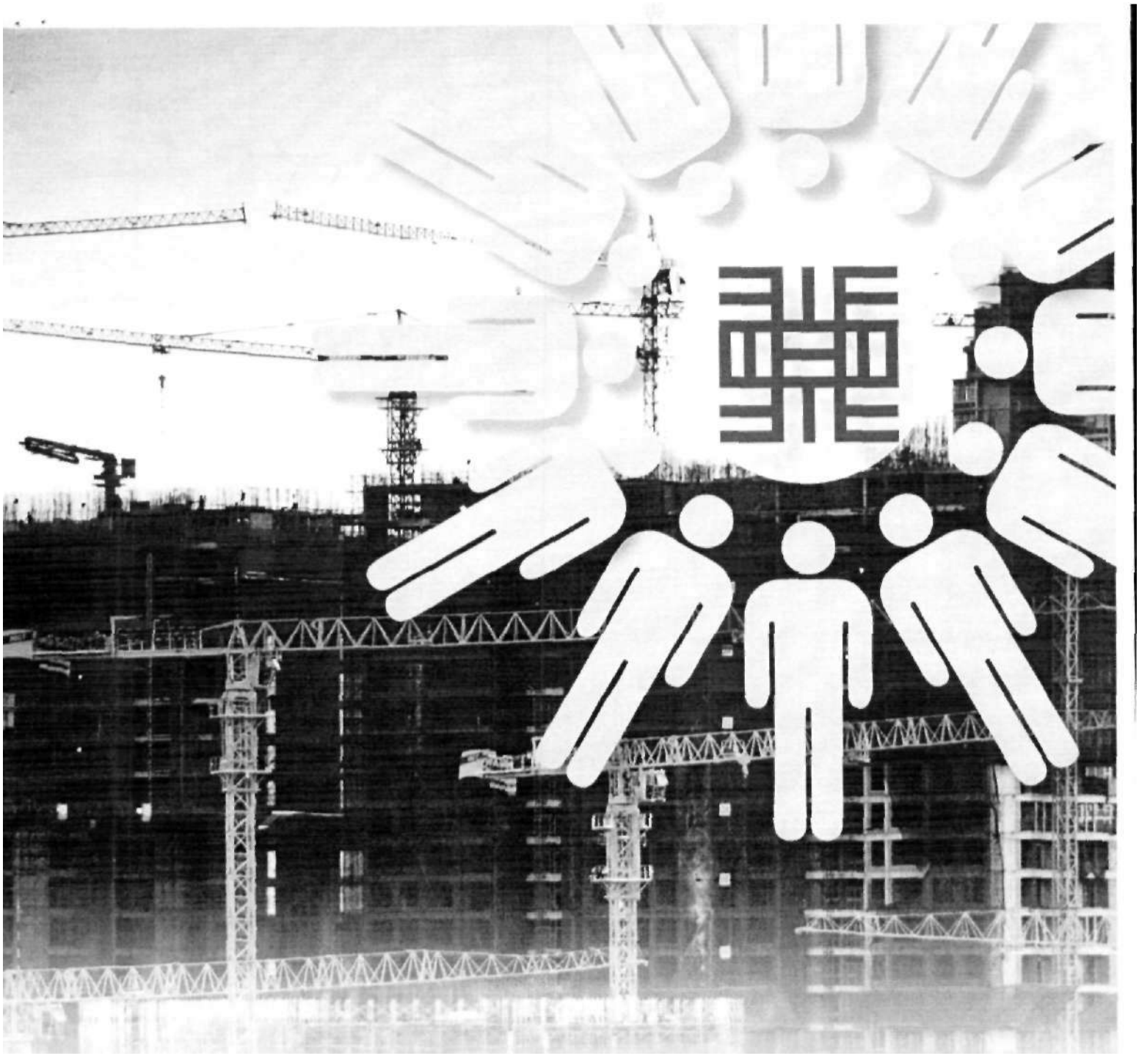


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Declaration

All papers in this publication have been through a review process involving initial screening of abstracts, review of full papers by at least two referees, reporting of comments to authors, revision of papers by authors and re-evaluation of re-submitted papers to ensure quality of content.

