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Pathways for Navigating Prevalent Construction Risk Types in Nigerian Building Projects

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Abstract

Contractors are compelled to reduce direct and indirect project costs due to escalating competition in the building industry. Many find that implementing a risk management strategy enhances competitiveness. This study uniquely evaluates risk mitigation strategies for SMEs in a developing economy context. Thus, this study analyses the adequacy of contractors' pathways to navigate common risk types with a view to achieving sustainable growth of contracting firms. Results show that contractors commonly use 33 pathways to navigate 13 construction risk categories, the most effective pathway being cost control and estimating techniques for managing the financial risk category. Therefore, it is recommended that contractors implement modern cost control and estimation techniques for effective risk management. This may be accomplished by co-opting key financial experts in budgeting and keeping contingency funds on hand for emergencies.

prevalent risk types project success risk management mitigating strategy

Introduction

The construction sector is characterized by its changing environment, complexity, and involvement of various stakeholders. While the construction

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industry contributes greatly to the growth of the economy of nations, it is prone to a lot of risks and challenges (Simeon & Soyingbe, 2023). Some of the risks associated with the complexity of construction projects include schedule, financial, environmental, political, and safety-related concerns. According to Liao et al. (2021), construction projects consist of various stages, including design, construction, operation, and maintenance. Several risks associated with each phase are design, execution, financial, political, and contractual, among others. In this vein, Wong et al. (2018) note that delays and rework might be attributed to omissions and changes to designs during the design and construction phases. Yet, inflation and fluctuating material prices, which are key examples of financial risk, are attributable to Nigerians' avarice and thus, self-inflicted. Purnus and Bodea (2015) add that financial risks in construction projects are caused by changes in the economic environment, funding shortages, currency rate fluctuations, and political instability. Lam et al. (2023) note that the exposure of construction projects to financial uncertainty may lead to bankruptcy. The inability of workers to identify and reduce safety risks is traceable to a lack of strong safety culture, inadequate training, and awareness initiatives. Meanwhile, Kim et al. (2020) add that the lack of skilled labor has significant effects on project management, influencing both labor output and work quality. These construction risks are not only peculiar to the construction industry in developed countries, but they are also prevalent in the construction industry of developing countries. In this regard, Simeon et al. (2024a) opine that many construction projects across the world are of variable quality, perform poorly, and money is spent without achieving client satisfaction. Besides, Gbadeyan et al. (2022) attribute contractual risks in the Nigerian construction industry to high corruption rates, political instability, and inadequate governance systems.

In the same perspective, perhaps the most notable external factor that can influence a contractor’s attitudes to risk is public policy, which may change how the firm's risk management and project management are done (Taofeeq et al., 2020). Since these risks can arise at any project stage, controlling them is crucial for meeting time, cost, quality, safety, and environmental objectives (Al-Hashimi & Masuri, 2022). If these common risk types are not sufficiently identified, analyzed, and mitigated, their consequences may lead to poor project outcomes, including delays, cost overruns, inferior quality, and compromised safety. Therefore, risk management is now a key aspect of construction project management. Projects have to be finished on time, within the budget, and to a certain level of quality, and therefore, risk identification, risk assessment, and risk mitigation are key aspects of the project. Aldaiyat (2021) affirms that performing risk analysis helps accomplish goals for construction projects.

In this regard, various approaches have been devised to address these risks (Yusuf, 2016; Chen et al., 2020; Oladiran et al., 2022; Gbadeyan et al., 2022; Osuizugbo et al., 2022; Belanova, 2023; Simeon et al., 2023; Hennings et al., 2023; Oladiran et al., 2024), but their use is frequently uneven, and their effectiveness varies among projects. For instance, security risks can be navigated by leveraging technology. Simeon et al. (2023) substantiate that closed-circuit television (CCTV) surveillance is of significance in crowded areas, like construction sites, and is paramount to mitigating possible risks to workmen and visitors. Moreover, Belanova (2023) notes that technology risk is navigated by carefully assessing new technologies before implementation. Meanwhile, Chen et al. (2020) opine that the use of project management software has proven to be an effective means of navigating schedule risk.

Oladiran et al. (2022) and Oladiran et al. (2024) accentuate that building information modeling (BIM) is often utilized to reduce design risk by enabling precise and thorough visualization, collision detection, and design simulation before construction. Meanwhile, contractors often include force majeure clauses in their contracts to navigate force majeure risks. A force majeure clause, which is also known as a superior force, is a provision that protects both the contractor and client from penalties in the event of an unforeseen incident such as war, strike, government action, or natural disasters that prevent them from fulfilling the contract terms. Yusuf (2016) explains that the force majeure clauses specify each party's obligations in the case of a force majeure incident and include provisions for time extensions or additional expenses. Meanwhile, builders' early participation substantially impacts the idea of buildability. Osuizugbo et al. (2022) contend that collaborations between designers and builders throughout the design stage improve buildability because construction stakeholders may contribute insights that lead to more realistic design solutions.

Given the presence of various risk management strategies, research that specifically discusses each of these pathways is needed. Moreover, very few studies have been conducted to provide comprehensive pathways to navigate prevalent risk types. Thus, assessing the effectiveness of the approaches being used by contractors to navigate these risks is urgently needed since current methodologies tend to rely on reactionary strategies instead of proactive risk management strategies. Thus, this study evaluates the effectiveness of contractors' approaches to navigating prevalent risk types with a view to promoting sustainable growth among contracting firms. The research objective assesses pathways for navigating the various construction risk types. The study's significance lies in its ability to prepare contractors to navigate impending risks through the development of proactive mitigation strategies.

Literature Review

Pathways for Navigating Common Construction Risks

Contractors often use an array of pathways to navigate the aforementioned risk types. Some of these pathways are now being discussed. Weather risk clauses, often referred to as weather contingencies, are crucial tools for contractors to navigate construction or execution risks that are related to inclement weather. Contracts are drafted with these provisions to handle the possible effects of weather-related delays on project budgets, schedules, and performance. According to Senouci and Mubarak (2016), the weather has a major impact on construction activities, which increases costs and causes delays. According to Ballesteros-Pérez et al. (2016) and Ballesteros-Pérez et al. (2018), inclement weather can cause major project delays, resource waste, and financial losses for both parties; hence, such clauses must be included in construction contracts. Moselhi et al. (1997) add that weather-related factors impact 45% of all construction activities, leading to potential yearly cost increases of billions of dollars. The incorporation of weather contingencies into project planning allows contractors to create more practical timelines that consider possible weather delays.

Meanwhile, reducing the risks of theft and vandalism requires effective management techniques. Farinloye et al. (2013) advocate implementing a variety of security systems that are suited to the type of construction work being done. Agyeman and Gyamfi (2017) corroborate that encouraging the installation of strong monitoring systems can identify and discourage theft on building sites. The security of unmanned locations during non-working hours could be improved by combining CCTV with motion detection devices and alarms. Simeon et al. (2023) buttress that CCTV surveillance is of significance in crowded areas, like construction sites, and is paramount to mitigating possible risks to workmen and visitors. Contractors may work with private security companies in high-risk locations to guarantee site safety, particularly after work hours (Fennelly, 2016). Eastman et al. (2011) have shown that building information modeling (BIM) is being utilized more often to reduce design risk by enabling precise and thorough visualization, collision detection, and design simulation before construction.

Environmental management systems (EMS) aim to increase a company's competitiveness and environmental responsibility at the same time.

