

Risk Factors Affecting Infrastructure Projects in Nigeria

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Abstract

The Construction sector contributes significantly to economic growth, value creation, employment, and national GDP. This considerably vital industry is faced with enormous risks and daunting challenges that impede its performance, impacting the progress of nations. This study identifies risk factors responsible for poor project delivery in Nigeria and ranks them by project phases. One hundred twenty-nine factors were identified based on a literature review covering 26 well-cited and referenced articles in high-impact journals. Sixty of these factors were analysed for the frequency of their citation and relevance to Nigeria's construction industry. Findings show that lack of knowledge management and funding challenges ranked among the highest risks in Nigeria, while poor contractor performance and insufficient technical skills rank low. The study calls for further work adopting primary data collection to assess the frequency of occurrence and severity of the impact of each risk factor on infrastructure projects in Nigeria.

Keywords: risk management, risk factors, project delivery, construction project, project management

INTRODUCTION

Nigeria, with its large and rapidly growing population of over 206 million (NPC, 2023), is also richly endowed with vast natural resources, underlining its status as a nation with immense potential. Since the end of the Nigerian Civil War in 1970, the construction industry has played a pivotal role in translating the country's potential towards sustainable development by shaping cities, connecting towns, and fuelling economic growth (Tank, 2023). As the country pivots toward an era of rapid urbanisation and infrastructure growth (Oyewobi et al., 2023), the construction industry is expected to play a central role in transforming the nation's dreams into reality. Currently, the provision of public goods and critical infrastructure is borne largely by the government at the federal, state and local government levels. This situation is attributed to the low levels of capital formation in the country, as well as insecurity (Ewetan & Urhie, 2014). The persistent state of insecurity in the country harms the existing assets and slows down the provision of new infrastructure.

Construction involves the provision of infrastructure through the process of production, assembly and commissioning of power generation and transmission grids, dams and reservoirs, roads/bridges, air and seaports, railways, communication networks, factories, and buildings. It also includes their rehabilitation, repair, maintenance, altering, and deconstruction (Fenner et al, 2018). Infrastructure plays a significant role in the country's development. The construction sector underpins the growth of any nation's economy by creating value and employment and by contributing to the Gross National Product (Urbanski et al., 2019). However, the construction industry in Nigeria currently faces enormous risks and daunting challenges, which range from increasing complexity (Bello et al., 2023). reduced profit margins (Al-Mhdawi et al., 2020), and supply chain disruptions (Lee Kuo et al., 2011) to latent vulnerabilities and relatively low levels of innovation (Lee, 2020). Nevertheless, the situation

is not entirely bleak. According to the National Integrated Infrastructure Master Plan (2021- 2025), the Nigerian construction industry grew by 3.7% in 2023 and is projected to achieve an average long-term growth of 4.5% per year between 2024 and 2032. This statistic shows the great potential of the sector, opportunities which if properly harnessed and rightly directed, will deliver multiple economic benefits for the country.

The government of Nigeria has an ambitious plan to remodel the economy to bring about growth and development. He also promised to address insecurity, create jobs, guarantee food security, end extreme poverty, and prioritize infrastructure development. This lofty goal and promise are threatened by rising insecurity, high unemployment, fiscal constraints arising from revenue challenges (AFDB, 2023), a huge debt burden, rampaging inflation, and endemic corruption (Eze & Alugbuo, 2021). According to the AFDB, there is limited fiscal space for public investment and difficulty in attracting private investments constraining the ability to make essential infrastructure improvements. Consequently, infrastructure funding may remain insufficient in 2024 (PWC, 2024).

The allocation for infrastructure in 2024 by the Federal Government budget is N1.32 trillion (USD 1,009 billion) (BOF, 2024), trailing the security and education sectors. At 30% of the infrastructure to GDP benchmark, this is a far cry from both the World Bank's suggested 70% and the annual USD 150 billion requirement specified in the National Integrated Infrastructure Masterplan (2021-2025). This calls for judicious and prudent utilisation of the limited financial resources to achieve performance targets.