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IMPACT OF RISK FACTORS ON CONSTRUCTION PROJECTS QUALITY IN NIGERIA

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One of the primary objectives of every construction project is meeting or exceeding the quality requirements of clients. The nature and complexity of construction projects encompass a lot of risks, which could hinder the attainment of the desired project quality. Evaluating the impact of risk is essential for determining the extent to which it could derail the attainment of project objectives. This study assessed the impact of risk factors on construction projects 'quality in Nigeria. Quantitative research method comprising questionnaire survey was used for the study. Data was obtained using close ended structured questionnaires distributed to 192 construction practitioners. The impact of 65 risk factors on construction project quality was evaluated. Descriptive statistics was used to analyse the data. The study found eighteen (18) risk factors as having high impact on projects quality; the topmost being 'shortage of skilled labour '(MS = 4.30), 'poor design '(4.19), 'inadequate experience by project team '(4.18), 'deviating from specifications due to misunderstanding of drawings and specifications '(4.05) and 'inadequate project monitoring '(3.96). The study concludes that the impact of some risk factors could adversely lead to unacceptable quality reduction. The study recommends paying more attention to managing the risk factors having high impact so as to achieve the desired projects quality.

Keywords: assessment, construction projects, impact, quality, risk factors

INTRODUCTION

The Construction sector is crucial to social and economic development of nations because of several reasons. Adeagbo (2014) posited that the sector possesses huge potential with respect to employment generation. The various activities undertaken in the sector are very useful to developing effective linkages among various sectors of the economy as well as sustaining economic development. Efforts at ensuring sound and sustainable national and economic development cannot ignore the importance of infrastructural development (transportation-road, rail, air, sea modes), industrial development (construction of industrial parks and factories),

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construction of institutional buildings, and provision of accommodation with respect to construction of various types of buildings, among others. These are areas where the construction sector is indispensable.

The Nigerian construction sector makes modest contribution to the national economy. According to National Bureau of Statistics '(NBS, 2011; 2012 and 2014) the sector accounted for 1.84 % of the country's Gross Domestic Product (GDP) in 2008. Furthermore, in year 2016 and 2017, the sector's contribution improved to 3.55% and 3.77% respectively (NBS, 2018). Moreover, 2020, the sector accounted for 3.50% of real GDP (NBS, 2021). The sector's average contribution over these years stood at 3.17%. Despite its contribution to the GDP, the sector and its stakeholders are afflicted with so much risks because of the nature of construction environment, organizations, business activities and processes (Ibironke, Famakin & Akingunola, 2011). According to Chieng, Wu and Huang (2014), the size and complexity of construction projects (CPs) are increasing, thus increasing risks.

ISO 31000 (ISO, 2009) simply defines risk as any event that has the potential of hindering the achievement of objectives. Odeyinka (2006) described risk in construction as a variable in the construction process whose variation results in uncertainty as to the final cost, duration, and quality of the project. In the construction industry, risk is a combination of activities that affect the project objectives (POs) of time, cost, quality and scope (Ehsan, et al, 2010). Therefore to successfully deliver a construction project, it is necessary to have risk management (RM) as an integral part of construction project management practice (Zou, Chen, & Chan 2010).

In the construction projects context, RM is a systematic way of identifying, analysing, and dealing with risks associated with a project with the aim of achieving the project objectives. Risks cannot be ignored in construction projects because the success or failure of a construction project may solely be dependent on the RM competences of the key stakeholders of such projects. Construction stakeholders are constrained by this reality and therefore continuously seek measures that will guarantee economic balance between risks and attainment of the primary project objectives (time, cost and quality).

Quality is described as the totality of features required by a product or service to satisfy a given need; fitness for purpose (Parfitt & Sanvido 1993). In a simpler term, quality means meeting or exceeding the clients 'requirement. Requirements will be predefined by client in contract agreement and the requirements consist of the established characteristics of products, processes, and services. All the parties involved in the project must fully understand those requirements and expectation in order to achieve a complete project that meets clients 'quality expectation (Ganaway, 2006). Quality performance can be determined by taking clients' satisfaction into consideration.

Risk in construction, if not properly managed, could have a negative impact on the projects 'quality and could in turn causes client's dissatisfaction. Satisfaction has been explained as a function to make comparison between a perception of an outcome by an individual and the expectation of the outcome. Client's satisfaction has become challenging issue for the past few decades in construction industry. Usually, clients of construction sector experienced dissatisfaction in many aspects

including poor quality (Tiong et al., 2014) and could partly be attributed to improper identification and management of the risks.

Risk has also been broadly categorized as either subjective or objective and so, risk can either be subjectively or objectively analysed. Subjective risks are the ones which are analysed based on the experience and knowledge of the analyst, whereas objective risks are analysed by calculation of their actual impact and likelihood recorded in project risk registers. Adams (2008) believes that most of the construction project's risks are subjective because there are not sufficient historical data for their quantitative analysis and should be analysed according to analyst's judgment. This study therefore adopted the subjective risk assessment method.