Kumaraswamy and Chan (1998) substantiate that contractors frequently put EMS in place for monitoring and lessening the environmental effects of their operations, as compliance with environmental standards is crucial. Meanwhile, construction projects may be disrupted by force majeure risks, which are uncontrollable occurrences like natural disasters, pandemics, or political upheavals. In order to reduce these risks, contractors include force majeure clauses in their contracts. According to Yusuf (2016), these clauses specify each party's obligations in the case of a force majeure incident and include provisions for time extensions or additional expenses. Similarly, Hennings et al. (2022) argue that contractual provisions of force majeure frequently only offer temporary respite to postpone fulfilling contractual commitments.

Meanwhile, project managers can estimate the influence of different risk factors on project timelines and anticipate any delays by using advanced software tools. Meanwhile, Chen et al. (2020) show how using a neural network framework may help anticipate delays in prefabricated building projects. It is crucial to use past project data when creating quality and scheduling plans, as this may greatly lower project goal deviations. Proactive risk management requires these predictive skills, which help project teams foresee problems before they become serious. The Critical Path Method (CPM) is a well-known approach for project scheduling, notably in construction and engineering projects. It is an important tool for controlling schedule risks because it identifies the longest run of dependent tasks and determines how long it takes to finish them. Aghileh et al. (2024) add that this strategy allows project managers to identify essential functions that directly impact project completion time, enabling more efficient resource allocation and risk management techniques.

Meanwhile, the early participation of builders in the design stage of building projects is increasingly regarded as a critical method for reducing design risk. A benefit of early builder engagement is improved project coordination and integration. Masood et al. (2021) note that involving builders and suppliers throughout the digital design process might result in shared knowledge of project needs, enhancing stakeholder coordination. Besides, builders' early participation substantially impacts the idea of buildability. Osuizugbo et al. (2022) contend that collaborations between designers and builders throughout the design stage improve buildability because construction people may contribute insights that lead to more realistic design solutions. Besides, Adebiyi and Sanni (2020) discover that acts of terrorism, corruption, and government changes are among the most significant political risks in locations like as North-Eastern Nigeria, emphasizing that political risk insurance may be critical for businesses operating in such unpredictable situations.

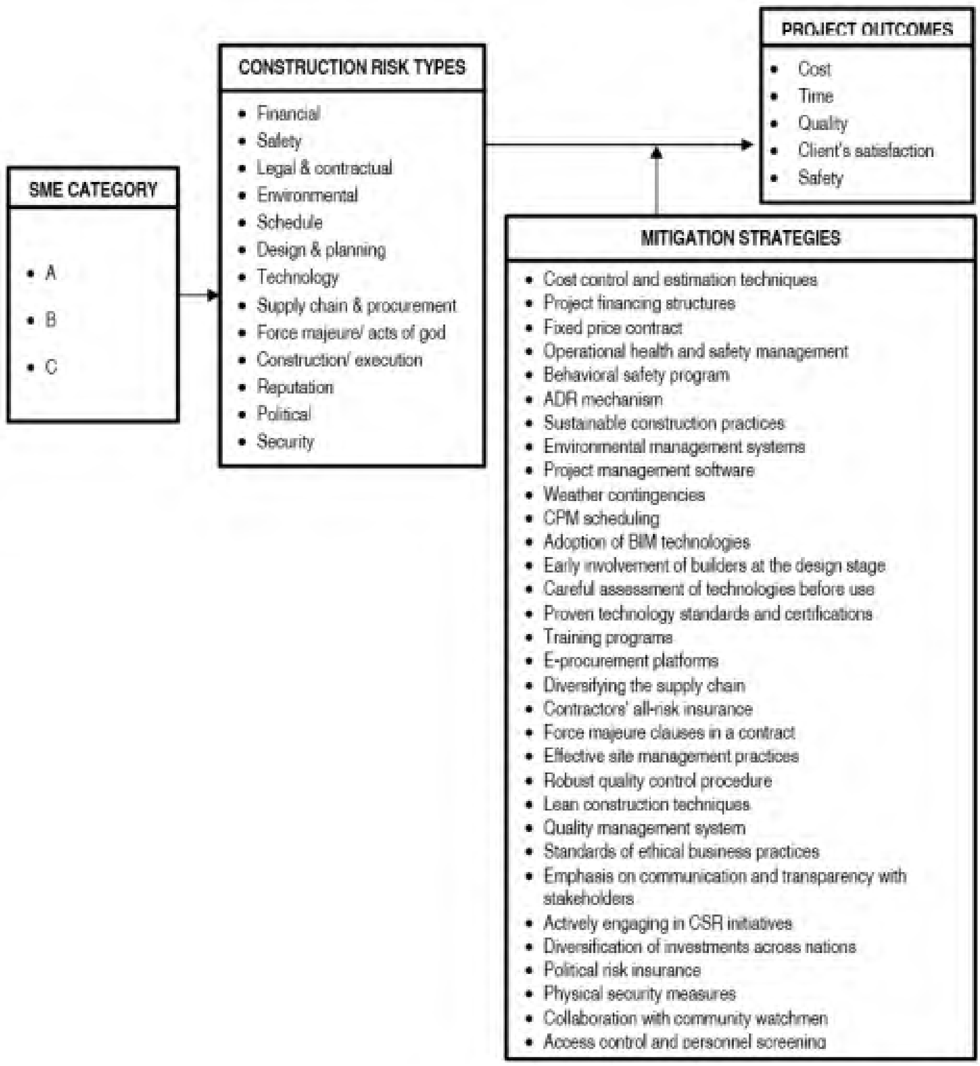
Meanwhile, the use of digital technology in procurement procedures improves transparency, lowers corruption, and simplifies operations, mitigating the risks associated with traditional procurement approaches. According to Dudić et al. (2024), businesses with proven risk management systems are more equipped to adopt innovations like e-procurement, which may alter procurement methods and lower risks associated with procurement failures. Meanwhile, effective cost management includes a variety of methods meant to reduce the risks of project delays and cost overruns, which are common in the construction sector. Zhou (2023) argues that the ability to adjust cost management strategies regularly not only helps reduce costs but also enhances project success by mitigating the adverse effects of risks. These pathways for navigating construction risk types of contractors are further summarized in Table 1.

Summary of findings for studies on pathways for managing risk types in construction

Risk Types	Pathways	Literature Source
Financial	- Cost control and estimation techniques	- (Rahman & Kumaraswamy, 2002; Zhou; 2023)
	- Project financing structures	- (Mills, 2001; Burger & Tyson, 2006)
	- Fixed price contract	- (Sharma & Swain, 2011; Zhou & Damnjanović, 2011)
Safety	- Occupational health and safety management system	- (Bochkovskyi, 2020; Simeon & Soyingbe, 2023)
	- Behavioral safety program	- (Hallowell & Gambatese, 2009)
Legal and contractual	- Alternative dispute resolution (ADR) mechanism	- (Fenn et al., 1997; Awwad et al., 2016)
	- Thorough documentation	- (Olubukola et al., 2024)
Environmental	- Sustainable construction practices	- (Oladiran et al., 2023)
	- Environmental management systems	- (Kumaraswamy & Chan, 1998; Watson et al., 2004)
Schedule	- Project management software	- (Chen et al., 2020)
	- Weather contingencies/weather risk clauses into a contract	- (Ballesteros-Pérez et al. 2017; Ballesteros-Pérez et al., 2018)
	- Critical path method (CPM) scheduling	- (Aghileh et al., 2024)
Design	- Adoption of BIM technologies	- (Eastman, 2011; Oladiran et al., 2022; Oladiran et al., 2024)
	- Early involvement of builders in the design stage	- (El-Sayegh, 2008; Masood et al., 2021; Osuizugbo et al., 2022)
Technology	- Careful assessment of new technologies before implementation	- (Belanova, 2023)
	- Proven technology standards and certifications	- (Hudson et al., 2020)
	- Training programs	- (Zhao et al., 2010; Zhao & Lucas, 2015; Du et al., 2022)
Supply chain/ Procurement	- E-procurement platforms	- (Dudić et al., 2024; Simeon & Nwakaego, 2025)
	- Diversifying the supply chain	- (Todo & Inoue, 2021)
Force Majeure/ Acts of God	- Contractors' all-risk insurance	- (Liu et al., 2018; Praja, 2023)
	- Force majeure clauses in a contract	- (Yusuf, 2016; Hennings et al., 2022)
Construction/ Execution	- Effective site management practices - Robust quality control procedure	- (Yang et al., 2011; Spillane & Oyedele, 2013; Oseghale et al., 2021)

