probability. RM in the context of construction management is a comprehensive and systematic way of identifying, analysing and responding to risks to achieve the project objectives (Banaitiene & Banaitis 2012). However, most of the times, these risks are not dealt with appropriately, nor systematically, resulting in the industry suffering poor performance (Belel & Mahmood, 2012). Also the RM system and practices of most organisations, according to Choudhry and Iqbal (2013), are reactive, semi-permanent, informal, and unstructured with little or no committed resources to deal with risks. Crispim *et al*. (2019) and Justus *et al*. (2024) added that the inability to cope with risk is the main cause for exceeding budget, exceeding deadlines and failing in other project objectives and intended outcomes. CI in developing countries approach RM in construction by using sets of practices that are normally insufficient, often producing poor results, and limiting project success (Adekele *et al*., 2019; Serpell *et al*., 2015). Instead of systematically tracking the risks, constructions firms allow all sorts of risks only to refer everyone of it to either insurance, subcontractors, and/or client or other parties (Banaitience and Banaitis, 2012 citing Wang and Chou, 2003), (a minor solution which is actually a subset of Systematic RM), thereby increasing the overall project cost, in most instances. Systematic Risk Management (SRM) is a management tool, which requires practical experience and training in the use of the technique (Mills, 2001). SRM involves quantitatively and comprehensively tracking, continuously and in an orderly manner, all risks (the known ones and the ones that are unknown and even the unexpected), assessing their likely effects (positive or negative), and whether they be treated as insurable or uninsurable risks, in order to effectively and efficiently manage them. SRM is also a proactive process, in the sense that it allows any detection of risks before they occur. Fostering a proactive RM culture is crucial to project success and stakeholders' satisfaction (Shishehgarkhaneh *et al*., 2024).

In compliance with best practice, Boateng *et al*. (2020) assessed SRM practices on building construction projects in Ghana. The study found that RM is not dealt with in a systematic, deliberate and continuous manner, but in an ad-hoc manner. This is despite the suggested guide by APM (2019) cited in Oyekunle (2024) that RM be a methodical approach; without which is the eminent resultant difficulty of maximising (positive) project's outcomes. Bahamid *et al*. (2022) studied the RM practices and knowledge in Yemen construction industry, but also concluded that risk was not managed systematically. The research went further to conclude that to guarantee that construction projects obtain maximum value for money, project managers of big construction businesses in Yemen need a strong understanding and training in globally accepted SRM procedures.

Comparatively, in Nigeria, most of the previous studies on RM have dwelt on the capacity of project participants in managing project risks. While Bukar and Ibrahim (2021) revealed that the major problem of the construction industry in risk is the lack of a regulatory framework to be imbibed and implemented by the companies and firms in the industry, Ezeabasili *et al*. (2021) identified risks and their criticality in the Nigerian construction industry. However, the study focused on RM practices at the various stages of the project lifecycle and not the capacity of participants to manage risk. Several studies in this area have emphasised on risk identification, risk analysis, adoption RM practice and its impacts, rightly so in trying to x-ray all the processes in details, but RM must always be looked at and taken holistically. Belel and Mahmood (2012) assessed RM practices but their focus was on Risk Identification, Benefits of RM practices and factors affecting RM practices. They found that insufficient skilled staff was identified as the most important source of risk in construction, while, lack of RM knowledge was ranked the most severe factor that militates against the practice of risk management.

Risk (internal and external) and risk management have significant impact on project performance (Bukar & Ibrahim, 2021). From the foregoing attempts, only a few studies may have been carried out on SRM Nigeria despite its numerous advantages, and therefore, a gap that this study seeks to fill. This study investigate the current practices of RM in Building Construction Projects through stepwise processes of RM, with a view to assessing whether or not they are done systematically. Advantages of SRM include, but not limited to: questioning the assumptions that affect success of construction projects the most; concentrating attention on actions that best controls risks; and assessing the cost-benefit of such actions (Mills, 2001).