Risks are inherent in all phases of a construction project life cycle (Bahamid et al., 2022) and do impact project performance in terms of time, cost, quality, health, safety and environmental sustainability (Zhao,2024). In developing countries, including Nigeria, construction organisations tend to approach risk management on projects through a set of insufficient practices, often producing poor results, and limiting the success of project management. (Serpell et al,2015). Adeleke et al (2019) decried the substandard outcomes of these risk management practices and their effect on restricting project performance. In its annual report (2021), the Bureau of Public Procurement (BPP) estimates that 70% of construction projects in Nigeria suffer delays and cost overruns. Successful delivery of projects is often hampered by inadequate planning, corruption, the vicious cycle of poor-quality construction, delayed completion, and constant price escalation leading to project abandonment (Idris & Kolawole, 2016).

There is a compelling need to identify the most common risks faced by the industry, assess existing risk management techniques, identify gaps in both form and implementation and proffer solutions to assist the Government and other stakeholders in adopting effective strategies to complete projects on time and within budgets.

The diversified and dynamic nature of work in the construction industry demands constant evaluation of performance (Vaz-serra and Edwards, 2021; Sokali et al., 2015; Mohammad & Mahani,2022). There is still a lack of a systemic approach to learning from previous projects, effectively communicating lessons learned from successes and failures, and systematically applying these to improve performance (Yepes & Lope, 2021). Efficient implementation of knowledge management will improve organisations' work quality, and reduce cost, time and repetitive mistakes (Idris & Kolawole,2016)

In Nigerians, competing needs for dwindling government revenue are numerous, compounded by a double-digit inflation rate (AFDB, 2023). Construction projects still suffer a failure rate of nearly 70% (BPP, 2023). Previous studies on delays and cost overruns in construction tend to be descriptive and explanatory rather than prescriptive in terms of proffering solutions to managerial impediments and barriers (Alsehaimi et al., 2013). Also due to high time pressures towards the end of projects, very little

knowledge is captured from past projects to foster learning and reuse in future projects (Alshamsi & Ajmal, 2018). This position is even more so alluded to by Avey et al. (2009) and Ajmal et al., (2010). This study aims to identify the construction risk factors responsible for poor project delivery in Nigeria and rank them based on the frequency of citation and relevance to Nigeria's construction industry. The goal is to establish a smart and sustainable framework for project selection, planning, and implementation.

The findings from this study will provide a foundation for further in-depth studies of specific risk factors, the frequency of their occurrence, and the severity of their impact on infrastructure project delivery in Nigeria. It will enable projects and project risk managers to improve efficiency in the management and effective delivery of projects, minimise delays, achieve value for money, fitness for purpose, greater predictability of project costs and duration as well as early detection and mitigation of constraining factors. Additionally, the research is expected to serve as an important resource for the successful implementation of public infrastructure projects in Nigeria.

METHODOLOGY AND RESEARCH PROCESS

A Preliminary literature review is carried out to focus on the identification of critical risk factors associated with infrastructure projects. The literature review covers searching for relevant books, journals, and articles. The specific focus is on articles published in the international journals of Project Management and publications listed on the Web of Science and Science Direct. Two keywords are used for the searches – “construction risk factors” and “risk management”. The searches resulted in identifying a total of 129 risk factors. Sixty of these were selected based on previous work by Echono (2011) and their prevalence in the Nigerian construction industry. A technique employed by Maseko (2017) and Al Sharafi et al (2017) was adopted to identify and select the risk factors. They were further ranked, based on the frequency of their appearance across the reviewed materials. Twenty-six well-cited research studies (mainly peer-reviewed articles), spanning from 2007 to 2023, with a focus on the identification and classification of construction risk factors in Nigeria and other developing countries were thereafter employed to assess the factors. **The summary of the analysis is attached as Appendix A.**