Researchers (Laryea et al., 2012; Enshassi & Mosa, 2008; Aliyu, 2013; Baba, 2014; Hedaya & Saad, 2017) have identified the risk factors that affect construction projects success. These include changes in scope of work on site, incomplete design at the time of tender, contractual claims, financial difficulty of owner, delay in progress payments by clients, poor of cost planning and monitoring of funds, variations and additional works among others. Many research efforts (Ishaq et al 2020; Ishaq et al 2021a; Ishaq et al 2021b; Abd El-Karim et al 2015; Yusuf 2016; Ghulam & Noel 2017,) have been made to study the influence of risk on time and cost objectives of construction projects. However, there is dearth of literature on the influence of risk on construction project's quality especially at the design and construction phases. Much has not been documented in this regard and therefore construction stakeholders have less information on the risk factors that could have high impact on projects 'quality. More so, quality is considered as one of the three primary objectives of construction projects that cannot be ignored. Therefore, this study sought to fill this knowledge gap.

LITERATURE REVIEW

Risk and construction projects

Risk is an uncertain event or set of circumstances that its occurrence will have an effect on achievement of one or more project objectives (PMI, 2004). Risk in relation to construction is an event in the process of a construction project in which its occurrence will lead to uncertainty in the final cost, duration or quality of the project (Akintoye & Macleod, 1997). According to Smith et al (2006), construction project irrespective of its size is subject to more risks because of distinctive characteristics of construction such as financial intensity, complex procedures, lengthy duration, aggressive environment and dynamic arrangements of organizations. Many other factors affect the level of risk including situation of market, level of competition, size of the project, political and economic variations, expertise of parties (PMI, 2004).

Because of the complexity and uniqueness of construction projects, the risk present in each construction project vary (Panthi et al., 2009). Construction projects consist of various stages or phases as described by different authors with all leading to the similar project life cycles. Liu and Zhu (2007) divide construction stages into conceptual, design, tender, preconstruction, and construction. Zou et al (2006) also divided the stages of a construction project into feasibility, design, construction, and operation. PMI (2004) defined phases of construction project as Concept,

Planning, Detailed Design, Construction, and post Construction. The number of phases may also increase depending on the managers 'viewpoint.

Risks in construction projects are distributed through the entire project life cycle. It is very likely that some of the risks may occur at more than one phase of the project life cycle. There are arguments regarding the degree of risk in different phases of a construction project. Godfrey (1996) believe that the greatest degree of risk exist in the earliest phase of the project when available information about the project is the least. This is in agreement with other researchers such as Hassanein and Afify (2007) who have stated that risk is at its peak in the conceptual phase. However, Zou et al. (2006) consider the construction phase to be more risky phase than the feasibility (conceptual) phase. In addition, there are other theorists believing that risks of construction projects increase as the project progresses which means that each phase of the construction project includes more risks than the previous ones. However, Wang et al (2004) considers that risk in construction projects greatly depends on the type of the project as well as the contract type. Oyewobi et al. (2012) further asserted that, the common consequences of project risks amongst others are cost overruns, time overruns, poor quality, and disputes among the parties to a construction contracts. Oyewobi et al., (2012) also added that risk is an important issue to contractors as well as clients and consultants of the industry and that, the problems of risk assessment are complex and poorly understood in practice.

Various institutes and authors have classified construction risks into different types and hierarchies. Smith and Bohn (1999) have classified construction risk as either internal or external. Risk has also been broadly categorized as either subjective or objective. Risks can be further subcategorized into smaller groups according to their type and impact. Wiguna and Scott (2006) classified risks into four categories: economic and financial risks, external and site condition risks, technical and contractual risks, and managerial risks. PMI (2004) also categorise risk into another four categories: Technical risks, organizational risks, project risks and external risks (TOPE risks). Hedaya and Saad (2017) classified risk into 8 groups to include contractor's site management related factors, design and documentation related factors, financial management related factors, information and communication related factors, human resource related factors, non-human resource related factors, project management and contract administration related factors, and environmental related factors. Enshassi and Mosa (2008) also classified risk as physical, environmental, design, logistics, financial, legal and construction. The risk factors from various studies were harmonized and adopted to develop the questionnaire for the study.