2. Literature Review

2.1. Risk Management Processes in Construction Industry

El-Karim (2017) defined RM as the systematic process of identifying, analysing and responding to project risk, and it includes maximizing and minimizing the probability and consequences of positive and negative attributes respectively. There are four stages in the methods to managing risk in construction industry a) risk identification; b) risk analysis and evaluation; c) risk response; and d) risk monitoring. By making use of the RM process, one can achieve a major improvement in the performance of the construction project management. The goal of RM process is not to completely remove all project risks. This is impossible according to Burchett (1999) in Mills (2001). Its aim is to produce an organised framework that will make management, to manage project risks, most importantly the crucial ones, in a more efficient and effective way (Bahamid & Doh, 2017).

RM is broader than insurance or insurance management, and for it to be effective it has to be done all through the construction life cycle of a project. Al-Bahar and Crandall (1990) assert long ago that even where risks are assessed, contracting firms do not frequently assess/evaluate the consequences (potential impact) associated with individual risks. This is managing risk in an effective way. Once a risk has been addressed and assigned a certain status, it is imperative to revisit it periodically to reassess its impact and adjust measures as necessary (Ruha, 2024). The ineffective implementations of risk management are often caused by, according to Liu *et al*. (2007): a lack of formalised RM procedures (also in Choudhry & Iqbal, 2013), including risk identification, analysis and control; a lack of continuity of RM in the different stages in the project life cycle, including conceive, design, plan, allocate, execute, deliver, review and support; poor integration between RM and other key processes, including design, estimating, planning, production, logistics, cost analysis, manufacturing, quality assurance, reliability, schedule analysis, support (e.g. maintainability), and test and evaluation; and a lack of interaction among different parties, including clients, contractors, insurers, and suppliers.

2.1.1. Risk Identification

PMI (2017) states that the whole process of RM must be planned, thus beginning with Plan Project Risk Management, before the identification of risks, their sources and classifications. Risk Identification attempts to classify responsibilities (Banaitiene & Banaitis, 2012). It determines the potential risks inherent in any project including sources, possible consequences and identify entities affected by risks (Hansen-Addy and Fekpe, 2015; Szymanksi, 2017). It also documents their characteristics which aid in risk analysis and fashioning out appropriate risk responses (PMI, 2017).

2.1.2. Risk Analysis

According to Wang (2004), Risk Analysis is the intermediate process between risk identification and management. This process rates identified sources of risks and uncertainties about the goals of a project, and usually accompanied by the estimation of the probability of occurrence and the severity of risk impacts (Szymanksi, 2017). Identified risks are analysed qualitatively and/or quantitatively. According to Hansen-Addy and Fekpe (2015), Qualitative Risk Analysis assesses the probability of occurrence of risks and the level of severity of impacts accompanied with these risks in a project. Banaitiene and Banaitis (2012) pointed out that Qualitative Risk Analysis permits key risk factors to be identified. It does not necessarily follow that all identified risks that are analysed qualitatively are further analysed quantitatively. As explained by PMI (2017), it is not even required for all projects. Literature largely agrees on what constitutes Quantitative Risk Analysis. Quantitative Risk Management, according to Banaitiene *et al*. (2011) involves the use of more sophisticated techniques and methods to investigate and analyse risk, by estimating the probability of occurrence of identified risk factors and the potential impact on projects.

2.1.3. Risk Response

Risk Response, according to Hansen-Addy and Fekpe (2015) is the process where strategies are formulated to deal with risks that have been identified and assessed, as and when they occur. PMI (2017) pointed out that these formulated strategies are selected from developed options, and actions to address overall project risk exposure, as well as treating individual project risks agreed on. This agreement is based on PMI's philosophy that all Project Team Members and key stakeholders must buy into the plan. It is at this stage that the bought-in plan of responding to identified and analysed risks, as and when they occur, would be implemented.