LITERATURE REVIEW

Nigerian Infrastructure Projects and Project Delivery

Nigeria is confronted with a high demand for infrastructural facilities. The World Economic Forum's Global Competitiveness Report for 2019 ranked the quality of Nigeria's infrastructure at 120 out of 141 countries. Nigeria also ranked 24th in the African Infrastructure Development Index (AIDI) published by AFDB (2020); far behind Seychelles, Egypt, Libya., South Africa and Mauritius occupy the first five (5) spots. Nigeria's infrastructure projects, as captured in the National Integrated Infrastructure Master Plan (2020-2043), are broadly classified under Transportation, Energy, Social Infrastructure (education, health, women's affairs), Information and Communications Technology, Housing, Agriculture, Water and Mining, Security and Vital Registration. The plan provides the roadmap for building a world-class infrastructure that will guarantee sustainable economic growth and development. It would enable the country to take advantage of its rich natural resources endowment, large and rapidly growing population (206m) with over 65% below the age of 24, and the vast opportunities in the domestic and global economies to enhance the nation's competitiveness and address problems such as poverty and lagging human capital development (WEF 2023).

The average annual budget on infrastructure in Nigeria is about 10% of the national requirement, with approximately USD 3 trillion required to close the infrastructure gap over the next 30 years (Aramide Adeyoye in Thisday, 2020). To achieve the target of increasing infrastructure stock to 70% by 2043, the Nigerian construction industry must witness a complete transformation and re-positioning. The sector is currently dominated by foreign companies, many of whom are subsidiaries and affiliates of European, North American and Asian (Chinese) construction firms (Adamu et al, 2015). Local firms lack technical competence, plants and equipment, and affordable funding support and are deficient in managerial skills, including project planning and financial management (Idoro, 2007; ThankGod, 2021).

Infrastructure projects in Nigeria typically suffer delays in completion (Ahmad et al., 2023), cost overruns and poor quality of construction (Mamman & Umesi, 2023). Major public infrastructure projects are designed and packaged by professional consultancy firms while contractors are selected either through open competitive bidding or less transparent restrictive modes of procurement (selective tendering). Project supervision and monitoring are undertaken by Government-employed or appointed project managers and firms. Unfortunately, this conventional risk management template has, by and large, failed to deliver successful projects (defined as completed on time, to the right quality and at budget) in Nigeria. Effective strategies to overcome barriers and risks, coupled with wholesale and sustained improvements in project delivery are required to reposition the sector as the major stimulant in the country's economic growth and development. It is also an effective framework for private sector participation in infrastructure investment. (Muhammad et al, 2021).

Construction Project Delivery

The backbone of any national economy is its stock of infrastructure (Ojo, 2022) as it facilitates the efficient production of goods and the provision of services necessary to guarantee the well-being of the populace (Adeyoye, 2020). Quality infrastructure ensures the productivity of the workforce (Adamu et al., 2015) and delivers wider benefits, including job and wealth creation. Public infrastructure projects are critical to the social-economic development of most countries. Yet Afieroho et al.(2023) regret that public infrastructure projects have a low success record in both developed and developing countries.

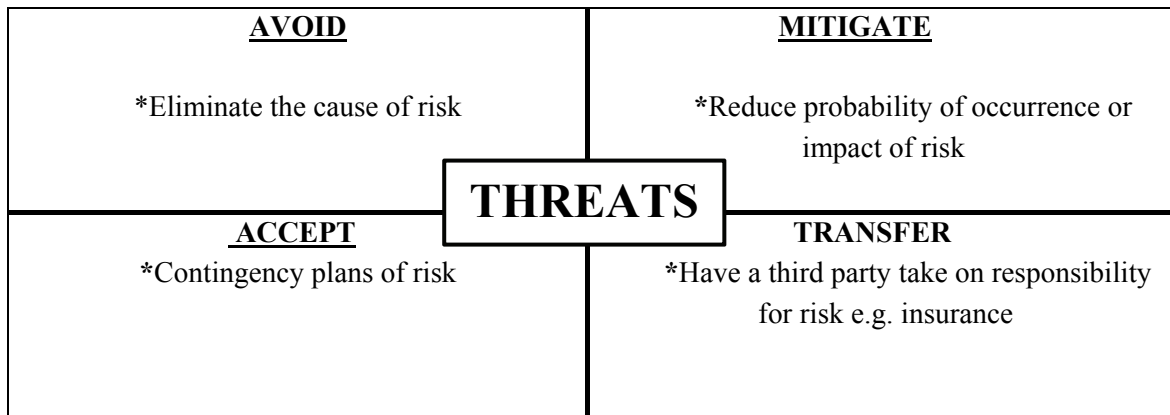
Infrastructure projects are unique, dynamic, and complex (Vaz-Serra & Edwards, 2021). They are often attended with high risks throughout the project cycle from initiation/conception, planning and packaging, design/specifications, procurement, and project execution up to completion, commissioning and use. (Shojael et al.,(2019)÷ and Bahamid et al.,÷ (2022) posit that this is inevitable given the temporary assemblage of diverse professionals and actors (architects, engineers, project managers, consultants, suppliers, and contractors) to actualise the construction process. Proper risk identification and allocation on construction projects have assumed prominence due to their significant impact on risk-handling decisions (Zavadskas et al,2010) as well as cost and time overruns (Project Management Institute Standards Committee, 2023). The successful delivery of any construction project depends increasingly on how risk is identified and managed by project managers. (Du Toit et al.,2010).

