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Guideline to Aid Project Managers in Conceptualizing and Implementing Risk Management in Building Projects

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Abstract

Risk management has become a critical issue as a result of globalisation and the continued quest for greater returns. Construction organisations most especially in developing countries, approach risk management in building construction projects by using a set of practices that are normally insufficient, produce poor results often, and turn profitable building construction projects into losing ventures. An integrated risk management approach allows construction organisations to consistently deliver superior performance while proactively managing risk. To address this gap, this paper offers a consolidated risk management system for building projects and provides project managers with guidelines for its proper implementation. In addition to helping project managers in improving risk management capability in building projects, the guideline profiled in this paper may also be of use to practitioners in other project risk management settings.

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Keywords: Risk management; Construction Projects; Integrated Framework

1. Introduction

Generally, projects are split into five managerial phases initiation, planning, execution, control and closure [1]. Each phase then has multiple checkpoints that must be met before the next phase begins. However, an investment in a building construction project is, of course, not without risks. Building projects are associated with risk-taking.

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Construction organizations should be prepared for the occurrence of possible risks. An effective project risk management will not only eliminate risks but will provide a standard process and procedure to deal with them and help prevent issues such as; (1) projects finishing late, exceeding budget or not meeting customer expectations (2) inconsistency between the processes and procedures used by projects managers, leading to some being favored more than others, (3) successful projects, despite a lack of planning, achieved through high stress levels, goodwill and significant amounts of overtime, (4) unforeseen internal and/or external events impacting the project.

When building construction projects begin to show signs of stress and failure, everyone looks to the project manager for answers. The management of risk can prove to be difficult for inexperienced project managers. This can have a knock-on effect on the delivery of a building construction project with respect to its objectives [2]. Frame [3] highlights that “Project managers bear ultimate responsibility for making things happen. Traditionally, they have carried out this role as mere implementers. To do their jobs they need to have basic administrative and technical competencies. Today they play a far broader role. In addition to the traditional skills, they need to have business skills, customer relations skills, and political skills. Psychologically, they must be results-oriented self-starters with a high tolerance for ambiguity, because little is clear-cut in today's tumultuous business environment. Shortcomings in any of these areas can lead to project failure.” Therefore, in order to help project managers, improve in their project risk management capability, this paper offers a consolidated risk management system for building projects and provides project managers with guidelines for its proper implementation.

2. Building Construction Industry

Building construction projects which are associated with housing, offices, hospitals, factories, churches etc. are unique and built only once. Additionally, these construction projects are dynamic, and are characterized by many unique factors such as work team rotations, exposure to weather conditions and changes in topography, topology and working conditions throughout the project life cycle [4]. Taking a look at the Nigerian construction industry, based on the forecast period of 2016-2020, the industry has continued to expand, with investment in infrastructure construction, healthcare, manufacturing plants, education facilities and housing projects continuing to drive growth [5]. Consequently, in 2012, the Nigerian building construction sector accounted for 1.33% GDP and this is below the world average benchmark for 9% of GDP [6]. This result leaves a huge room for growth in the construction of buildings across all sectors of the economy in the country. Nigeria is the focus of a great deal of attention from the international infrastructure sector currently, as a result of infrastructure gap and the commitment of the government (federal and the state level to fill the gap) to develop world-class infrastructure under the National Integrated Infrastructure Master Plan (NIIMP) 2043 to support sustainable economic development and growth. [5,7].

However, an investment in building construction projects is, of course, not without risks. For many years, construction organizations suffer from poor performance in terms of time delays, cost overruns and quality defects. The reasons behind these problems have attracted the attention of construction practitioners and researchers [8]. These problems can be overcome and reduced with having a well-organized and effective risk management system, thereby improving the performance of building construction projects. Improving building project performance is a primary driver of the economic performance and long-term sustainable competitiveness for construction organizations in a country [9]. Improving the performance of building projects can also improve competition, promote the enterprise, support science and innovation, raise skills, and encouraging investment [10].

2.1. Risk Management in Building Construction Industry

Construction risk as a variable in the process of construction whose occurrence results in uncertainty as to the final cost, duration and/or the quality of the project [11]. The management of risk is concerned with conducting risk management planning, identification, analysis, responses and monitoring and control on a project [1].