2.1.4. Risk Monitoring

Hansen-Addy and Fekpe (2015) identified risk monitoring as the final process in SRM. This phase, they continued, monitors and responds to current and emerging risks. Residual risks, that is, risks that still remain after implementing risk responses, and secondary risks, which are risks that arise directly out of the implementation of risk responses, are monitored (PMI, 2017). Risk Response is keeping track of risks identified, monitoring residual risks, and identification of new risks and evaluation of the effectiveness of the whole RM process. This view is also largely supported by PMI (2017). Judiciously managing risk does not imply avoiding it but to identify it correctly and determine all associated opportunities and hazards (Szymanksi, 2017).

2.2. Current Risk Management Practices in Construction Industry

There exists extensive literature in the field of risk studies in the construction industry. In the study of Zou *et al*. (2007), key risks in construction projects in Australia were identified and their likelihood of occurrence assessed. Risks were prioritized according to the significance of their influences on typical project objectives in terms of cost, time, quality, safety and environmental sustainability, and then scrutinised from a joint perspective of project stakeholders and life cycle. In Sri Lanka, Perera *et al*. (2014) adopted Delphi technique to identify critical risks on a life cycle basis and defined how such risks were shared and handled by parties involved in the projects. The findings showed that the construction and design phases are prone to many major risks. Moreover, "delays in payment by the client" was the most critical risk factor in the construction stage. Serpell *et al*. (2015) revealed the need for development of an instrument based on an organisational maturity model for evaluating the risk-management capability of construction organisations. This instrument has been applied to both, clients and contractors and is part of a general knowledge-based system that would allow a client or contractor first, to develop or improve its project RM capabilities based on international and local best practices; and second, to continuously improve the performance of this function along the realisation of new projects. Pawar and Pagey (2017) identified risks, investigate severity, examined RM actions in India. The study concludes that RM is essential to construction activities in minimizing losses and enhancing profitability. Serpell *et al*. (2015) tried fostering the effective usage of RM in construction. Their findings showed that risk management is either not used or done ineffectively in domestic construction projects. One of the primary reasons for this appears to be the lack of RM capabilities and knowledge. El-Karim (2017) also assessed the effect of factors affecting cost and time contingencies. Estimating cost and scheduling contingencies are major factors in achieving a successful and realistic budget and schedule for construction projects.

Previous research results in Nigeria have established that organisations that employ construction services on a periodic basis do not analytically practice RM, which has led to adverse effects for the performance of projects, for instance, the abandonment of projects (Aibinu & Jagboro, 2002) cited in Ugwu *et al*. (2019). Also, Nigeria's inability to manage risk properly has led to increase in projects failure (Nnadi *et al*., 2018) cited in Ugwu *et al*. (2019).

2.3. Systematic Risk Management Practices in Construction Industry

The construction industry being the most fragmented industry has several risks from several known, unknown and unexpected sources. According to Godfrey (1990) in Mills (2001), Systematic risk management (SRM) help to: identify, assess, and rank risks, making the risks explicit; focus on the major risks of project; make informed decision on the provision for adversity, such as mitigation measures; minimise potential damage should the worst happen; control the uncertain aspects of construction projects; and identify the opportunities to enhance project performance. SRM is a management tool, which requires practical experience and training in the use of the technique (Mills, 2001). SRM allows for early dictation of risks. SRM should be part of management functions, as it requires top management support.

Boateng *et al*. (2020) assessed SRM practices on building construction projects in Ghana, which they found was not done in a systematic and continuous manner. Project managers of large construction firms in Ghana require sound knowledge and training in internationally recognised SRM practices in order to ensure achievement of value for money in construction projects, they concluded. Similarly, in Yemen, as cited earlier, research revealed that, risk management is not executed systematically, intentionally, or continuously, and most firms' RM procedures are reactive, semi-permanent, informal, and unstructured, with few or no dedicated resources to address risks. This strategy is inconsistent with generally accepted risk management principles (Bahamid *et al*., 2022). SRM practices are essential in order to handle and manage risks so that the success of projects can be ensured (Abdul-Rahman *et al*., 2015 citing Hossen *et al*., 2015). Although all uncertainties cannot be removed, SRM improves the chances of the project being completed on time, within budget, to the required quality, and with proper provision for safety and environmental issues (Mills, 2001). To guarantee that construction projects obtain maximum value for money, project managers of construction businesses need a strong understanding of and training in globally accepted SRM procedures.