METHODOLOGY

The study adopted quantitative research approach because of the nature of the problem that seek to address 'how much of an impact 'using questionnaire survey. A structured closed ended questionnaire containing 65 project risk factors (grouped into 10) was designed to enable data collection. Questionnaire is the most widely used and useful instrument for collecting survey information because it provide structured, often numerical data and it can be administered with or without the presence of the researcher (Wilson & McLean 1994; Cohen, Manion &

Morrison 2007). The questionnaire was validated by experts in academia and industry prior to commencement of data collection. Respondents were asked to rate the impact of the risk factors on project quality (PQ) on a 5-point scale (1= Negligible to 5= Very high). A risk impact assessment guide by PMI (2004) as shown in Table 1 was adopted to guide the respondents and discussion of the results.

The study population consists of construction practitioners (Architects, Builders, Engineers, Quantity Surveyors and Project Managers). The justification for the selection of practitioners is that, practitioners have the knowledge and skills with regard to technical and managerial aspect of construction works. Hence, they are aware or more informed about the various risks associated with construction projects as well as the effects the risks may have on the quality of construction projects. A minimum sample size of 96 was determined using by Cochran (1977) formula, at 95% confidence level, 10% confidence interval and 50% degree of variability. In accordance with Glenn (1992) the sample size was increased to account for non-responses and incomplete responses. Considering the large number of variables contained in the data collection instrument, a valid response rate of at least 50% was assumed. Therefore 100% of the estimated sample size was added making a total of 192 distributed questionnaires. Convenience sampling technique was used to administer the questionnaires to target respondents. A total of 138 questionnaires were duly completed and returned while only 114 were useful for analysis, representing 59.38% valid responses.

Descriptive statistics was used to analyse the data. This has also been used in similar studies by Ishaq et al (2021a); Ishaq et al (2021b); Salawu (2016); Abdulrahman (2018). Mean scores and standard deviation were computed and used to rank the impact of the risk factors on PQ. A risk factor having mean score ≤ 1.49 is considered to have negligible (very low) impact; risk factor with mean score 1.5 to 2.49 is considered to have low impact; risk factor with mean score 2.5 to 3.49 is considered to have moderate impact; risk factor with mean score 3.5 to 4.49 is considered to have high impact; and risk factor with mean score ≥ 4.5 is considered as having very high impact. The standard deviation was used to rank the factors where there is a tie in the mean scores.

Table 1: Risk impact assessment guide

Identified risk factor	Project objectives	Negligible 1	Low 2	Moderate 3	High 4	Very high 5
Risk factor	QUALITY	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

Source: PMI (2004)

RESULTS AND DISCUSSION

Assessment of impact of the risk factors on Project Quality (PQ)

Respondents were presented with 65 risk factors affecting construction projects and were asked to rate the impact of the risk factors on quality of construction

projects on a 5 point scale (1= negligible and 5= very high). The risk factors are categorised into 10 groups and the result is presented in Table 2.

Table 2: Impact of the risk factors on project quality (group wise)

S/N	Risk Factors	Mean	SD	Group Rank
A	Contract Administration and Project Management Related Factors			
1	Bribery and Corruption	3.91	.916	1
2	Poor project management	3.69	1.131	2
3	Inaccurate quantity take-off	3.12	.599	3
4	Undefined scope of work	3.10	.852	4
5	Change in the scope of the work	3.02	.794	5
6	High Competition in Bids	2.94	1.885	6
7	Delay in decision making	2.17	1.180	7
	Group Mean	3.14		
B	Design Related Factors	Mean	SD	Group Rank
1	Poor design	4.19	.833	1
2	Mistakes/ errors in design	3.77	.866	2
3	Frequent design changes	3.63	.827	3
4	Incomplete design at the time of tender	3.09	.978	4
5	Delay in approval of design	2.59	1.331	5
6	Delay in design	2.38	.849	6
	Group Mean	3.28		
C	Construction and Contractor's Site management Related Factors.	Mean	SD	Group Rank
1	Inadequate experience by project team	4.18	.928	1
2	Deviating from specifications due to misunderstanding of drawings and specifications	4.05	.727	2
3	Inadequate project monitoring	3.96	.775	3
4	Poor site supervision	3.89	.615	4
5	Mistakes during construction	3.82	.793	5
6	Inadequate cost estimate	3.74	.821	6
7	Poor site management	3.74	.753	7
8	Inadequate project control	3.73	.856	8
9	Incompetent subcontractors	3.56	1.013	9
10	Inadequate time estimate	3.22	1.029	10
11	Schedule delay	3.14	.889	11
12	Equipment failure	2.93	.761	12
13	Equipment unavailability	2.81	.694	13
14	Undocumented change orders	2.69	.597	14
15	Materials theft	2.64	1.001	15
16	Shortage of materials	2.61	.771	16
17	Late delivery of materials	2.58	1.261	17
18	Materials wastage	2.54	.804	18
19	Late delivery of equipment	2.50	1.262	19
20	Labour accident	2.27	1.016	20
	Group Mean	3.23		
D	Financial Related Factors	Mean	SD	Group Rank
1	Poor cash flow management	3.39	.699	1
2	Financial difficulties of owner	3.39	.771	2
3	Financial failure of contractor	3.38	1.020	3
4	Delay in progress payment by owner/client	3.32	.896	4
5	Poor financial control on site	3.13	.759	5
6	Delay in payment to supplier/subcontractor	2.66	.865	6
7	Contractual claims	2.42	1.318	7
	Group Mean	3.10		
E	Information and Communication Related Factors	Mean	SD	Group Rank
1	Lack of coordination between stakeholders	3.03	.864	1
2	Poor communication between stakeholders	2.91	.868	2
3	Slow information flow between stakeholders	2.84	.974	3
	Group Mean	2.93		