Risk Types	Pathways	Literature Source
	- Lean construction techniques	- (Love & Edwards, 2004; Herbetson et al., 2023; Akinola, 2023; Singh & Sreekla, 2024) - (Carbonari et al., 2023; Issa, 2013).
Reputation	- Quality management system - Standards of ethical business practices - Emphasis on communication and transparency with stakeholders - Actively engaging in corporate social responsibility (CSR) initiatives	- (Loosemore & Phua, 2010; Simeon et al., 2024) - (Ameh & Odusami, 2010; Shah & Alotaibi, 2018) - (Hogan & Reid, 2022) - (Velychko et al., 2020)
Political	- Diversification of investment across nations/joint ventures - Political risk insurance	- (Zhao et al., 2010) - (Adebiyi & Sanni, 2020)
Security	- Physical security measures (security guards, CCTV surveillance, fencing lots) - Collaboration with community watchmen /night guards - Access control and personnel screening	- (Fennelly, 2016; Simeon et al., 2023). - (Martínez et al., 2017; Tade, 2022; Arthur-Aidoo et al., 2024) - (Schneiker, 2018; Ablordeppey et al., 2020)

The Conceptual Framework for the Study



Conceptual framework linking SMEs categories, risk types, mitigation strategies, and project outcomes.

This study, which aimed at evaluating the adequacy of contractors' pathways to navigate common risk types, is based on a framework consisting of four variable groups as shown in Figure 1. These variable groups are (1) organization category, (2) construction risk group, (3) mitigation strategies category, and (4) project outcomes category. The first variable group, named SMEs, comprises categories A, B, and C. The second variable group is named construction risk types, comprises financial, safety and health risks, legal and contractual, environmental, schedule, design, technology, supply chain and procurement, force majeure, construction and execution, reputation, political, and security risks. The third variable group comprises the mitigation strategies such as project financing structures, political risk insurance, collaboration with community watchmen (night guards), establishment of occupational health and safety, implementation of physical security measures, implementing robust quality control procedure, diversification of investment across nations/joint ventures, implementation of behavioral safety programs, alternative dispute resolution mechanisms, adoption of lean construction techniques, incorporating force majeure clauses into a contract, maintaining high standards of ethical business practices, critical path method scheduling, use of e-procurement platforms, diversifying supply chain, actively engaging in corporate social responsibility initiatives, use of proven technology standards and certifications, adopting sustainable construction practices, organizing training programs, thorough documentation, cost control and estimation techniques, incorporating weather contingencies/weather risk clauses into a contract, adoption of BIM technologies, Strong emphasis on communication and transparency with stakeholders, access control and personnel screening, use of project management software, contractors all risk insurance, effective site management practices, early involvement of builders in the design stage, fixed-price contracts, implementing environmental management systems, careful assessment of new technologies before implementation, and use of quality management system. The fourth variable group, named project outcomes, consists of cost, time, quality, safety performance, and client satisfaction. The SMEs encounter the prevalent construction risk types. The construction risk types group influences project outcomes, while the mitigation strategies group moderates the relationship between the construction risk types and project outcomes by reducing the construction risk types and improving project outcomes.

Methodology

The study area was Lagos State. The state is the commercial nerve center of the nation. Oladiran et al. (2024) note that Lagos State possesses a high concentration of construction practitioners and a large number of ongoing building works. Besides, the nation's building activity is mostly concentrated in the state because it accounts for a significant share of the country's development (Simeon, 2024). Furthermore, the state has the highest concentration of micro-small-medium construction enterprises engaging in building projects (Simeon & Soyingbe, 2023).

For this reason, Lagos is an important area for the study of common types of risks in construction because of its growing economy and urban issues such as logistics problems and traffic jams. The survey research approach is best suited for this study because it needs primary data, considering the fact that the population is spread out over 20 Local Government Areas in Lagos State. The study's population comprised licensed contracting firms categorized under the LSTB class, whereas the target group of respondents consisted of construction professionals employed in these firms. Site managers, construction managers, project managers, planning managers, and site engineers are included in this group of construction professionals.

It is these construction experts who were chosen since they best represented the contractors that employed them. In addition, their insights were relevant because they evaluated risks realistically to enhance the chances of accomplishing building projects. The sampling frame was drawn from the contractors who were registered with the LSTB. Olusola et al. (2021) opine that the Lagos State Tenders Board categorizes contracting firms into five distinct classes (Class A, B, C, D & E), and this is based on the cost of construction projects they undertake. From their analysis, there are 304 authorized contractors under these 5 categories. Out of the 304 registered contracting firms, 115 (Class A) were small-sized, 91 (Class B & C) were medium-sized, while the remaining 98 (Class D & E) were large-sized. In this study, however, only 3 categories of firms (SMEs) were considered (A, B & C), which sum up to 206 (68%). Meanwhile, Classes D and E, which are the large-sized classes, account for about 98 (32%) of the list and have been excluded from the research. The reason why SMEs were included in the research rather than large enterprises is that they tend to be more susceptible to risks due to having fewer resources and taking up smaller projects. It is unlike larger, well-established firms, which are less sensitive to regional issues like environmental conservation and legislation. This study employed a one-stage stratified random sampling technique. The A, B, or C classification contracting firms of the LSTB fall into the strata. The sample was drawn from the frame of contracting companies, which were registered with the LSTB, and the sample size for each stratum was calculated. The sample size of the various strata from a sample frame of registered contracting firms registered with the Lagos Tender Board is as follows:

Class A = $\frac{115}{206}$ X 100 = 55.83%

Class B = $\frac{32}{206}$ X 100 = 15.53%

Class C = $\frac{59}{206}$ X 100 = 28.64%

To determine a sample size, the Z-score, standard deviation, and confidence interval are used in the Cochran's sample size formula. At 95% confidence level, standard deviation of 0.5, and a margin of error (confidence interval) of ± 5%, where n is the sample size, z = value at reliability level of significance level (1.96), e = acceptable sampling error, σ = standard deviation. Therefore, the resulting sample size is shown below:

$n = \frac{Z^2\sigma^2}{e^2}$ ....Eq. 1

$n = \frac{(1.96)^2 \; X \; (0.5)^2}{(0.05)^2} = 384.16$

Scientific determined sample size (n) = 384

Sample size for Class A = $\frac{55.83 \; (384)}{100} = 214.39$

Sample size for Class B = $\frac{15.53 \; (384)}{100} = 59.64$

Sample size for Class C = $\frac{28.64 \; (384)}{100} = 109.98$

Approximately, there are 214, 60, and 110 samples to be drawn from the respective firm's categories. All the samples sum up to 384 as before. To confirm whether the samples are proportionally distributed in each stratum, the number of samples that represent a stratum is divided by the stratum size. This is achieved as follows:

214/115 = 1.9

60/32 = 1.9

110/59 = 1.9

Since the results are the same, it implies that the samples are proportionately distributed.