Risk Factors Affecting Construction Projects Delivery

Risk may be defined as a threat or random incidence or condition that if it occurs, may result in an advantage or disadvantage (PMI, 2022). In the construction industry, risk refers to any exposure to possible loss, which can be short or long-term (Nguyen & Nguyen, 2020), internal or external (Odimabo, 2016). and avoidable or inevitable (Akinola et al., 2012). Figure 1 illustrates a risk impact matrix that can be used to support assessing and prioritising risks. Risks can either be avoided, mitigated

by reducing the probability of occurrence or its impact transferred to a third party (e.g insurance) or accepted with adequate plans for its effective management

FIGURE 1: Risk Impact Matrix



Author: Adapted from Smith (2010, p.284)

FIG 1 RISK IMPACT MATRIX

In the early literature, risk factors were classified as either **business, technical or operational** (Olawale & Sun, 2010). Over time, various classifications emerged, the most common of which are based on- **A).** Responsibility for, and risk sharing amongst participants and stakeholders viz client/owner (financial and delay risks), consultants (technical risks), contractors and suppliers (construction and physical risks), Government (socio-political and organizational risks), people/society (environmental and safety risks), and such (El -Sayegh,2008).

B). The various stages in the project cycle (Choudry et al, 2014) viz: **Initiation /conception** – inadequate technical advice, disagreements on scope/location, funding not secured, community disagreement and such; **Planning/Design** – inadequate site investigation, incomplete design, poor specifications, inappropriate risk allocation; **Procurement** – Long procurement process, petitions and litigation, inefficient procurement/fraud, low contract price/inaccurate work estimation (BOQ, BEME) and such; **Project execution** – adverse site conditions/weather, delay in site handover, labour productivity, disputes, strikes, and work stoppages, the poor performance of the contractor, unrealistic work programme, equipment failure/non-availability, poor quality control, high transport costs, contractor insolvency and such; **Commissioning and use** – Delays in regulatory approvals of fitness for habitation, high operating/maintenance costs, vandalism, poor documentation/final accounts and such.

C). **Internal** (e.g. construction risks) versus **external** (e.g. environmental risks) factors and whether they are within or outside the control of project managers/participants. (Vu et al, 2016).

Construction projects typically suffer from delays (Vaz-Serra & Edwards, 2021) and cost overruns due to a multitude of reasons, both internal and external to the actors. Although the phenomenon is global, the trend is more common in developing countries where they sometimes exceed 200% of the budget cost. Latham (1994) asserts that “No construction project is risk-free. Risk can be managed, minimised, shared, transferred or accepted. It cannot be ignored”. According to the International Organization for Standardization (ISO.2018) risk refers to the “effect of uncertainty on objectives”. Risk management refers to coordinated activities to direct and control an organisation concerning risks (Bahamid et al

.2022). Siraj and Fayok (2019) reviewed common construction risks by identifying 130 articles published in renowned/prestigious journals. Also, several models of risk management have been proposed in the literature by researchers and different bodies of knowledge (Goh et al., 2013). The overall goal is to identify, assess, and control risks using these models to reduce them to an acceptable degree and achieve successful project outcomes (Rohaninejad & Bagherpour, 2013). A previous work by Crispim et al (2019) observed that most respondents to a survey on ways project managers handle risks were from finance, IT, and telecoms. And manufacturing, with the scant participation of industry professionals. A major finding is that the incapability to manage risks is the primary reason for project budgets, timelines and other project goals being exceeded. Oke & Adetoro (2023) assert that risk management practice is low and ineffective in most developing nations of the world including Nigeria. This was attributed to a lack of knowledge of risk management by parties involved in the construction project.