Table 2 cont'd: Impact of the risk factors on project quality (group wise)

F	Legal Related Factors	Mean	SD	Group Rank
1	Legal disputes during construction phase among contract parties	2.81	.830	1
2	Lack of specialised arbitrators to help settle dispute fast	2.27	1.182	2
3	Difficulty of obtaining permits from regulatory authorities	2.26	1.311	3
4	Ambiguity of work legislations	2.10	1.381	4
	Group Mean	2.36		
G	Human Resource (Workforce) Related Factors	Mean	SD	Group Rank
1	Shortage of skilled labour	4.30	.499	1
2	Shortage of technical personnel	3.80	.658	2
3	Difficulty in training new labour	3.70	.889	3
4	Shortage of unskilled labour	3.43	.975	4
5	Poor labour productivity	3.12	.898	5
6	Labour absenteeism	2.95	.850	6
7	High cost of labour	2.74	1.064	7
	Group Mean	3.43		
H	Economic Related Factors	Mean	SD	Group Rank
1	Increase in interest rates	2.89	.866	1
2	Increase in exchange rates	2.78	.870	2
3	Increase in prices of materials	2.77	.729	3
4	Increase in cost of labour	2.56	.799	4
5	Increase in fuel/oil Prices	2.12	.922	5
	Group Mean	2.63		
J	Political Related Factors	Mean	SD	Group Rank
1	Political crises/Civil unrest	3.23	1.004	1
2	Changes in governmental Laws	2.40	1.086	2
3	Unfavourable Governmental policies	2.36	1.012	3
	Group Mean	2.66		
K	Environmental Related Factors	Mean	SD	Group Rank
1	Force majeure (earthquake, flood etc.)	3.86	1.231	1
2	Unfavourable project location	3.11	.910	2
3	Effects of weather	2.98	1.052	3
	Group Mean	3.32		

Table 2 presents the impact of the risk factors on projects quality (PQ). As seen in the Table, a total of 65 risk factors were presented and grouped into 10. The first group of factors (Group A) is the Contract administration and project management related factors containing 7 sub factors. Risk incurred due to bribery and corruption has the highest mean value (3.91) and is therefore considered as the risk factor with the highest impact on PQ within this group thus ranked 1st. while Poor project management (3.69) and inaccurate quantity take-off (3.12) are the 2nd and 3rd risk factors with highest mean value. On the other hand, the risk factor having the lowest mean value under this category is Delay in decision making (2.17) thus ranked 7th. Also as it can be seen in the same group (A), first two risk factors (those ranked 1st and 2nd) have a mean value within the range of (3.51 to 4.49) thus

considered as having high impact on PQ while all the remaining risk factors under this group with the exception of the risk factor ranked 7th have mean value ranging from (2.51 to 3.49) and are considered as having moderate impact on project completion cost. However, the risk factor ranked 7th (delay in decision making) have a mean score of (2.17) thus considered as having low impact on PQ. Furthermore, this group has an overall mean value of (3.14)

The second group of factors (Group B) is the design related risk factors. Under this category, it can be seen that, the risk factor with highest impact on PQ is poor design having a mean score of (4.19) and is therefore ranked 1st followed by mistakes and error in design (3.77) ranked 2nd and Frequent design changes (3.63) ranked 3rd. on the other and, the risk factor with the least impact on PQ is delay in design having a mean value of (2.38) and therefore ranked 6th. Risk factors ranked 1st to 3rd under this group have a mean value ranging from (3.50 to 4.49) and are therefore categorised as having high impact on project completion cost while the risk factors ranked 4th and 5th have a mean value ranging from (2.50 to 3.49) hence considered as having moderate impact on PQ. The risk factor ranked 6th have a mean value of (2.38) and is therefore considered as having low impact on PQ. This group also has an overall mean value of (3.28)