The total of the three results is (1.9 X 3) = 5.7

The sampling fraction of each stratum is determined.

Thus, $\frac{1.9}{5.7} \; X \; 100 = 33.3\%$

This suggests that each of the three strata has an equal sampling fraction of 33.3%. Therefore, the number of samples that will represent each stratum

33.3% of Class A (115) = 38 out of the 115 should be randomly selected from Class A

33.3% of Class B (32) = 11 out of the 32 should be randomly selected from Class B

33.3% of Class C (59) = 20 out of the 59 should be randomly selected from Class C

Hence, the total number of estimated samples for the three categories of contracting organizations is 69. Although the required sample size was 69, 120 questionnaires were administered in a bid to allow non-response data, to increase the power of the test, and provide a safety buffer. At the end of the survey period, 103 valid questionnaires were retrieved, representing a response rate of 85.8%. Despite this high response rate, potential non-response bias cannot be completely ruled out. It is presumed that there were no notable differences between the non-responders and the respondents that would have meaningfully impacted the results. However, care should be taken when generalizing the findings beyond the study's sample. For the three contracting organization categories, an estimated 103 samples were chosen in total. Forty were selected from class C, twenty-five from class B, and thirty-eight from class A of the 103 lists of SME contractors. A structured questionnaire served as the primary tool for gathering responses from the intended respondents. The intended respondents were given the closed-ended questionnaires to complete independently. The first section concentrated on the general characteristics of the respondents and their firms. At the same time, Section II discussed the pathways for navigating prevalent contractors' risks on construction projects using a 5-point Likert scale where 1 denotes not effective, 2 denotes slightly effective, 3 denotes moderately effective, 4 denotes effective, and 5 denotes very effective. The Cronbach's Alpha (CA) test was then conducted on the questionnaire's variables, and the variables under the objectives (pathways for navigating prevalent risk types of contractors in construction projects) were then put through a reliability test using Statistical Packages for Social Sciences (SPSS) to ascertain the instrument's reliability. The reliability analysis for the study construct is 0.865. Thus, indicates very good and implies the instrument is very consistent. Data gathered through the administration of the questionnaires after the 12-week survey period were analyzed with the aid of Microsoft Excel and the Statistical Package for Social Science (SPSS Version 26.0). The descriptive results were analyzed using statistical tools such as frequencies, percentages, mean scores, standard deviation, and ranking. Meanwhile, the inferential statistics were analyzed using ANOVA Test. Likert-scale responses were analyzed as interval data even though they are ordinal in character. Although mean comparisons and extensive statistical methods are made possible by this method, it has a drawback in that the presumptions of equal intervals between response groups might not be true.

Results and Discussion

Demographic Profile of Respondents and Organizations

Table 2 presents the demographic profiles of the respondents and their organizations, which have been divided into seven categories: designation, professional affiliation, academic qualification, years in business, organization category, procurement method, and type of work undertaken. Table 2 reveals that the highest number of respondents are project managers (43.7%), whilst the lowest number of respondents are planning managers (2.9%). The project managers' presence emphasizes their function in dealing with financial risks, budget deviations, and cost overruns. Table 2 also reveals that the majority of the respondents are affiliated with the Nigerian Institute of Building (38.8%), while 16.3% of the respondents affiliated with the Nigerian Institute of Architects have the least number of representations. Additionally, the highest number of respondents hold a Bachelor’s Degree (51.5%), while the lowest number of participants have only a Post-graduate Diploma (4.9%). This result indicates that all respondents have formal education, which makes the information supplied reliable. Table 2 further reveals that 56.3% of the respondents have been in the construction business for over 10 years, while 43.7% of the respondents have been in business for up to 10 years. This indicates that the majority of respondents have decades of experience in the construction industry, which validates the veracity of the data obtained. Additionally, 36.9% of the contractors are registered in

Category A of the Lagos State tender board, 24.3% are registered under Category B, and 38.3% work in Category C tender board class. On procurement method, 15.5% of the projects used for the study were procured by the lump sum method, 50.5% of the projects used for the study were procured by the design-bid-build (traditional) method, while 34.0% of the projects were procured by the design and build method. The results indicate that the majority of the projects used for the study were procured by the design-bid-build method. Besides, 53.4% undertake general contracting works, 19.4% undertake renovation works, and 27.2% undertake new construction works only. The results indicate that the majority of the contractors selected for this study execute general contracting works.

Demographic profile of respondents and organi

Description	Frequency (N)	Percentage (%)
Designation		
Project Manager	45	43.7
Construction manager	8	7.8
Planning manager	3	2.9
Site Manager	17	16.5
Site Engineer	30	29.1
Total	103	100
Professional affiliation		
NIA	14	13.6
NIOB	40	38.8
NSE	30	29.1
NIQS	19	18.4
Total	103	100
Academic qualification		
OND	17	16.5
HND	18	17.5
B.Sc.	53	51.5
PGD	5	4.9
M.Sc.	10	9.7

Description	Frequency (N)	Percentage (%)
Total	103	100.0
Years in business		
1-5 Years	8	7.8
6-10 Years	37	35.9
11- 20 Years	31	30.1
21 and above years	27	26.2
Total	103	100
Organization category		
A	38	36.9
B	25	24.3
C	40	38.8
Total	103	100
Procurement methods		
Lump sum	16	15.55
Design-bid-build	52	50.5
Design and build	35	34.0
Total	103	100
Type of work undertaken		
General contracting	55	53.4
Renovation works	20	19.4
New construction	28	27.2
Total	103	100

Pathways for navigating prevalent risk types on construction projects

Table 3 shows the pathways for navigating the common risks contractors encountered on building projects. The contractors were asked to rate the effectiveness of 33 pathways to navigating risk types using a 5-point Likert scale. The criterion used to determine the effectiveness of the pathways for navigating the various risk types encountered by the contractors in construction SMEs was adapted and modified from Oladiran et al. (2024) and includes those variables whose mean scores are 3.00 and above, which represent "moderately effective" on the scale. The 33 pathways for navigating the common risks often encountered by contractors were categorized into 13;

namely, financial risks, safety and health risks, legal and contractual risks, environmental risks, schedule risks, design risks, technology risks, supply chain and procurement risks, force majeure risks, construction and execution risks, reputation risks, political risks, and security risks.

Table 3 reveals that by category, the pathways proposed under financial risks (MS=3.78) are the most effective, followed by those proposed under the design and planning risks (MS=3.75). This is followed by the pathways proposed under force majeure risks (MS=3.69), schedule risks (MS=3.67), security risks (MS=3.58), technology, construction, and reputation risks (MS=3.57), respectively. This is followed by the pathways proposed under legal and contractual risks (MS=3.56), environmental risks (MS=3.51), supply chain and procurement risks (MS=3.49), followed by safety and health risks (MS=3.46), and political risk (MS=3.42). These results underscore the effectiveness of all 13 pathways proposed by contractors for navigating prevalent risk types are effective. The following can be observed in Table 3:

Financial risks: All three pathways for navigating financial risks are effective, but cost control and estimating techniques (MS=4.05) are the most effective for navigating risks among contractors. So, it stands to reason that accurate cost estimation and control are key to financial stability of building contractors. Therefore, by avoiding unnecessary financial stress, allocating resources correctly, and building a good reputation for completing on time and to budget, companies can become more competitive and profitable.