2.3.1. Models and Frameworks

The use of models and frameworks have been proposed by several researchers. A formal RM process, according to Zhao (2024), has been recognised as an effective way to handle risks in organisations. ISO31000:2018 provides a generic RM framework and process (Zhao, 2024). Also according to Zhao (2024), PMI (2017) develops a framework and process for RM at project level. Some, out of the numerous, models developed include: Cynefin-Risk (CR) model (Frank & Mohamed, 2024); Construction Risk Management System (CRMS) (Al-Bahar & Crandall, 2024); Innovative Framework and Alien Eyes' Risk Model (Nawaz *et al*., 2019). Models that bring together all the processes (as listed previously) and the attributes of SRM can be developed to bring together all that are needed for SRM for construction project. The development and/or usage of most of the models and frameworks mentioned above, and more (not stated here), have not been sighted in literature. Most of them have either stopped at the level of proposals or actually developed but missing in literature.

2.3.2. Artificial Intelligence (AI)

Just as has been found to fit into the several facets of many industries in general and the construction industry in particular, the AI is being proposed and works are in advanced stages for the use of AI in construction risk management. Shishehgarkhaneh *et al*. (2024) and Zhao (2024) have highlighted the introduction of AI in RM. Though, as adequate captured, the sources of construction project risks are both internal and external. While, the internal sources within the control of the organisation and so very possible for AI, the external sources may not. This is due to the complexity of the industry, which is filled with so much uncertainties.

3. METHODOLOGY

Quantitative research approach was adopted in this study. Quantitative research is the collection and analysis of numerical data to describe, explain, predict or control phenomena of interest. This research reviewed relevant literature. Well-structured closed ended, self-administered questionnaires were also used to collect data from construction practitioners. The questionnaire consisted of two Parts (Parts A & B). Part A consisted of the respondent's general information such as their profession, years of experience and level/position in organization. Part B consisted of a table of probability of occurrence based on Likert scale of 1-5, where: 1 = Never; 2 = Least often; 3 = Less often; 4 = Often; 5 = Very often.

In this study, data was collected from registered Building construction firms in Nigeria. In order to effectively answer the research questions, there was the need to engage construction managers in building construction companies with adequate practicing experience in risk management, and who are also recognised built environment professionals. Purposive sampling technique was adopted. Purposive sampling technique being a non-randomised technique that does not need underlying theories or set of sample size, thus the study set out to find respondents who could and were willing to provide information by virtue of their experience and knowledge. The actual sample size was established from the field study (Bernard, 2002). Construction companies in Abuja and

Lagos were found to be 70 and 450 respectively (Business-List, 2023). According to Yamane (1967), the sample size of a given population can be calculated using Equation 1.

$$n = N/1 + N * e^2 \qquad \ldots Equation\ 1$$

Where,

n = Required Sample Size

N = Total Number of the Population

e = Level of precision or sampling error (10%)

Total Sample Population = 520

Salkind (1997) recommends a 40% to account for non-response/uncooperative subjects. Therefore, Sample Size (n) was found to be approximately 117, which were self-administered and distributed to construction firms within Abuja and Lagos. 52% were returned duly filled, and were analysed using descriptive statistics (mean score and standard deviation) and ranked according to mean score which considered factor with ≥3.50 statistically significant.

4. PRESENTATIONAND DISCUSSION OF RESULTS

4.1. Respondents Profile

A summary of respondents' profile show Project Managers (27.9%) and Quantity Surveyors (24.6%) recorded the highest response. Majority of the respondents (82%) had working experience of between 5 and 20 years and they are in-between supervisory and top-level management cadre. This is an indication that the firms had experienced and knowledgeable respondents and also show their ability to grasp management issues.

