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Risk Management of Construction Sites: Professionals Perspectives

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Abstract

Construction is inherently risky but, less technically complex than projects in industries such as software, defense and engineering. This is simply because specialists in design and construction produce projects within a specified timescale. The success of any mega construction project is constantly subjected to certain sensitive external and internal environmental factors. The effects of these environmental factors usually cause uncertainties which bring elements of risk. Construction risk has been the object of attention because of time and cost over-runs associated with construction projects. In this paper contractor's items of risks and his methods of identifying, monitoring and controlling site risks were examined. This study reviewed previous literatures and conducted field survey on perceptions of professionals on how contractors identify, monitor and control site risks. The results show that the three assessed indices obtained either the 'high' or 'very high' relative importance index (RII) ratings. Conclusion was reached that a strict set of codes, laws, and regulations must be followed during the construction process to prevent these risks. The paper recommends that construction professionals and contractors should lead risks avoidance campaign in every construction site in the country.

Keywords: *Construction risk, Risk management process, Risk identification, Risk assessment, Risk control measures*

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Background to the Study

Bahamid and Doh (2017) in their research reported that organizations from many industries have recognized the increasing importance of risk management, and many companies have established risk management departments to control the risks they are, or might be exposed to. The authors also stated that construction industry and its clients are widely associated with a high degree of risk due to the nature of construction business activities, processes, environment and organizations. Risk in construction has been the object of attention because of time and cost over-runs associated with construction projects. Perry (1985) have expressed risk as an exposure to economic loss or gain arising from involvement in the construction process; Mason (1973) have regarded risk as an exposure to loss only. Bufaied, (1987) describes risk in relation to construction as a variable in the process of a construction project whose variation results in uncertainty as to the final cost, duration and quality of the project. It is generally recognized that those within the construction industry are continually faced with a variety of situations involving many unknown, unexpected, frequently, undesirable and often unpredictable risks.

Ashley (1981), Kangari and Riggs (1989) have all agreed that these situations are not limited to the construction industry; it is recognized that risk is built into any commercial organization's profit structure and is a basic feature of a free enterprise system. As much as risk analysis and management is important to the activities of the construction industry, little is known regarding the industry response, and in particular the techniques employed for risk analysis and management (Morphy2015-2020). Construction researchers are still faced with the challenges of discovering the most effective techniques of handling construction. Project managers resort to professional indemnity insurance to transfer risks associated with services provided to clients. According to Akintoye, (1997) it is generally recognized that risk should be transferred to the party that is in the best position to deal with it, the process where a contractor transfers all risks involved in a project does not mean well for innovations within the industry. Jimoh, Sani, Adoza, and Yahaya, (2016) reported that contractors have a tendency to contract out all the work packages involved in a project to sub-contractors and undertake contract management as part of a strategy to reduce or eliminate their risk. The implication therefore is that the general contractors with the means to do so either fail to or have no incentive to undertake research as part of the strategies to reduce the risks associated with their construction business activities risk.

Construction Risk

On construction projects, risk increase with hazards and decrease with safeguards. Historically construction has been risky for several reasons, and risk management in construction is designed to plan, monitor and control and prevent exposure to risk (Perry, and Hayes, 1985). To do this it is necessary to identify the hazard, assess the extent of the risk, provide measures to control the risk and manage any residual risks (Shannon 2017). To start managing your construction risks, you need to be able to list out what could jeopardize your projects (Chitkara 2012).Construction expert have also categorize project risks in the following order;

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is an important tool because it forms the basis of risk-based decision-making. Each risk assessment will examine and measure the sources of potential loss (exposures) over which a contractor has control (Kangari, and Riggs, 1989). The risk assessment can also identify and segregate the exposures over which the client department has control. The Risk Assessment may need to be done and revisited at various stages of the project. Initially it would be completed by the contract manager; once a contractor has been selected the risk assessment should be reviewed with the contractor (Choma, 2008). Perry, and Hayes, (1985) insist that risk assessment will assist the development of OHS Plans, Site Safety Plans, JSAs and Safe Work Method Statements. Risk control comprises risk treatment that requires taking action to avoid, prevent, reduce or transfer losses. Risk control can occur before, or after, a loss event. The various methods of loss control usually require on organization to develop, implement and maintain various processes and procedures to ensure the effectiveness and success of the risk control program.