Construction and contractors site management related factors (Group C) contain 20 sub factors. Under this group, the first three risk factors with the highest mean score are inadequate experience by project team (4.18), deviating from specifications due to misunderstanding of drawings and specifications (4.05) and inadequate project monitoring (3.96). These risk factors are ranked 1st, 2nd and 3rd respectively. On the other hand, materials wastage (2.50), late delivery of equipment (2.47) and late delivery of materials (2.39) are the risk factors with the lowest mean value in this group in this group thus ranked 18th 19th and 20th. Furthermore, out of the twenty risk factors under this category, nine of them (factors ranked 1st to 9th) have a mean score ranging from (3.5 to 4.49) and are therefore considered as having high impact on PQ while all the remaining risk factors under this group with the exception of the risk factor ranked 20th have mean score ranging from (2.5 to 3.49) and are therefore considered as having moderate impact on PQ. The risk factor ranked 20th (labour accident) have a mean value of (2.27) and is therefore considered as having low impact on PQ. Furthermore, this group has an overall group mean of (3.23).

Financial related factors (Group D) has 7 sub factors. Under this category, the first three risk factors with the highest mean score are Poor cash flow management with mean score of (3.39), financial difficulties of owner (3.39) and financial failure of contractor (3.38). These factors based on their mean scores are ranked 1st, 2nd and 3rd respectively. On the other hand, the risk factors with lowest mean scores are delay in payment to supplier/subcontractor (2.66) and contractual claims (2.42) thus ranked 6th and 7th respectively. Furthermore, it can also be seen from the Table that risk factors ranked 1st to 6th under this category have mean score ranging from (2.5 to 3.49) and therefore can be considered as having moderate impact on PQ while the risk factors ranked 7th have a mean score of (2.42) thus, considered as having moderate impact on PQ. This group also have an overall group mean of (3.10).

Information and communication related factors (Group E) has 3 sub factors. All the risk factors have a mean score ranging from (2.5 to 3.49) and are considered as having moderate impact on PQ. The risk factor with highest mean score under this category is lack of coordination between stakeholders (3.03) followed by poor communication between stakeholders (2.91) and slow information flow between stakeholders (2.85). These risk factors are ranked 1st, 2nd and 3rd respectively. The group also has and overall mean score of (2.93).

Legal related factors (Group F) have 4 sub factors. The risk factor with highest impact on project completion cost is Legal disputes during construction phase among contract parties (2.81) followed by lack of specialised arbitrators to help settle dispute fast (2.27). These risk factors are ranked 1st and 2nd respectively. On the other hand, Ambiguity of work legislations have the least mean score (2.10) thus ranked 4th. Furthermore, the risk factor ranked 1st under this category has a mean score of (2.81) thus considered as having moderate impact on PQ while the remaining risk factors (those ranked 2nd, 3rd and 4th) have a mean score ranging from (1.5 to 2.49) thus considered as having low impact on PQ. The group also has and overall mean score of (2.36)

Human resources (workforce) related factors (Group G) has 7 sub factors. Under this group, the first three risk factors with the highest mean values are shortage of skilled labour with mean score of (4.30), Shortage of technical personnel (3.80) and difficulty in training new labour (3.70) and are therefore ranked 1st, 2nd and 3rd respectively. On the other hand, the risk factors with lowest mean values are poor labour productivity (3.12), labour absenteeism (2.95), and high cost of labour (2.74) and are ranked 5th, 6th and 7th respectively. Furthermore, the Table also shows that under this category, the risk factors ranked (1st to 3rd) have mean score ranging from (3.5 to 4.49) therefore can be considered as having high impact on PQ while risk factors ranked (4th to 7th) have a mean score ranging from (2.5 to 3.49) and are considered as having moderate impact on PCC. The group have overall mean score of (3.43)

Economic related factors (Group H) has 5 sub factors. The risk factor with highest mean score under this category is increase in interest rates with a mean score of (2.89) followed by increase in exchange rates (2.78). On the other hand, the risk factor with the lowest mean score is increase in fuel/oil prices with a mean score of (2.12). Furthermore all the risk factors under this category, with the exception of the factor ranked 5th obtained a mean score ranging from (2.5 to 3.49) and are thus considered as having high impact on PQ. The risk factor ranked 5th have a mean score of (2.12) thus have moderate impact on PQ. The group has an overall mean value of (3.63)

Political related factors (Group J) has 3 sub factors. The risk factor with highest mean score under this category is political crises/civil unrest (3.23) followed by changes in governmental Laws (2.40) and unfavourable Governmental policies (2.36). These risk factors are ranked 1st, 2nd and 3rd respectively. The risk factor ranked 1st have a mean score ranging from (2.5 to 3.49) thus considered as having moderate impact on PQ while the remaining two risk factors under this category have a mean value ranging from (1.5 to 2.49) and are therefore considered as having low impact on PQ. The group has and overall mean score of (2.63).