The construction industry recognises that this systematic risk management process is essential to manage the risk affecting building construction projects. Risk identification process reveals and determines the possible project risk as well as conditions and arising risk. The qualitative risk analysis process is regarded as the most useful part of risk management where the result gained is used extensively in subsequent stages. Important information about risks such as the likelihood of occurrence, the risk severity and risk ownership are required at this stage. The quantitative

risk analysis process involves the creation of a model which represents the project being studied and the general uncertainties. Consequently, the process of management of risk includes risk response strategies that are defined as risk retention, risk transfer, risk reduction, and risk avoidance [12]. These procedures are incorporated into building projects and are performed iteratively until the end stage of the project lifecycle. Various techniques and tools are continuously being developed with the aim of supporting and enhancing risk management activities [2].

Thoughtful and strategic risk management primarily maximises the effect of positive events and minimises the negative effects, thus increasing the chance of project’s success [13]. Effective actions are possible if a proper risk management approach is followed. Figure 1 shows a best practice system for risk management in building construction projects. The risk management system highlighted in Figure 1, will help project managers to conceptualise risk associated with building projects, in order to plan and undertake effective risk mitigation measures to curtail the risks before they happen. If Figure 1 is implemented successfully in building construction projects as recommended in this paper, it will offer the chance to gain a clear understanding of the goal, duties and contents of the service and feasibility of the project.

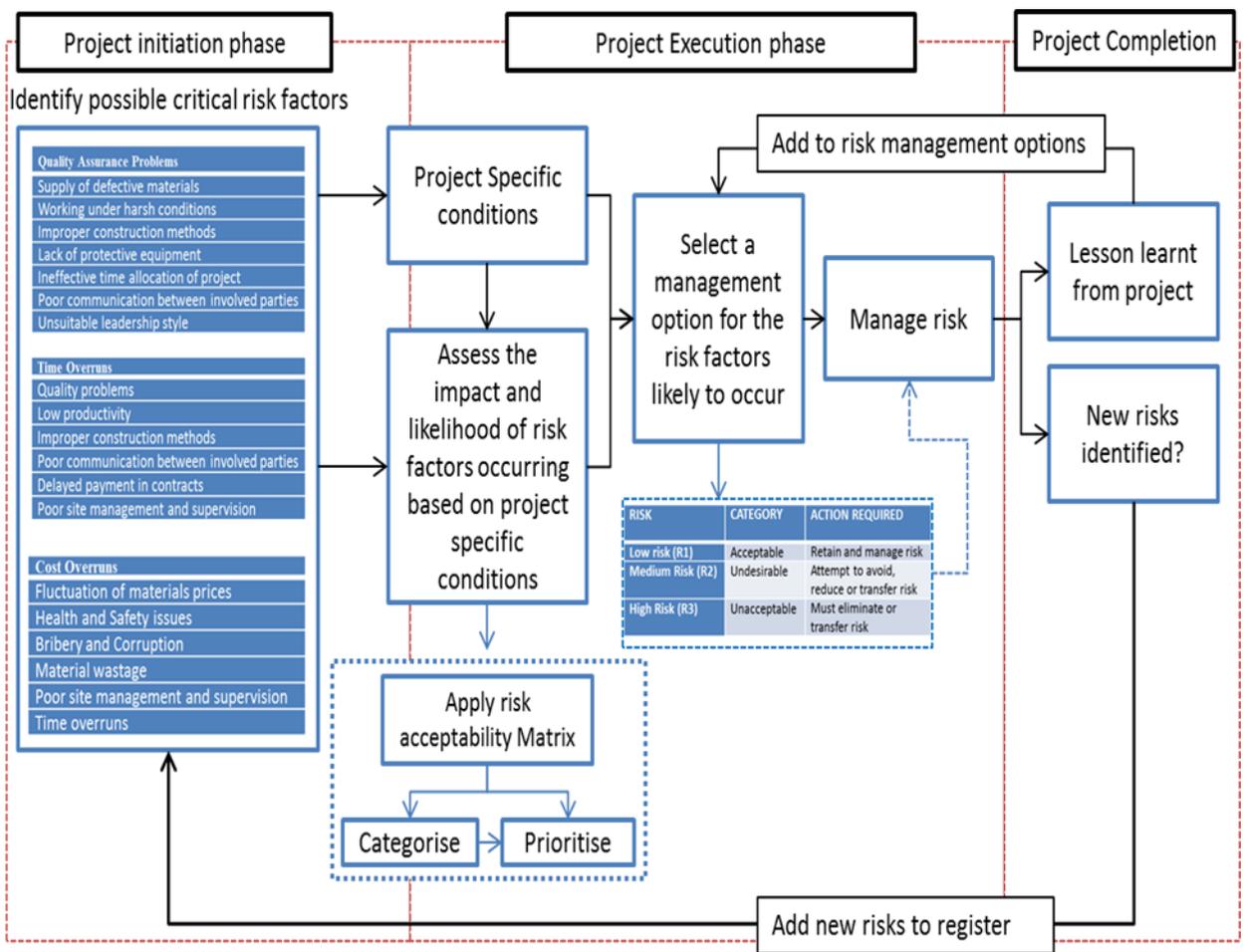


Figure 1: Best Practice System for Risk Management in Building Construction projects

3. Methodology

The essence of risk management is to be able to identify and quantify the risks inherent in any activity and put in place a management mechanism or plan to help mitigate or manage the influence of such risks on the activity. This paper discusses the guidelines in conceptualizing and implementing the best practice risk management system shown in Figure 1.