Safety and health risks: The two suggested ways of managing health and safety risks are good. But a better way to manage risk among contractors is to set up an occupational health and safety management system (OHSMS) (MS=3.58). It means safety is front and centre of the operational strategy, not an afterthought, which leads to a commitment to a safer environment, regulatory compliance, and employee well-being.

Legal and contractual risks: The two suggested ways of managing contractual and legal risks are good. But the best way to reduce risk among contractors is through documentation (MS=3.73). This means contractual disputes can be reduced and managed with the right documentation, efficient alternative dispute resolution procedures, and a smoother project handover.

Environmental risks: The two suggested ways of managing environmental risks are good. But a better way for contractors to manage risk is to adopt sustainable construction practices (MS=3.54). This means while improving sustainability and avoiding problems with current regulations construction projects can reduce their environmental impact.

Schedule risks: Using project management software (MS=3.94) is the best way for contractors to manage schedule risks, although all three are good. So, effective schedule risk management reduces financial losses and delays and boosts stakeholder confidence.

Design and planning risks: For design and planning challenges, the two ways are good. But a better way for contractors to manage design and planning risk is through BIM (MS=3.88). Secondly is the early involvement of builders in the design stage (MS=3.61). So, using BIM and involving builders early in the design process can improve project execution, reduce design errors, increase efficiency, and save costs.

Technology risks: Although all three ways of managing technological risks are good, the best way for contractors to manage risk is to thoroughly research modern technology before deployment (MS=3.62). This means to reduce the chance of errors, inefficiencies, or safety issues, companies must spend time and money researching the technology, integrating with industry standards or benchmarking, and training staff.

Supply chain and procurement risks: Both of the suggested ways of managing procurement and supply chain risks are good. But a better way for contractors to manage risk is through e-procurement (MS=3.51). So, by ensuring supply chain continuity, business operational performance, and proactive risk management, these ways reduce procurement risks and supply chain continuity improves stability and diversification. This could result in a claim that companies using this approach are more sustained during continuous business operations, more resilient during conflicts, and more shielded from the operational or financial effects of supply chain disruptions.

Force majeure risks: Both of the suggested approaches for handling force majeure situations are efficient. Yet, a better technique to manage risk among contractors is through contractors' all-risk insurance (MS=3.79). Adding force majeure provisions to a contract ranks second (MS=3.63). It is implied that they ensure that responsibilities are managed clearly, resolve possible conflicts, and protect the interests of stakeholders, all of which speed up the completion of the project in the event of unforeseen circumstances.

Construction/execution risks: Effective site management practices (MS=3.69) are the most efficient approach among contractors, but all three are useful for managing construction and execution risks. This is followed by adopting a strong quality control procedure (MS=3.51) and adopting lean construction techniques (MS=3.50). Following this, prioritizing such actions might greatly improve the project's results.

Reputation risks: All four reputation risk management strategies are good. But the best strategy to manage reputation risk for contractors is to have a quality management system (MS=3.62). Others are to participate in corporate social responsibility (CSR) programs (MS=3.41), put top priority on transparency and communication with stakeholders (MS=3.52), and adhere to high standards of business ethics (MS=3.61). So, if you lower your credibility criteria, you will lose enterprise and stakeholders' respect and trust.

Political risks: Both strategies to manage political risk are good. But a better strategy to manage risk for contractors is to diversify assets between countries and joint ventures (MS=3.50). Political risk insurance comes next (MS=3.34). Thus, implementing these strategies will protect organizations in these unstable areas, and they will work more efficiently and be less vulnerable to losses caused by political violence.

Security risks: Physical security measures (MS=3.69) are the best way to manage reputation risk for contractors, then cooperation with community watchmen (MS=3.63) and access control and personnel screening (MS=3.43). All five ways to navigate security risks are good and expected to be an integrated approach to security that reduces theft, vandalism, and other forms of vulnerability.

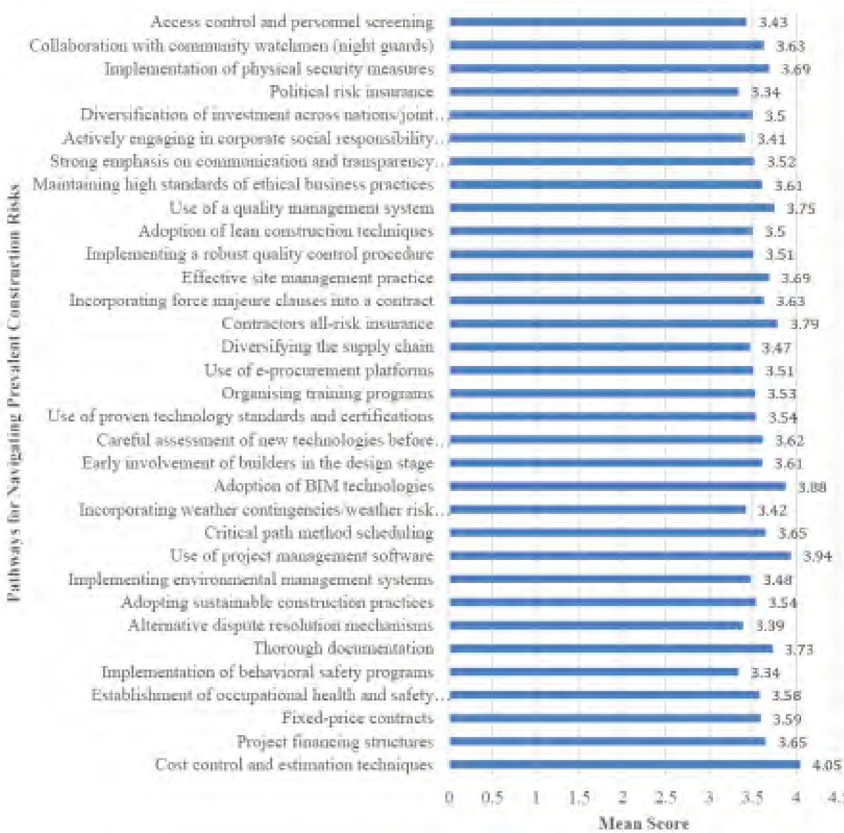
athways for navigating prevalent risk types on construction projects

Pathways for navigating risk types	N	SD	MS	GR	OR
Financial risks			3.78		
Cost control and estimation techniques	103	1.294	4.05	1	1
Project financing structures	103	1.576	3.65	2	9
Fixed-price contracts	103	1.106	3.59	3	16
Safety and health risks			3.46		
Establishment of occupational health and safety management systems	103	1.303	3.58	1	17
Implementation of behavioral safety programs	103	1.333	3.34	2	32
Legal and contractual risks			3.56		
Thorough documentation	103	1.182	3.73	1	6
Alternative dispute resolution mechanisms	103	1.223	3.39	2	31
Environmental risks			3.51		
Adopting sustainable construction practices	103	1.195	3.54	1	18
Implementing environmental management systems	103	1.179	3.48	2	25
Schedule risks			3.67		
Use of project management software	103	1.037	3.94	1	2
Critical path method scheduling	103	1.202	3.65	2	9
Incorporating weather contingencies/weather risk clauses into a contract	103	1.361	3.42	3	29
Design and planning risks			3.75		
Adoption of BIM technologies	103	1.123	3.88	1	3