The last group of the risk factors Group (K) is the environmental related factors having 3 sub factors. The risk factor with the highest mean score under this category is force majeure (earthquake, flood etc.) (3.86) and therefore ranked 1st followed by unfavourable project location (3.11) ranked second and effects of weather (2.98) ranked 3rd. The risk factor ranked 1st has a mean value of (3.86) thus considered as having high impact on PQ while the risk factors ranked 2nd and 3rd have mean values ranging from (2.50 to 3.49) thus considered as having moderate impact on PQ. This group has an overall mean score of (3.32).

Comparing the group mean scores of the risk factors, human resources (workforce) related factors has the highest group mean (3.43) therefore ranked 1st followed by design related factors (3.28) and environmental related factors (3.32) thus ranked 2nd and 3rd respectively. On the other hand, the groups with the lowest mean score are economic related factors having a mean score of (2.77) and legal related factors (2.36) thus ranked 9th and 10th respectively. The results are presented in Table 3

Table 3: Comparison of Mean scores for the impact of the risk factors on project quality across the Categories of Factors

Codes	Risk factors group	Group Mean	Group Rank
G	Human resources (workforce) related factors	3.43	1
K	Environmental related factors	3.32	2
B	Design related factors	3.28	3
C	Construction and contractors' site management related factors	3.23	4
A	Contract administration and project management related factors	3.14	5
D	Financial related factors	3.10	6
E	Information and communication related factors	2.93	7
J	Political related factors	2.66	8
H	Economic related factors	2.63	9
F	Legal related factors	2.36	10

As seen in Table 3, all the groups of factors with the exception of legal related factors (group F) have a group mean scores ranging from (2.5 to 3.49) thus considered as having moderate impact on PQ while the exception have a mean value ranging from (1.5 to 2.49) thus considered as having low impact on PQ. Human resources (workforce) related factors (3.43) was identified as the group with highest impact on PQ though the overall impact was moderate, followed by environmental related factors (3.32) and design related factors (3.28).

Furthermore, Table 4 presents the overall impact of the risk factors on PQ in descending order of their mean values.

Table 4: Overall impact of the risk factors on construction project quality.

S/N	Risk Factors	Mean	SD	Rank
1	Shortage of skilled labour	4.30	.499	1
2	Poor design	4.19	.833	2
3	Inadequate experience by project team	4.18	.928	3
4	Deviating from specifications due to misunderstanding of drawings and specifications	4.05	.727	4
5	Inadequate project monitoring	3.96	.775	5
6	Bribery and Corruption	3.91	.916	6
7	Poor site supervision	3.89	.615	7
8	Force majeure (earthquake, flood etc.)	3.86	1.231	8
9	Mistakes during construction	3.82	.793	9
10	Shortage of technical personnel	3.80	.658	10
11	Mistakes/ errors in design	3.77	.866	11
12	Poor site management	3.74	.753	12
13	Inadequate cost estimate	3.74	.821	13
14	Inadequate project control	3.73	.856	14
15	Difficulty in training new labour	3.70	.889	15
16	Poor project management	3.69	1.131	16
17	Frequent design changes	3.63	.827	17
18	Incompetent subcontractors	3.56	1.013	18
19	Shortage of unskilled labour	3.43	.975	19
20	Poor cash flow management	3.39	.699	20
21	Financial difficulties of owner	3.39	.771	21
22	Financial failure of contractor	3.38	1.020	22
23	Delay in progress payment by owner/client	3.32	.896	23
24	Political crises/Civil unrest	3.23	1.004	24
25	Inadequate time estimate	3.22	1.029	25
26	Schedule delay	3.14	.889	26
27	Poor financial control on site	3.13	.759	27
28	Inaccurate quantity take-off	3.12	.599	28
29	Poor labour productivity	3.12	.898	29
30	Unfavourable project location	3.11	.910	30
31	Undefined scope of work	3.10	.852	31
32	Incomplete design at the time of tender	3.09	.978	32
33	Lack of coordination between stakeholders	3.03	.864	33
34	Change in the scope of the work	3.02	.794	34
35	Effects of weather	2.98	1.052	35
36	Labour absenteeism	2.95	.850	36
37	High Competition in Bids	2.94	1.885	37
38	Equipment failure	2.93	.761	38
39	Poor communication between stakeholders	2.91	.868	39
40	Increase in interest rates	2.89	.866	40
41	Slow information flow between stakeholders	2.84	.974	41
42	Equipment unavailability	2.81	.694	42
43	Legal disputes during construction phase among contract parties	2.81	.830	43
44	Increase in exchange rates	2.78	.870	44
45	Increase in prices of materials	2.77	.729	45
46	High cost of labour	2.74	1.064	46
47	Undocumented change orders	2.69	.597	47