Research Method

A survey of expert opinions on risk management of construction project site was conducted with a well-structured questionnaire, designed and administered to construction professionals in Owerri, the capital of Imo State, Nigeria. A total of fifty (50) questionnaires were distributed to various registered professionals, selected by stratified proportionate random technique, out of which forty-three (43) representing 86% of the study population were properly completed and returned. The major issues addressed in the survey include: risk identification, risk assessment, and risk control measures on construction sites. Data collected from the professionals were presented and statistically analysed in Tables 1 to 4. The respondents' opinions were assessed on five point Linkert scale; mean and relative importance index (RII) were used to analyse the level of importance of their opinions on construction site risk management. Interpretation of the RII values are as follows:

RII < 0.60, item is assessed to have low rating

0.60 ≤ RII <0.80, item assessed to have high rating.

RII ≥ 0.80, item assessed to have very high rating

Table 1: Professional Respondents

S/N	Professionals	Nr. of Questionnaires Distributed	Nr. of Questionnaires Returned	(%) of Total Questionnaires Rtnd
1	Architects	10	10	23.26
2	Civil Engineers	5	4	9.30
3	Quantity Surveyors	5	5	11.63
4	Builders	5	5	11.63
5	Mechanical Engineers	5	4	9.30
6	Electrical Engineers	5	4	9.30
7	Construction Managers	5	4	9.30
8	Land Surveyors	2	1	2.33
9	Town Planners	3	2	4.65
10	Estate Surveyors	5	4	9.30
	Total	**50**	**43**	**100**

Table 2: Identified Key Construction Risks

S/N	Risk Hazard Factors	Mean	RII	Rank
CR1	Fire outbreak	4.02	0.80	3rd
CR2	Public accident	4.00	0.80	3rd
CR3	Power lines	3.95	0.79	4th
CR4	Excavations	4.30	0.86	1st
CR5	Lifting of Materials	3.58	0.72	6th
CR6	Handling of Chemicals	4.02	0.80	3rd
CR7	Site Communication	4.30	0.86	1st
CR8	Incident Reporting and Investigations	3.95	0.79	4th
CR9	incompetency of workers	4.15	0.83	2nd
CR10	Vehicles and Driving	3.87	0.77	5th
CR 11	Explosives	4.15	0.83	2nd
CR 12	Trip, Slip and Fall Hazards	3.87	0.77	5th
CR 13	Use of plant and site equipment	4.02	0.80	3rd

Table 3: Risks Assessment of Construction Hazards

S/N	Assessment Hazard	Mean	RII	Rank
CRA1	Bushfire, and other fire out brake	3.80	0.75	5th
CRA2	Unprotected excavation, and dangerous earthworks	4.21	0.84	1st
CRA3	Induced voltage, current leakages, electrical storms and lighting	4.21	0.84	1st
CRA4	Public, personnel and fauna dangerous site exposure,	3.90	0.78	4th
CRA5	Falling objects, and material damages	4.05	0.80	3rd
CRA6	Spillage, and environmental damages	4.05	0.80	3rd
CRA7	Lack of understanding of alert instructions	3.90	0.78	4th
CRA8	Lack of learning from incidents	3.90	0.78	4th
CRA9	Dangerous applications, and equipment damage	4.21	0.83	2nd
CRA10	Driver fatigue, and effects of drugs or alcohol	4.15	0.83	2nd
CR A11	Blasting in public areas with less protection	4.15	0.83	2nd
CRA12	Uncontrolled access and egress from site	3.53	0.70	6th
CRA13	Electric shock, plantinjuries, and pollution	4.21	0.83	2nd