Table 1: Demographic Information

Professional Qualification	**Frequency**	**Percentage (%)**
Architect	11	18.0
Quantity Surveyor	15	24.6
Engineer	12	19.7
Project Manager	17	27.9
Builder	6	9.8
Total	61	100.0
Years of Working Experience		
Below 5 years	5	8.2
5 - 10 years	14	23.0
10 - 15 years	15	24.6
15 - 20 years	21	34.4
Above 20 years	6	9.8
Total	61	100.0
Level/Position in Organisation		
Top Level Management	15	24.6
Medium Level Management	27	44.3
Supervisor Role	16	26.2
Technical Staff	3	4.9
Total	61	100.0

4.2. Systematic Risk Management Practices in Building Construction Projects

In order to ascertain the current practices of systematic risk management in the construction industry, respondents were asked to indicate the level of frequency for undertaking risk management activities under Risk Identification, Risk Analysis, Risk Response and Risk Monitoring. Clustering mean scores were computed which also aided to obtain ranking of variables to determines statistical significance. The following measurement scale regarding mean scores were used: where 1=Never (1.00 to 1.80); 2=Least often (1.81 to 2.60); 3=Less often (2.61 to 3.49); 4=Often (3.50 to 4.20); and 5=Very often (4.21 to 5.00). Means and indices ≥3.50 were considered statistically significant. Having determined the mean score of each variable, the frequency indices for the risk management processes were computed, ranked and compared to a significant threshold of ≥3.50 (Ameyaw & Chan, 2015; Renault *et al*., 2018).

Table 2: Risk Identification (RI) Process

Variables	Code	Mean	Std. Deviation	Ranking
Developing risk breakdown structure to define risk categories	RI1	2.66	1.09370	5
Estimating resources and costs needed for risk management activities include them in project budget	RI2	3.11	1.24773	2
Defining and including risk management activities in the schedule	RI3	2.84	1.03570	3
Holding planning meeting to develop risk management processes and procedure	RI4	2.51	1.08969	7
Consciously developing process for identifying risk	RI5	2.54	1.07353	6
Involving all key stakeholders in risk identification	RI6	2.74	1.26361	4
Identifying risk as and when they occur	RI7	3.98	1.08769	1

4.2.1. Process One - Identification of Risk Factors

Under risk identification variables (Table 2), *'Identify risk as and when they occur'* emerged the only significant factor with a mean score of 3.98 and a corresponding standard deviation of 1.087 under this subcategory. Closely following is *'Estimate of resources and costs needed for risk management activities include them in project budget'*, though not statistically significant having obtained a mean score of 3.11. This implies that risk identification is not carried out in line with proper risk management processes or systems. This particular process is the least engaged risk management process, even though it is expected to be the most critical (Mills, 2001). Even though a major tool for risk identification is brainstorming sessions which involve all stakeholders (PMI, 2017), this came out insignificant as a further proof of risk factors not being systematically identified.

Table 3: Risk Analysis (RA) Process

Variable	Code	Mean	Std. Deviation	Ranking
Developing risk matrix that defines probability and impact of risk	RA1	2.44	0.86650	5
Create priorities of risk	RA2	2.57	1.07174	2
Establish overall risk of project	RA3	2.51	1.20586	3
Assess of probability of achieving specific project objective	RA4	2.38	1.05141	6
Develop qualitative risk analysis methods and tools	RA5	2.49	1.16366	4
Analyse risk as and when they occur	RA6	3.79	1.06638	1

4.2.2. Process Two - Analysis to Identified Risk

A total of 72% of respondents revealed that risks were analysed (very) often as and when they occur and hence, with a mean score 3.79, considered significant under the study (Table 3). However, the entire process of Risk Analysis was found to be not significant.

This further reinforces the position that risk management in construction is carried out in an unplanned manner (Mhetre *et al*., 2016). Whiles Hansen-Addy and Fekpe (2015) pointed out joint evaluation by key project participants as the most frequently used risk analysis practice, findings in this study indicate otherwise. From the above table, all the other steps under risk analysis proved insignificant, indicating that this process in risk management, though carried out in some instances, but were not done systematically.