Findings

Across the eight (8) categories of classification of risk factors, (Mahendra et al., 2013 and Maseko, 2017), financial risk had the highest factor at 11, followed by construction risk at 9. The others are fairly even between 7 and 8 factors, except environment and other risks with factors of 4 and 5, respectively. Figure 2 presents their relative significance in risk management.

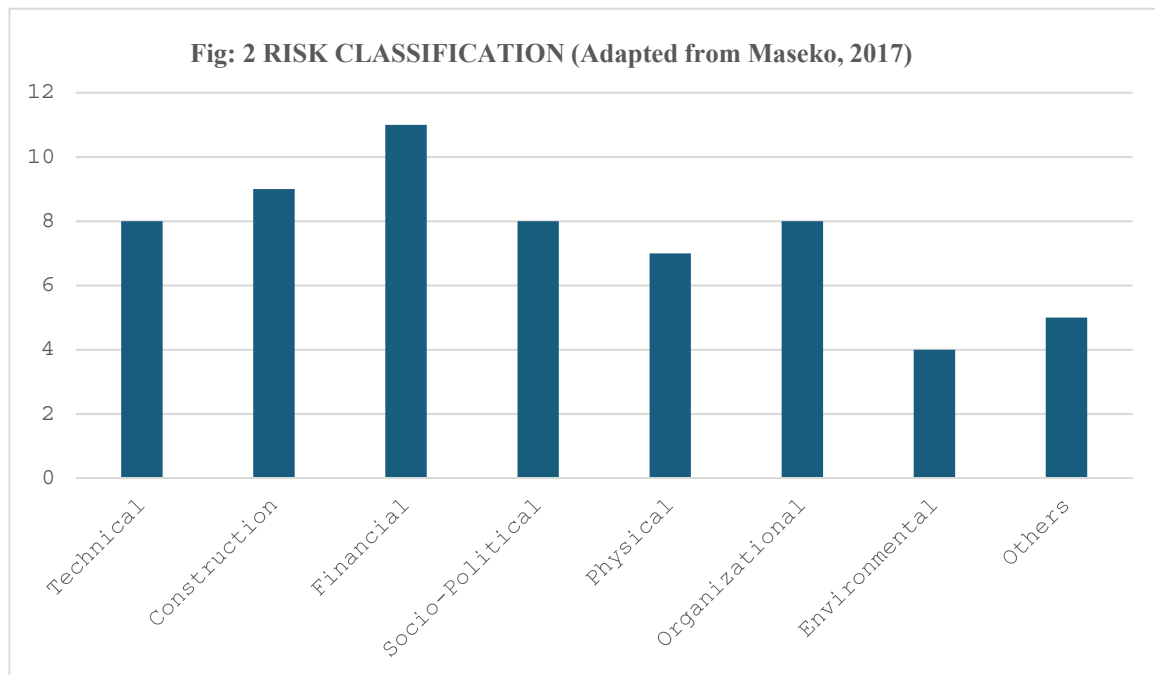


Table 1, shows the ranking of the highest and lowest risk factors based on the frequency of listing in the 26 cited and analysed literature as captured in Appendix A.

Table 1: A Comprehensive Analysis of Risk Factors

Rank	High Frequency	# of Listing	Low Frequency	# of Listing
1	Lack of knowledge management	14	Poor performance of contractors.	4
2	Political instability	13	Delays in site handover.	5
3	Funding challenges	12	Damage to structure.	6
4	Price fluctuation/Inflation	12	Low market needs.	6
5	Insecurity	11	Equipment; Fire or theft.	6

6	Change orders	10	Insufficient technical skills.	7
7	Bribery and Corruption	10	Incomplete Design.	7

Out of the 60 risk factors selected, 50 fell between 7 and 10 in terms of frequency of citation in the literature sources.