Table 4: Site Risks Control Measures

S/N	Control Measures	Mean	RII	Rank
CRM1	Installation of Firefighting equipment	4.02	0.80	5th
CRM 2	Adequate plant and equipment security and maintenance	4.15	0.83	2nd
CRM 3	Identification of power lines, and instant precautionary measures	4.02	0.80	5th
CRM 4	Providing adequate protection alerts on excavations and similar works	4.30	0.86	1st
CRM 5	Inspection of lift equipment and minimizing access to height	4.05	0.81	4th
CRM 6	Compliance with legislative requirements on the use of chemicals	4.05	0.81	4th
CRM 7	Regular meetings on hazard reports and prevention	4.10	0.82	3rd
CRM 8	Applying corrective action reports and recommendations.	4.00	0.80	5th
CRM 9	Training workers on hazard detection and avoidance	4.15	0.83	2nd
CRM 10	Regular vehicle maintenance, and fatigue management,	4.05	0.81	4th
CRM11	Blasting management plan and safety	4.05	0.81	4th
CRM12	Regular wearing of PPE, and appropriate OHS Inspections,	4.15	0.83	2nd
CRM13	Plant pre-use inspections and qualified plant operators	4.10	0.82	3rd

Discussion of Results

Identified Construction Site Risks

Table 2. Shows that among the identified risks factors eight have "very high" relevance importance index (RII > 0.80) of risk and the remaining five have "high" (0.60 ≤ RII <0.80). Excavation works and site communication tied to 1st rank with RII = 0.86. Competency of workers and explosives materials tied to the second position in order of importance with RII = 0.83. These results agree with professional's estimation of many high level risks on construction site

Site Risks Assessed Hazards

Table3.Shows that the RII for eight out of the thirteen assessed hazards have relevance index of 0.80 and above, which implies "very high" level of relevance. The remaining five have high relevance index of between 0.60 ≤ RII <0. 80). Unprotected excavation, and dangerous earthworks and induced voltage, current leakages, electrical storms and lighting tied to 1st rank with RII = 0.84.Dangerous applications, and equipment damage, driver fatigue, and effects of drugs or alcohol, and blasting in public areas with less protection tied to the second position in order of importance with RII = 0.83.The result supports the experts' recommendation of pre assessment of construction site risks to enable effective control measures (Kangari, and Riggs, 1989).

Site Risks Control Measures

Table 4. Shows that all the thirteen proposed control measures obtained "very high" range of level of relevance, (RII ≥ 0.80). Providing adequate protection alerts on excavations and similar works indicating levels of relevance of RII = 0.86. Adequate plant and equipment security and maintenance, training workers on hazard detection and avoidance, and regular wearing of PPE, and appropriate OHS Inspections, tied to second rank with RII = 0.83. Other measures were equally high. This is a confirmation that proactive measure must be installed on construction sites to be able to reduce to zero level, risky hazards that often occur on project sites(Perry & Hayes, 1985).

Barriers to contractors' application of risk management techniques

1. Lack of familiarity with the techniques.
2. The degree of sophistication involved in the techniques is unwarranted for project performance.
3. Time plus lack of information and knowledge.
4. Doubts whether these techniques are applicable to the construction industry.
5. Most construction projects are seldom large enough to warrant the use of these techniques or research into them.
6. They require availability of sound data to ensure confidence.
7. The vast majority of risks are contractual or constructions related and are fairly subjective, hence they are better dealt with based on experience from previous contracts undertaken by the firm.

Conclusion

Large construction project sites are very complex and can pose various internal and external risks. A strict set of codes, laws, and regulations must be followed during the construction process to best avoid these risks. Unfortunately, there is no way to completely avoid risks as there are bound to be unknown factors that arise over the course of a project. One of the best ways to manage site risks is to identify the various types and plan to manage them. If you can identify and categorize risks before you start a project, you can optimize your risk management and avoid any possible losses. Risk elements associated with construction projects influence the time, cost and quality performance of the project. Risk management therefore becomes a continuing activity in project development, from inception and throughout the life of the project.

Recommendation

Research observations shows that site risks can be better managed or effectively avoided when consultants and contractors make collective campaign on site risks.

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