4. Guidelines for Implementing Best Practice System for Risk Management in Building Construction projects

The aim of the system is to guide project managers that intend to manage and assess risk associated with their building construction projects. The system represents a conceptualisation of how the different parts relate with one another in achieving the desired outcome, which is to manage risks on the project. However, to achieve this desired outcome, project managers have to put in something (input) into its system, which is then engaged in some processes to achieve the desired outcome.

Therefore, the system in Figure 1 comprises of the following sections: the project initiation phase; project execution phase and finally the project completion. These phases are further discussed below.

4.1. Project Initiation Phase

The initiation process defines and authorizes the start of a project. The initial scope is defined, and initial financial resources are committed. Internal and external stakeholders are identified, and the Project Manager is selected [1]. At this phase, the process of risk management begins with risk identification which develops the basis for the next steps of analysis, assessment and control. If this is done correctly it ensures risk management effectiveness. Risk identification is a continuous process. It is not possible to identify risk as a one-off activity [14]. Practically, the techniques used to thoroughly capture the critical risks affecting a building construction project include but is not limited to; brainstorming, Delphi technique, interviews, experiential knowledge, outputs from risk-oriented analysis, risk register etc.

Consequently, different definitions and classifications can be used in managerial practice. Tchankova [14], reports that general classification may use physical, social and economic sources. However, an in-depth investigation of the problem of risk identification may need classification that can cover all types of risk in more detail [14]. Hence, the sources of risk can be represented depending on the construction environment. Figure 1 identifies possible critical risk associated with building construction projects.

4.2. Project Execution Phase

Execution is the method where a major portion of the project work is carried out both physically and mental. Frigent and Comninis [15], the project execution phase has to do with monitoring and control and with applying corrective responses as necessary. As a result, risk assessment is regarded as the most useful part of the risk management process as the results gained from the analysis will be used extensively in the subsequent stages. Important information about risks such as the likelihood of occurrence, the risk severity, and risk ownership is required at this stage.

At this phase, it is important to determine the specific condition of each risk factor by determining their likelihood and impact. Tah and Carr [16] stated that a common language for describing risk likelihood and impact is necessary so as to achieve consistent quantification. These two dimensions are combined to determine whether risk is considered low, moderate or high. In order to achieve a consistent quantification, the terms used in this paper to quantify risk likelihood are improbable, rarely, occasionally, probable and frequent. Also, the terms used to quantify risk impact are marginal, little, moderate, great and extreme. Table 1 and 2 describes the terms, meanings, and measures that can be used.

Table 1: Risk Assessment-Likelihood

Description	Scenario	Scale Value
Frequent	Very frequent occurrence	5
Probable	Likely to occur regularly	4
Occasional	Quite often occurs	3
Rarely	Small likelihood but could well happen	2
Improbable	Unlikely but possible	1

Table 2: Risk Assessment-Impact

Description	Scenario	Scale Value
Extreme	Project could not be sustained (e.g. bankruptcy)	5
Great	Serious threat on project	4
Moderate	Medium effect on project	3
Little	Small effect on project	2
Negligible	Trivial effect on project	1

Risks are assessed using the Risk Acceptability Matrix (RAM). The RAM uses the five nonlinear scales for likelihood and impact as shown in Table 1 and 2 to distinguish between the two matrix dimensions as shown in Figure 2. The categorisation (Figure 2) and prioritisation (Figure 3) of the risk acceptability matrix (RAM), with the Y axis describing the likelihood of risk occurrence while the X axis the impact. The Y axis ranges from improbable to frequent while the X axis ranges from marginal to extreme. The RAM ranks risk factors to twenty-five (25) ranks according to their perceived significance as shown in Figure 3. According to this matrix, the risk factors are categorised into three groups as illustrated in Figure 2, specifically: R3 (high risk), R2 (Medium risk) and R1 (Low risk).