Pathways for navigating risk types	N	SD	MS	GR	OR
Early involvement of builders in the design stage	103	1.087	3.61	2	14
Technology risks			3.57		
Careful assessment of new technologies before implementation	103	1.156	3.62	1	13
Use of proven technology standards and certifications	103	1.227	3.54	2	18
Organizing training programs	103	1.203	3.53	3	20
Supply Chain/Procurement Risks			3.49		
Use of e-procurement platforms	103	1.251	3.51	1	22
Diversifying the supply chain	103	1.219	3.47	2	27
Force majeure risks			3.69		
Contractors' all-risk insurance	103	1.099	3.79	1	4
Incorporating force majeure clauses into a contract	103	1.221	3.63	2	11
Construction/execution risks			3.57		
Effective site management practice	103	1.129	3.69	1	7
Implementing a robust quality control procedure	103	1.195	3.51	2	22
Adoption of lean construction techniques	103	1.327	3.50	3	24
Reputation risks			3.57		
Use of a quality management system	103	1.126	3.75	1	5
Maintaining high standards of ethical business practices	103	1.223	3.61	2	14
Strong emphasis on communication and transparency with stakeholders	103	1.219	3.52	3	21
Actively engaging in corporate social responsibility initiatives	103	1.192	3.41	4	30
Political risks			3.42		
Diversification of investment across nations/joint ventures	103	1.228	3.50	1	24
Political risk insurance	103	1.347	3.34	2	32
Security risks			3.58		

Pathways for navigating risk types	N	SD	MS	GR	OR
Implementation of physical security measures	103	1.306	3.69	1	7
Collaboration with community watchmen (night guards)	103	1.138	3.63	2	11
Access control and personnel screening	103	1.280	3.43	3	28

N = Frequency, SD = Standard Deviation,
, GR = Group Ranking, and OR = Overall Ranking



g strategies for navigating prevalent construction risk types

Figure 2 reveals 33 mitigating strategies for navigating prevalent construction risk types in building projects. The top 5 mitigating strategies are presented. The result showed that cost control and estimating techniques are the topmost ranked mitigating strategies with a mean score of 4.05. This is followed by the use of project management software with a mean score of 3.94. In third position is the adoption of BIM technologies with a mean score of 3.88. Meanwhile, contractors' all-risk insurance is ranked in fourth position with a mean score of 3.79. While the use of a quality management system was ranked in fifth position with a mean score of 3.75.

ANOVA Test Results on the Pathways for Navigating Prevalent Construction Risk Types

Table 4 presents the inferential results of the pathways for navigating prevalent construction risk types in Nigerian building projects. To further analyze the pathways for navigating prevalent construction risk types, a hypothesis was formulated as follows:

H01: The pathways for navigating prevalent construction risk types do not significantly vary among organization categories.

The ANOVA Table in Table 4 reveals that there is no significant difference in the perception of the contractors on 32 out of the 33 hypothesized pathways for navigating construction risk types, with p-values greater than 0.05 (P>0.05). The paths for navigating prevalent construction risk types for which there is no significant difference, and for which the null hypothesis was accepted, include: project financing structures, political risk insurance, collaboration with community watchmen (night guards), establishment of occupational health and safety, implementation of physical security measures, implementing robust quality control procedure, diversification of investment across nations/joint ventures, implementation of behavioral safety programs, alternative dispute resolution mechanisms, adoption of lean construction techniques, incorporating force majeure clauses into a contract, maintaining high standards of ethical business practices, critical path method scheduling, use of e-procurement platforms, diversifying supply chain, actively engaging in corporate social responsibility initiatives, use of proven technology standards and certifications, adopting sustainable construction practices, organizing training programs, thorough documentation, cost control and estimation techniques, incorporating weather contingencies/weather risk clauses into a contract, adoption of BIM technologies, access control and personnel screening, use of project management software, contractors all risk insurance, effective site management practices, early involvement of builders in the design stage, fixed-price contracts, implementing environmental management systems, careful assessment of new technologies before implementation, and use of quality management system. Whereas, the pathways for navigating prevalent construction risk types for which there is a significant difference with p-value less than 0.05 and for which the null hypothesis was rejected is a strong emphasis on communication and transparency with stakeholders.

test results on the pathways for navigating prevalent construction risk typ

Pathways	DFb	DFw	DFt	F	P-value	Remark	Decision
Project financing structures	2	100	102	1.249	0.291	NS	Accept
Political risk insurance	2	100	102	1.635	0.200	NS	Accept
Collaboration with community watchmen (night guards)	2	100	102	0.558	0.574	NS	Accept
Establishment of occupational health and safety	2	100	102	2.284	0.107	NS	Accept
Implementation of physical security measures	2	100	102	0.714	0.492	NS	Accept

Pathways	DFb	DFw	DFt	F	P-value	Remark	Decision
Implementing a robust quality control procedure	2	100	102	1.086	0.342	NS	Accept
Diversification of investment across nations/joint ventures	2	100	102	0.733	0.483	NS	Accept
Implementation of behavioral safety programs	2	100	102	0.216	0.806	NS	Accept
Alternative dispute resolution mechanisms	2	100	102	0.416	0.661	NS	Accept
Adoption of lean construction techniques	2	100	102	0.071	0.932	NS	Accept
Incorporating force majeure clauses into a contract	2	100	102	0.014	0.986	NS	Accept
Maintaining high standards of ethical business practices	2	100	102	0.274	0.761	NS	Accept
Critical path method scheduling	2	100	102	1.040	0.357	NS	Accept
Use of e-procurement platforms	2	100	102	0.465	0.630	NS	Accept
Diversifying the supply chain	2	100	102	0.358	0.700	NS	Accept
Actively engaging in corporate social responsibility initiatives	2	100	102	0.871	0.422	NS	Accept
Use of proven technology standards and certifications	2	100	102	1.723	0.184	NS	Accept
Adopting sustainable construction practices	2	100	102	0.553	0.577	NS	Accept

Pathways	DFb	DFw	DFt	F	P-value	Remark	Decision
Organizing training programs	2	100	102	0.211	0.810	NS	Accept
Thorough documentation	2	100	102	0.190	0.828	NS	Accept
Cost control and estimation techniques	2	100	102	0.321	0.726	NS	Accept
Incorporating weather contingencies/weather risk clauses into a contract	2	100	102	0.689	0.504	NS	Accept
Adoption of BIM technologies	2	100	102	1.489	0.230	NS	Accept
Strong emphasis on communication and transparency with stakeholders	2	100	102	3.318	0.040	S	Reject
Access control and personnel screening	2	100	102	0.909	0.406	NS	Accept
Use of project management software	2	100	102	0.531	0.590	NS	Accept
Contractors' all-risk insurance	2	100	102	0.449	0.639	NS	Accept
Effective site management practices	2	100	102	0.491	0.613	NS	Accept
Early involvement of builders in the design stage	2	100	102	2.125	0.125	NS	Accept
Fixed-price contracts	2	100	102	0.637	0.531	NS	Accept
Implementing environmental management systems	2	100	102	3.009	0.054	NS	Accept
Careful assessment of new technologies before implementation	2	100	102	0.178	0.838	NS	Accept

Pathways	DFb	DFw	DFt	F	P-value	Remark	Decision
Use of a quality management system	2	100	102	2.211	0.115	NS	Accept

DFb=degree of Freedom between groups, DFw=degree of Freedom within groups, DFt=degree of Freedom total, NS=no significant difference, S=Significant, P=significant at P<0.05.