DISCUSSION

The findings revealed how the lack of knowledge management, political instability, inadequate and irregular funding, and insecurity are among the most prevalent risks in the Nigerian construction industry. It is noted that, in the Nigerian context, lack of continuity in project execution by successive administrations is the bane rather than frequent changes in political administration. Funding challenges persist due to revenue shortfalls, inefficiency in allocation and misappropriation. The worsening security situation across most parts of the country has taken its toll on infrastructure projects.

Although bribery and corruption came in 7th out of 60 factors, public perception may suggest a higher ranking. Similarly, it is curious that poor performance of contractors (60th) and insufficient technical skills (55th) were rated as low risks. This may not be unconnected with the domination of the sector, particularly for large-scale infrastructure projects, by foreign contractors and their subsidiaries.

It is also instructive that most of the risk factors (50 in total) fall within 7-10 on the frequency of listing. This validates their selection as the most prevalent risks associated with infrastructure projects in Nigeria.

Physical and environmental risk factors tend to have fewer citations than financial and socio-political risks. This is a reflection of the level of instability (including security challenges) and uncertainty that is prevalent in the Nigerian construction industry

Overall, the findings are largely consistent with existing literature and practice on risk identification and mitigation. Further assessment of their relative impacts will provide key insights into an effective risk management strategy.

CONCLUSION

Traditional project control is reactive in nature and focused on the identification of deviation from project plans. For continuous improvement to be successful, project managers and planners must learn from past experiences and translate the learning into improved performance. Building capacity through this process will ensure that the right resources are available and that the right proficiencies and knowledge are available. Attaining the lofty goal of accelerated infrastructure development in Nigeria will require an efficient project delivery system that is timely, cost-effective and responsive to the quality expectations of end users.

This will entail improvements in knowledge management, stability in prices of construction materials, predictability of funding sources, consistency in project and risk management and zero tolerance to corruption.

Limitation

A major limitation of the study is its exclusive reliance on literature findings. The findings could be seen to fail to capture/assess the frequency of occurrence of the identified risk factors in the Nigerian construction industry and more importantly, the severity of their impact on project delivery when they occur. Effective risk planning, assessment and mitigation are therefore impaired, thus necessitating further research, using additional tools and techniques to achieve the objective of an efficient template for successful project delivery in Nigeria.

Recommendations

This study aimed to identify critical risk factors that impact the delivery of infrastructure projects in Nigeria. While the current effort has successfully identified the risk factors prevalent in the Nigerian construction industry, further work is required to assess their specific impacts and proffer appropriate strategies to mitigate and effectively manage them. A mixed research methodology incorporating both quantitative and qualitative techniques including questionnaires, surveys, focus group interviews, and desk/case studies of major public infrastructure projects, is recommended. Triangulation and other analytical tools (SPSS, Smart PLS software, and Cronbach's alpha) will aid validity and reliability testing. This further research, which will be undertaken with primary data, is imperative to bridge Nigeria's infrastructure gap and to promote rapid economic growth and sustainable development of the country.

APPENDIX A

Table 2. Risk factors in construction projects. Literature Review from 2007 to 2023.