Table 4: Risk Response (RR) Process

Variables	Code	Mean	Std. Deviation	Ranking
Assign one or more persons for each agreed to risk response	RR1	2.43	1.14687	6
Use tools like decision tree analysis to choose the most appropriate response	RR2	2.48	1.08944	5
Develop planned responses	RR3	2.85	1.06201	4
Allocate contingency reserve for time	RR4	3.56	1.21848	3
Allocate contingency reserve for cost	RR5	3.62	1.14257	2
Response to risk as and when they arise	RR6	3.87	1.10265	1

4.2.3. Process Three – Responses to Analysed Risk

The results revealed that planned responses are not developed to manage risk factors; neither is anyone or persons assigned to develop risk responses (Table 4). Very much like risk identification and analysis, there are no tools that are used to choose appropriate risk responses. However, respondents were of the view that contingency time and cost reserves are allocated as risk response measures as they both attained mean scores (3.56 and 3.62 respectively) above the significant threshold of 3.50. With most projects travelling well beyond initially intended completion periods, according to Asiedu and Alfen (2016), contract durations are promptly extended to cater for any delays. Consistent with the developing trend from the findings, risk factors are mostly responded to as and when they occur, without prior identification and analysis (Boateng *et al*., 2020).

Table 5: Risk Monitoring (RM) Process

Variables	Code	Mean	Std. Deviation	Ranking
Discussion of risk in team meeting	RM1	3.02	1.05660	3
Actively and routinely track risk and reassess	RM2	2.39	1.08442	4
Project team hold periodic meeting specifically for risk discussions	RM3	2.34	1.20948	5
Examine the effectiveness of risk response	RM4	3.08	1.08467	2
Monitor risk, not specific all, but as part of general management of the project	RM5	3.75	1.01087	1

4.2.4. Process Four – Monitoring of Risk Responses

From (Table 5) above, RM5 is the only activity that is significant. This means that risk is not specifically monitored, but as part of general project meetings, having obtained a mean score of 3.75 and the standard deviation of 1.011. This does not deviate so much from the findings of Hansen-Addy and Fekpe (2015) who indicated periodic status reporting, which is part of general project meetings, as the most frequently used risk monitoring tool. This points to the fact that risk is not systematically and consciously monitored. Since risk management is not consciously carried out, risks are not routinely tracked and reassessed, the effectiveness of responses is not evaluated, and no dedicated meetings are held to address risk. This buttresses the findings of Yirenkyi-Boadi and Chileshe (2015) who concluded that though construction professionals in Ghana are aware of risk management practices, they do not implement them.

4.3. 4.3. Consistency Reliability Test

To ensure reliability of the questionnaire, it was checked for internal consistency reliability through Cronbach's alpha.

Table 6: Cronbach's Alpha Reliability Coefficient for Likert-type

No.	Coefficient of Cronbach's Alpha	Reliability Level
1	More than 0.90	Excellent
2	0.80-0.89	Good
3	0.70-0.79	Acceptable
4	0.60-0.69	Questionable
5	0.50-0.59	Poor
6	Less than 0.49	Unacceptable

Source: Gliem and Gliem (2003)

As a rule of thumb, to satisfy reliability requirements, values should be greater than 0.70 (Ringle, 2020). Cronbach's alpha value for this study ranged between 0.70-0.79 (0.704). Thus, the questionnaire satisfied both reliability requirements.

Table 7: Cronbach's Alpha Reliability Test

Scale Reliability Statistics	
	Cronbach's α
Scale	0.704

4.4. 4.4. Factor Analysis

Factor Analysis (FA), which is part of the General Linear Model (GLM) family of procedures that has same assumptions as multiple regressions, and is primarily used to identify not-directly-observed factors based on a larger set of observable or measurable indicators (variables). To understand the nature of a particular variable, factor loadings are computed. Factor loading is the correlation between the original variables in the specific factor. To test for statistical validity, Kasier – Meyer – Olkin (KMO) was computed (Table 8). KMO measures whether or not the distribution of value is adequate for conducting FA. KMO with value >0.50 is acceptable. However, a measure of KMO >0.90 is marvellous, >0.80 meritorious, >0.70 middling, >0.60 mediocre, >0.50 miserable and <0.50 unacceptable (George & Mallery, 2003). The use of FA in construction risk management has gained acceptance as many studies have adopted its use (Renault, 2018; Zafar, 2019).