Table 4 cont'd: Overall impact of the risk factors on construction project quality.

48	Delay in payment to supplier/subcontractor	2.66	.865	48
49	Materials theft	2.64	1.001	49
50	Shortage of materials	2.61	.771	50
51	Delay in approval of design	2.59	1.331	51
52	Late delivery of materials	2.58	1.261	52
53	Increase in cost of labour	2.56	.799	53
54	Materials wastage	2.54	.804	54
55	Late delivery of equipment	2.50	1.262	55
56	Contractual claims	2.42	1.318	56
57	Changes in governmental Laws	2.40	1.086	57
58	Delay in design	2.38	.849	58
59	Unfavourable Governmental policies	2.36	1.012	59
60	Labour accident	2.27	1.016	60
61	Lack of specialised arbitrators to help settle dispute fast	2.27	1.182	61
62	Difficulty of obtaining permits from regulatory authorities	2.26	1.311	62
63	Delay in decision making	2.17	1.180	63
64	Increase in fuel/oil Prices	2.12	.922	64
65	Ambiguity of work legislations	2.10	1.381	65

Table 4 presents the impact of all the 65 risk factors on PCC irrespective of their groupings. As seen in the Table, the first five risk factors with the highest mean scores are shortage of skilled labour (4.30), poor design (4.19), inadequate experience by project team (4.18), deviating from specifications due to misunderstanding of drawings and specifications (4.05) and inadequate project monitoring (3.96). These risk factors are ranked 1st, 2nd, 3rd, 4th, and 5th, respectively. On the other hand the last five risk factors having the lowest mean score are lack of specialised arbitrators to help settle dispute fast having a mean value of (2.27), difficulty of obtaining permits from regulatory authorities (2.26), delay in decision making (2.17), increase in fuel/oil Prices (2.39) and ambiguity of work legislations (2.10) and are therefore ranked 61st, 62nd, 63rd, 64th and 65th respectively.

Furthermore, out of the 65 risk factors considered in the study, eighteen risk factor (those ranked 1st to 18th) have a mean value ranging from (3.5 to 4.49) and are therefore considered to have high impact on PQ. This implies that, these risk factors could lead to project quality reduction that will not be acceptable by the client. Therefore, the risk factors identified to have high impact on PQ should be given more attention and appropriately managing them to minimise their adverse effects on the quality of the construction works.

Similarly, thirty seven risk factors (those ranked 19th to 55th) have a mean score ranging from (2.5 to 3.49) hence, can be considered as having moderate impact on PQ. Meanwhile the remaining ten risk factors (those ranked 56th to 65th) have a mean score ranging from (1.5 to 2.49) hence considered as having low impact on PQ.

CONCLUSIONS

The paper assessed the impact of project risk factors on construction projects ' quality. The study concludes that, shortage of skilled labour, poor design, inadequate experience by project team, deviating from specifications due to misunderstanding of drawings and specifications and inadequate project monitoring to be the six (6) topmost risk factors that negatively impacts the quality of construction projects. Moreover, it was also concluded that, of the sixty five (65) risk factors assessed, eighteen (18) risk factors have a high impact on PQ while thirty seven (37) risk factors are having a moderate impact on PQ, ten (10) of the risk factors have a low impact. In addition, it was also concluded that the impact of some risk factors (those with high impact) could adversely lead to unacceptable quality reduction. The study recommends paying more attention to managing the risk factors having high impact so as to achieve the desired projects 'quality.

The limitation of this research is that, the paper did not consider the frequency of occurrence of the risk factors, however, in order to determine the significance/ severity of the effects of the risk factors on project 'quality, there is the need to assess the frequency of occurrence of the risk factors and make further evaluation. This is because the severity of a risk factor is best determined as a product of the frequency of occurrence of the risk and its magnitude of impact. As such, further research is being carried out in this regard.

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