Risk Classification and description	Source																										
	Zou et al. (2007)	Zavadskas et al. (2010)	Olawale and Sun. (2010)	Echono. (2011)	Akinola et al. (2012)	Goh et al. (2013)	Mahendra et al. (2013)	Odimbo and Oduora (2013)	Wetete et al. (2013)	Renulka et al. (2014)	Tipili and Iyessu. (2014)	Choudhry et al. (2014)	Adimu et al. (2015)	Odimbo. (2016)	Lindhard and Larsu. (2016)	Jimoh et al. (2016)	Arditi et al. (2017)	Ayubun-Versah & Knight. (2017)	Alkhalife et al. (2018)	Behamid et al. (2019)	Nguyen and Nguyen (2020)	Muhammad et al. (2021)	Behamid et al. (2022)	Ayodeji et al. (2023)	Ahmad et al. (2023)	Mannan et al. (2023)	
Technical risks																											
Incomplete design																											
Poor specifications		X	X				X					X		X													X
Inadequate site investigation/unforeseen site conditions		X	X					X				X						X									
Change in scope	X					X	X					X		X													
Wrong procedures and execution			X	X						X										X							
Insufficient technical skill						X	X							X		X						X			X		X
Innovation/new technology		X	X			X	X	X				X					X		X						X		X
Lack of knowledge management			X		X			X	X	X		X		X		X		X	X			X	X		X		X
Construction risks																											
Labour productivity					X		X	X						X		X					X	X				X	
Disputes, strikes/work stoppages				X			X			X	X		X			X	X					X					
Adverse Site conditions					X		X		X			X				X				X							X
Equipment failure/non-availability				X		X	X				X			X		X					X				X		
Design changes		X	X	X		X	X			X			X		X		X	X			X						X
Unrealistic program/ work schedule		X			X			X				X				X		X			X			X	X		
Delays in site handover	X			X												X					X			X			X
Poor workmanship/ quality standards		X	X	X	X	X			X			X					X				X						
Poor performance of contractors				X					X							X									X		
Financial risks																											
Material costs			X	X			X			X				X		X			X			X					X
Low market needs		X					X							X	X							X			X		X
Funding problems		X			X		X	X			X			X	X			X	X			X			X		X
Exchange rate fluctuation		X	X				X				X			X											X		X
Payment delays		X			X				X					X		X					X	X					
Wrong estimation	X		X				X			X			X								X						X
Excessive taxes/tariffs		X	X				X		X			X				X				X		X			X		X
Price fluctuations	X				X			X	X	X		X				X				X	X			X		X	X
Inflation/interest rate for credit		X	X	X	X			X		X		X		X		X					X						
Contractor insolvency				X		X				X				X					X					X		X	
Rising Labour costs		X										X	X					X	X					X		X	X
Socio-political risks																											
Changes in laws and regulation		X	X				X	X									X					X				X	X
Culture of impunity		X		X						X				X				X						X	X	X	
Bribery, corruption		X	X				X							X			X	X		X				X	X	X	X
Import dependence/ debts					X		X				X											X			X		X
Insecurity					X		X	X			X			X							X			X		X	X
Delays in regulatory approval		X					X		X										X			X					X
Communal conflicts				X		X								X		X					X				X		
Political instability	X		X	X				X	X	X	X		X		X		X				X				X		X
Physical risks																											
Damage to structure				X		X	X						X		X					X							
Damage to equipment		X		X			X				X					X					X				X		X

Risk Classification and description	Source																											
	Zou et al. (2007)	Zavadskas et al. (2010)	Olawale and Sun. (2010)	Echono. (2011)	Akinola et al. (2012)	Goh et al. (2013)	Mahendra et al. (2013)	Odumabo and Odunza (2013)	Nketekete et al. (2013)	Renuka et al. (2014)	Tipili and Iyasa. (2014)	Choudhry et al. (2014)	Adamu et al. (2015)	Odimebo. (2016)	Lindhard and Larsu. (2016)	Jimoh et al. (2016)	Arditi et al. (2017)	Ajekun-Mensah & Knight. (2017)	Akinbile et al. (2018)	Bahamid et al. (2019)	Nguyen and Nguyen (2020)	Muhammad et al. (2021)	Bahamid et al. (2022)	Ayodeji et al. (2023)	Ahmad et al. (2023)	Ayodeji et al. (2023)		
Labour injuries/death		x						x									x	x										
Equipment; fire, or theft.		x						x								x									x			
Material fire/theft		x						x								x			x						x			
Poor quality of materials		x										x							x									
Shortages/supply delay; equipment, material		x		x								x							x						x			
Organizational risks																												
Inefficient procurement/fraud.																												
Management Changes				x																						x		
Poor documentation e.g change orders												x																
Contractor's competence/experience												x															x	
Lack of capacity or motivation																												
Poor communication				x	x																							
Shortage of skilled staff																										x	x	
Excessive malpractices			x													x	x									x		
Environmental risk																												
Natural disasters (force majeure)																												
Community disagreement																												
Bad media/public opinion																												
Vandalism/insurgency																												
Other risks factors																												
Low contract price			x																									x
Breach of contract			x																									x
Disputes with contractor			x																									x
Petitions and litigation																												x

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