In the RM phases of identifying, responding to, and monitoring risks, all factor loadings were above 0.50, and the Kaiser-Meyer-Olkin (KMO) measure exceeded 0.6, indicating the suitability of the data and sample size for Factor Analysis. Similarly, in the risk analysis process, the KMO was 0.72, and all factor loadings were above 0.50, indicating appropriateness for Factor Analysis.

Certainly, in both the risk identification, response, and monitoring stages, as well as the risk analysis process, the high factor loadings exceeding 0.50 indicate strong relationships between the observed variables and the underlying factors being measured. Additionally, the satisfactory KMO values suggest that the data collected is appropriate for Factor Analysis, affirming the robustness of the analytical approach employed in assessing and managing risks. This level of validation enhances confidence in the results obtained and strengthens the overall RM framework, enabling more informed decision-making.

Table 8: Factor Analysis

Variable	Indicator	Factor Loading	KMO
Develop risk breakdown structure to define risk categories	RI1	0.816	0.69
Estimate resources and costs needed for risk management activities include them in project budget	RI2	0.920	
Define and include risk management activities in the schedule	RI3	0.576	
Holding of planning meetings to develop risk management	RI4	0.612	
Consciously develop process for identifying risk	RI5	0.748	
Involve all key stakeholders in risk identification	RI6	0.521	
Identify risk as and when they occur	RI7	0.640	
Develop risk matrix that defines probability and impact of risk	RA1	0.811	0.72
Create priorities of risk	RA2	0.701	
Establish overall risks of project	RA3	0.866	
Assessment of probability of achieving specific project objective	RA4	0.460	
Develop qualitative risk analysis methods and tools	RA5	0.682	
Analyse risk as and when they occur	RA6	0.776	
Assign one or more persons for each agreed to risk response	RR1	0.382	0.68
Use tools like decision tree analysis to choose the most appropriate response	RR2	1.022	
Develop planned responses	RR3	0.708	
Allocate contingency reserve for time	RR4	0.705	
Allocate contingency reserve for cost	RR5	0.715	
Response to risk as and when they arise	RR6	0.594	
Discussion of risk in team meeting	RM1	0.572	0.60
Actively and routinely track risk and reassess	RM2	0.819	
Project team hold periodic meeting specifically for risk discussions	RM3	0.372	
Examine the effectiveness of risk response	RM4	0.820	
Monitor risk, not specific all, but as part of general management of the project	RM5	0.419	

5. Conclusion and Recommendations

This study aimed to assess the SRM practices on building projects in Nigeria. The techniques of project RM in the Nigerian construction industry were discussed. There is little recording of the RM process, which is viewed as an informal and insignificant effort by all stakeholders. This research discovered that risk management is not conducted in a systematic manner due to a lack of risk identification, analysis, response, and monitoring tools.

This study therefore recommends holistic risk management as against ad-hoc approaches. Also, construction professionals and all those involved in risk management should receive the necessary trainings, and firms should develop ways of harnessing, storing and sharing practical experiences, expertise and knowledge. Top management and organisational culture should support efforts towards systematic risk management, with its full inclusion in the organisations governance structures. Full accountability of all risk management efforts must be asked for and documented, and continuous improvement of systematic risk management be made part of the contracting organisations. Also consideration of managing risk through the use of models and frameworks, with the assistance of Artificial intelligence should begin to be in the forefront of management meetings and thinking.

In recent times, advocacy is in favour of managing risk at the enterprise level. However, very little is known about enterprise risk management in the Nigerian construction industry. Further research should focus on unearthing the challenges working against the implementation of Enterprise Risk Management in developing countries such as Nigeria.

6. Limitation of theStudy

This study is limited to the risk management of contracting organisations, from where all data were collected. Further studies could assess other stakeholders in the industry.

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