Discussion of Findings

Cost control and estimation techniques, project financing structures, and fixed-price contracts are effective pathways for navigating financial risks. However, cost control and estimating techniques have turned out to be the most effective financial risk because they give a clear understanding of project costs, aid in identifying possible future overruns, and provide better allocation of resources. Zhou (2023) is of the same view that the more firms can revise their cost management strategies, the lower the costs are likely to be and the higher the success of projects, because the negative impacts of risks are lessened.

Similarly, Sharma and Swain (2011) have pointed out that the success of a construction project will always depend on risk management, which is possible because fixed-price contracts give contractors an institutional framework within which they are sure of their monetary obligations. This finding is also in accordance with Zhou and Damnjanović (2011), who established that fixed-price contracts enable contractors in Chinese construction enterprises to include risk premiums in their bids and thus protect contractors from possible cost increases caused by market fluctuations. The establishment of OHSMS and the implementation of behavioral safety programs are practical ways of managing financial risks. Yet, establishing OHSMS is the most effective because OHSMS provides a systematic framework for risk identification, evaluation, and mitigation, and ensures consistency and compliance. These findings corroborate Alokabel et al. (2014) that commitment and policy formation, planning, execution, measurement, and evaluation are the fundamental tenets of work HSMS in workshops environment in Indonesia. This methodical approach guarantees that safety precautions are established and actively sought for and tracked. Meanwhile, behavioral safety programs lower the risk of accidents in the United States construction industry by encouraging a culture of safety via employee involvement and behavior change (Hallowell & Gambatese, 2009). Thorough documentation and alternative dispute resolution mechanisms effectively mitigate legal and contractual risks. These pathways reduce misconceptions by offering a transparent record of agreements and activities. While ADR provides an organized, frequently faster, and more economical method of resolving conflicts outside of court, reducing legal difficulties and delays, documentation guarantees that all parties are aware of their rights and duties. This agrees with the findings of Olubukola et al. (2024), who stressed the need for good communication, which is assisted by well-organized construction documentation. Alternative dispute resolution (ADR) mechanisms such as mediation, arbitration, and negotiation are frequently favored over litigation in the UK since they are faster and less expensive to resolve problems (Fenn et al., 1997). Meanwhile, in the Middle East, ADR mechanisms are more efficient in resolving conflicts, frequently resulting in cheaper costs and faster outcomes than traditional litigation, which may be time-consuming and costly (Awwad et al., 2016). Adopting sustainable construction practices and implementing environmental management systems are effective strategies for managing environmental risks. These pathways are effective because they minimize long-term ecological damage, lessen resource consumption, improve sustainability, and reduce the construction's impact on the environment. This agrees with the findings of Oladiran et al. (2023) and Simeon et al. (2024b) that contractors frequently use sustainable building methods, including sustainable materials and reducing waste, to mitigate environmental risks, which include concerns related to sustainability, weather, and environmental regulations. Meanwhile, the use of project management software, critical path method scheduling, and incorporating weather risk clauses into contracts are effective ways to navigate schedule risks. These pathways are effective because the use of project management programs and software helps in tracking progress and spotting delay possibilities in real time; the critical path method prioritizes essential tasks that directly influence the project timeline; and weather risk clauses in contracts minimize the effects of unanticipated weather-related delays. This agrees with the findings of Aghileh et al. (2024), who note that the CPM allows project managers to identify essential tasks that directly impact project completion time, enabling more efficient resource allocation and risk management techniques. The adoption of BIM technologies and the early involvement of builders in the design stage have proven to be effective pathways for navigating design and planning risks. These pathways are efficient for managing design and planning because they increase collaboration, accuracy, and early detection of possible risks. This aligns with the findings of (Eastman et al., 2011; Oladiran et al., 2022; Oladiran, 2024) that BIM is being utilized more often to reduce design risk by enabling precise and thorough visualization, clash detection, and design simulation before construction. In New Zealand, Masood et al. (2021) note that involving builders and suppliers throughout the digital design process might result in shared knowledge of project needs, enhancing stakeholder coordination. In Nigeria, Osuizugbo et al. (2022) contend that collaborations between designers and builders throughout the design stage improve buildability because construction stakeholders may contribute insights that lead to more realistic design solutions. Besides, careful assessment of innovative technologies before implementation, use of proven technology standards and certifications, and organizing training programs are effective pathways for navigating technology risks. These pathways are effective for navigating technology risk because they aid in ensuring appropriate usage, compliance, and reliability. Training guarantees that users have the skills needed to use and sustain the technology efficiently, evaluation reduces the likelihood of adopting untested or incompatible technologies, and established standards offer a benchmark for performance and safety. The use of modern technologies such as Virtual Reality (VR) in training programs has demonstrated promising benefits regarding information absorption and risk management capacities. In the Chinese construction industry, VR technology may significantly increase training efficiency in risk avoidance and control in building projects, particularly in circumstances where traditional training approaches may fall short (Du et al., 2022). Meanwhile, in the US, Zhao and Lucas (2015) found that a lack of focus is problematic as it can result in dangerous accidents, which is why fully immersive training sessions for construction workers can be particularly helpful. The increased use of e-procurement platforms, coupled with secure supply chain management, cuts the risk exposed in procurement processes. These pathways are effective because of their ability to increase flexibility and openness in processes. Supply chain diversification is considered a procurement risk mitigation technique since it reduces the dependence on one supplier or region. This approach helps in ensuring an uninterrupted supply of resources by minimizing the risks caused by supplier collapses, natural disasters, political unrest, and other market volatilities. Todo and Inoue (2021) noted that construction firms can spread their procurement activities across various suppliers and regions, thus reducing the negative effects of supply disruptions on project completion and cost. In addition, contractors' all-risk (CAR) insurance policies, alongside contract incorporation of force majeure clauses, are also one way to manage force majeure risk. These pathways are effective because they provide economic cover and specific guidance in the contract. Besides, force majeure clauses precisely define obligations and processes during uncontrolled circumstances, reducing disagreements and providing a fair risk distribution. This agrees with the findings of Praja (2023), who highlights how CAR insurance may improve overall project management techniques by efficiently transferring risks related to productivity, cost, and performance restrictions in construction projects in Indonesia. In a similar vein, Liu et al. (2018) explain how contractors must work with insurance firms and legal counsel to handle the challenges of acquiring the right insurance products, such as CAR insurance, which is crucial for risk transfer. According to Yusuf (2016), these force majeure clauses specify each party's obligations in the case of a force majeure incident and include provisions for time extensions or additional expenses in construction projects in Nigeria. Similarly, Hennings et al. (2022) argue that contractual provisions of force majeure frequently only offer temporary respite to postpone fulfilling contractual commitments. Project managers can estimate the influence of different risk factors on project timelines and anticipate any delays by using advanced software tools. Effective site management practices, implementing robust quality control procedures, and adopting lean construction techniques are construction and execution risks. These pathways are effective because they establish a proactive framework for detecting and reducing risks over the project's duration. For instance, effective site management enables smooth operations and optimal resource use. A robust quality control procedure reduces mistakes and defects, resulting in less rework and delays (Simeon et al. 2024a). Lean construction prioritizes minimizing waste and process efficiency, resulting in increased production and cost-effectiveness. This agrees with the findings of Yang et al. (2011) that a well-planned construction site may drastically lower the number of accidents by reducing the needless movement of people and goods between buildings. Spillane and Oyedele (2013) concur, stressing that to mitigate health and safety concerns, it is crucial to create and implement an efficient design site layout before starting work on-site. Lean construction may be used with modern technology like Building Information Modeling (BIM) to further improve risk management capabilities. This integration promotes a more agile project management strategy, allowing teams to respond to changes quickly and efficiently, reducing project duration and budget risks (Issa, 2013; Carbonari et al., 2023). Proper implementation of an ethical business framework, incorporation of a quality management, system, communication, and transparency with stakeholders, and participation in corporate social responsibility (CSR) are all effective ways to navigate through reputation risks. Trust and reliability are key elements that enable these pathways to be effective. As an example, a quality management system fosters a firm's reputation because it allows for the consistent availability of high-quality materials or services. Ethical business practices on the other hand promote integrity amongst business owners which builds trust in the firm from the public. Communication and transparency foster accountability which improves relationships by reducing misconceptions, thus, civility and respect are maintained. Participation in CSR initiatives further mitigates reputational risks by demonstrating social responsibility and improving the company’s image. This aligns with the discoveries of Herbertson et al. (2023) that project managers may considerably lessen the influence of risks on project results by putting in place strong quality management systems that include inspection and monitoring tasks. Hogan and Reid (2020) argue that the extent to which a company is willing to be candid with its stakeholders affects the company's reputation and success. On the other hand, investment diversification by country or by joint ventures and political risk insurance are some strategies that can also be used to navigate through political risks. These pathways are effective because they lower the chances of being exposed to instability. For example, engaging in joint ventures with regional players and expanding into new markets lessens political risks as dependency on a particular jurisdiction is limited. Furthermore, political risks emanating from events like expropriations or civil unrest can be shielded under political risk insurance which serves as a safety net for ambiguously troubling territories. Further, the findings by Aydogan and Koksal (2014), where joint ventures may reduce an individual's risk value while putting forces and materials together, is more applicable to business due to the accelerated pace of globalization of the construction industry. These joint ventures as well as diversification through overseas investments, have remained key components in the mitigation of political risk in the construction industry. Companies with diverse portfolios are likely to absorb the shock because even if one area suffers, returns from other investments may cover the losses. These pathways are effective because they swiftly eliminate the issue by monitoring the surrounding environment, restricting unwanted access, and ensuring the safety of personnel and property. It is worth noting that physical security measures, electricity fencing, collaboration with mobile police (MOPOL), community watchmen such as the Oodua Peoples Congress (OPC), private security outlets, and access control with personnel vetting are some strategies that work effectively in reducing security risks in construction sites. These pathways are effective because they swiftly combat physical threats by keeping an eye on the environment, prohibiting unwanted entry, and guaranteeing the protection of both people and property. For instance, neighborhood watchmen provide local vigilance, access control assists in identifying and limiting illegal persons, and physical security measures discourage possible invaders. This agrees with the findings of Agyeman and Gyamfi (2017) that encouraging the installation of strong monitoring systems can identify and discourage theft on building sites. Farinloye et al. (2013) advocate implementing a variety of security systems that are suited to the type of construction work being done in the Nigerian construction industry. The security of unmanned locations during non-working hours is improved by combining closed-circuit television (CCTV) with motion detection devices and alarms. Simeon et al. (2023) buttress that CCTV surveillance is of significance in crowded areas, like construction sites, and is paramount to mitigating possible risks to workmen and visitors. Contractors may work with private security companies in high-risk locations to guarantee site safety, particularly after work hours (Fennelly, 2016). Community guards are essential to preserving public safety and order, especially in places like building sites where theft and vandalism are common risks. Arthur-Aidoo et al. (2024) buttress that besides discouraging criminal activity, their presence gives employees and the neighborhood a sense of security. As demonstrated by the many cultures where local organizations work together to protect their communities and properties, this is consistent with historical traditions where community engagement in security has been the norm (Tade, 2022). Construction sites in both highly and sparsely inhabited regions were shown to be more effective at avoiding theft when lighting, fence, and gate locking were used (Ablordeppey et al., 2020). Credential verification and background checks are examples of effective screening procedures that may be used to identify any dangers connected with employees (Schneiker, 2018). Meanwhile, despite their high level of acquaintance with BIM-related terminology, Nigerian architects were found to have a poor adoption rate of BIM (Ezeji et al., 2023). Furthermore, Oladiran et al. (2024) conclude that while there is potential for BIM adoption in Lagos, Nigeria, it is probably going to be restricted to larger projects because small businesses might not give BIM deployment in Nigeria top priority in the near future. This study suggests that in order to increase the use of BIM in Nigerian construction projects, a local library of construction materials is necessary, as there is currently none.