Impact \ likelihood	Extreme (5)	Great (4)	Moderate (3)	Little (2)	Marginal (1)
Frequent (5)	R3	R3	R3	R2	R1
Probable (4)	R3	R3	R2	R2	R1
Occasionally (3)	R3	R3	R2	R2	R1
Rarely (2)	R3	R2	R2	R1	R1
Improbable (1)	R3	R2	R1	R1	R1

Figure 2: Risk acceptability matrix (RAM) – Categor.

Impact \ likelihood	Extreme (5)	Great (4)	Moderate (3)	Little (2)	Marginal (1)
Frequent (5)	(1)	(6)	(9)	(15)	(21)
Probable (4)	(2)	(7)	(11)	(16)	(22)
Occasionally (3)	(3)	(8)	(12)	(18)	(23)
Rarely (2)	(4)	(10)	(14)	(19)	(24)
Improbable (1)	(5)	(13)	(17)	(20)	(25)

Figure 3: Risk acceptability matrix (RAM)-Prioritization

The causes of poor performance in building construction projects is measured using the risk likelihood and risk impact indices of each identified risk factor and placed in the appropriate cell within the RAM based on the perception of respondents. In order to explain this, ‘supplies of defective materials’ are being used as an example identified in Figure 1 to demonstrate the risk assessment using the RAM. Table 3 suggest that ‘supplies of defective materials’ is placed on the “occasional” likelihood row within the RAM whereas the “great” for impact is positioned in the suitable column. Therefore, the two risk attributes will meet up within R3 in the matrix, precisely in the cell number eight (8) as illustrated in Figure 2. This meant that the "supplies of defective material" is ranked eighth in criticality by means of the RAM as demonstrated in Table 3. The same assessment was carried out for other risk

factors by categorising and prioritising and the results have been demonstrated in Table 3.

Table 3: Assessment of risk factor using RAM

Risk Factor	Risk Likelihood	Risk impact	RAM	
			Ranking	Category
Supplies of defective materials	Occasionally	Great	8	R3

After risks are identified and assessed, they are not left unattended in the execution phase of construction projects. The outcome of the RAM enables responsible project managers to understand the risk impacts, and subsequently plan and undertake effective risk mitigation actions to curb the effect before or when they occur. The best practice risk management system also provides threshold values to acceptability of risks as shown in Table 4.

Table 4: key to acceptance of risk

RISK	CATEGORY	ACTION REQUIRED
Low risk (R1)	Acceptable	Retain and manage risk
Medium Risk (R2)	Undesirable	Attempt to avoid, reduce or transfer risk
High Risk (R3)	Unacceptable	Must eliminate or transfer risk

4.3 Project Completion

Risk management activities do not usually end abruptly when the entire task on the plan have been performed successfully. In the completion process, a number of loose but important ends are tied up [17]. As a result, as identified in the best practice risk management system, lesson learnt from the management of risk factors associated with building project must be captured and added to the management options to serve as aid for subsequent project. Also, if new risk factors were identified, they should be added to the risk register. Table 5 show a summary of the guidelines in conceptualizing and implementing the best practice risk management system.

Table 5: Guidelines for implementing Best Practice Framework for Risk Management in Building Construction projects in Nigeria

Stage of Projects	Actions required	Remarks
Project Initiation	Identification of possible risk factors, conduct risk assessment with emphasis on the impact and likelihood of risk factors occurring on the project	Information such as project sum, the type of client, duration, availability of drawings etc. to be used in selecting risk factors and conducting risk assessment
	Apply a risk acceptability matrix (RAM) to categorise and prioritise risk	
Project Execution Phase	Select risk management option by conducting risk assessment and categorization.	Use information provided in the framework to determine action required based on the categorisation of the risk
	Manage risk factors based on the best practice management options	Refer to best practice management options
Project Completion	Capture lessons learnt from the management of the	Add the insights to the management options to

risk factors	serve as aid on subsequent projects
Check if new risks factors were identified which are not listed in the risk registrar, and add to it	Update risk register anytime new risks are identified on projects

5. Conclusion

Risk management in building construction projects is not limited to noting down all the benefits and challenges or putting a label ‘negative risk’ on each disturbing and causing thrill of positive emotions event. Management is a complex, long lasting and far-reaching process that begins long before the investment and sometimes lasts even after its completion. To wisely manage risk does not mean to avoid it but to identify it correctly and determine all associated opportunities and hazards. This paper discusses the guidelines that will aid project managers in conceptualizing and implementing a best practice risk management system. To sum up, effective risk management is crucial for survival of building construction projects. As a result, the adoption of a best practice framework approach to risk management provides a positive opportunity for project managers to thrive and grow in a rapidly evolving construction environment.

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