Conclusion

The goal of every construction project is to deliver a functionally and financially viable building that is completed on time, within the agreed cost, and to the required quality standards that meet the client's requirements. Proper risk management on any project will ultimately ensure that all necessary risks in terms of finances, project quality, and time are inevitably catered for. The study aimed at evaluating the effectiveness of the pathways for navigating prevalent construction risk types with a view to promoting sustainable growth among contracting organizations. The study employed a survey research strategy to obtain data from 103 SME contractors in Lagos State. The study proposed 33 pathways for navigating prevalent types of risk on building projects and classified them into 13 groups. The contractors acknowledge that all 33 pathways proposed are effective for navigating risks on construction projects. The study notes that the strategy of employing cost control and estimation techniques to navigate financial risks, the strategy of deploying project management software to navigate schedule risks, the strategy of adopting BIM technologies to navigate design and planning risks, the strategy of incorporating contractors all risk insurance to navigate force majeure risks during contract documentation, and the pathway for utilizing quality management systems to navigate reputation risks are chief effective pathways for navigating risks in construction projects. Additionally, getting contractors' all-risk insurance to deal with force majeure risks is a smart move. It gives financial protection against surprise events that could stop work, like accidents or natural disasters. This plan makes sure contractors have liability insurance, which stops expensive delays and keeps projects moving. This implies that robust risk insurance serves as a financial safety net, mitigating contractors' concerns when unexpected disruptions occur. It stresses the importance of expecting unexpected accidents to make sure building projects succeed despite external issues, protecting the client and the contractor from big losses. Also, using quality management systems to handle reputation risks is a good strategy because it ensures that project standards remain steady, cuts down on mistakes, and builds trust with clients. Construction companies can protect their reputation, get new business, and avoid the bad effects of poor project results or safety issues by keeping their work quality high. This means that keeping high-quality standards through quality management systems has an impact on a construction firm's reputation. Doing high-quality work all the time protects the company's image and makes clients more confident, which is key to getting new contracts and reducing damage to reputation from failures. This study recommends that contractors implement robust cost control and estimation techniques to enable accurate cost predictions, accurate allocation of resources, and effective risk management. This will stop overspending, ensure projects are completed on time, and protect profit margins. This can be done by using reliable cost control and estimating, reviewing, and revising financial plans regularly, bringing in financial experts to the cost control process, and having contingency funds for unexpected expenditures. The study also recommends that construction managers use trustworthy PM software to schedule, track progress, and allocate resources. This will reduce delays, increase efficiency, and get projects completed on time, hence reducing disruption and increasing customer satisfaction. This can be done by setting clear objectives, tracking progress, and consistently using them throughout the project duration. It is recommended that construction companies use BIM throughout the design stage to collaborate, visualize designs, and identify potential risks early to reduce errors, improve decision making, and get projects completed on time. To this end, future research directions should assess the impact of the mitigation strategies on the cost and time performance of building projects.

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