

AA/055

A Risk Assessment and Management Framework to Support Project Delivery

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Abstract

Risk factors associated with construction projects have a major impact on issues related to cost, time and quality of project delivery. Unexpected events result in either positive or negative outcomes often causing deviations from project plans and making construction projects particularly prone to risk. Despite the extensive research on risk management in the construction industry, there is limited literature dealing specifically with project risk in developing countries. It is against this background that this study investigates the use of risk assessment and management processes in organisations. Data were collected from construction professionals working with construction clients (both private and public), consultants, and contractor organisations within the Ghanaian construction sector. The survey data were used to examine the differences in the levels of agreement between the three stakeholders. The research findings indicated that although project stakeholders are aware of risk factors associated with construction projects, there is a need for the benefits of using risk management processes to be emphasised and communicated. Based on the research findings a risk assessment and management framework was established to support future successful delivery of construction projects in developing countries.

Keywords

Risk assessment, risk management, developing countries

1 Introduction

In the current global competitive economy, managing various forms of risk is of paramount importance to an organisation's survival, Tah et al (2008). Additionally, stakeholders including regulators, legislators, investors, customers and the public are now demanding full accountability and effective controls. Proactive risk assessment and sound risk management is therefore necessary to protect an organisation's competitive position and the successful completion of construction projects.

This situation is undoubtedly more pronounced in developing countries, and may be directly related to the demise of some construction companies in Ghana where numerous construction projects fail to fulfil the expectations of users resulting in project failures. Clients' perceptions of delay in construction projects have revealed that most of the causes of project delay which lead to cost overruns can be avoided, or the impact substantially reduced, if risk assessment and management is

carried out effectively throughout the project life cycle (Agyakwa-Baah, 2009). It is therefore paramount that project managers, particularly in developing countries like Ghana, consider risk assessment and management as an integral part of the construction process.

2 Risk Assessment and Management

In risk management, one attempts to identify all possible foreseeable risks, and assess the likelihood of occurrence and impact. Decisions can then be made on how to manage risks by reducing their impact, or by avoiding them completely. Moreover, the risk management process must not only involve identifying potential risks but should include a formal planning activity. Estimates need to be made on the likelihood of occurrence and predicted impact (RAMP, 2002). A monitoring process should also be introduced to ensure that risks are reduced to the desired level (Kerzner, 2006). It is important to note that although risk management aims to ensure that risks are managed in the most effective way, it will not remove all risks from a project (Mills, 2001). It is imperative to ensure that risk management processes are made as simple as possible in order to remain manageable and effective (Dallas, 2005).

3 Ghanaian Construction Industry

Over the past 10 years, construction in Ghana has greatly improved, albeit not to expectations. The various sectors such as affordable housing, infrastructure and transport, including road and rail, have received some, but limited, attention. According to the External Aid Financing Performance Report, 2008, external aid, which includes grants and concessional loans flow into Ghana, has averaged some US\$770 million between 2001 and 2007, registering its highest inflow of US\$1.1 billion in 2005. The average revenue flows generally representing some 25% of budget revenue and 6% of GDP.

In an effort to improve the Ghanaian economy and the government's objective in the Ghana Poverty Reduction Strategy (GPRS II) to promote the provision of basic services, much investment has been made in infrastructural development. The construction industry in Ghana, therefore, plays an important role within the economy. However, despite the investment made, construction is still largely inefficient as characterised by lengthy payment delays, cost and time overruns, and poor project implementation. Moreover, many of these issues can be directly attributed to risks not being managed effectively on the projects.

4 Aims and Research Methodology

The aims of the research were to investigate the implementation of risk assessment and management practices in medium and large enterprises within the Ghanaian Construction Industry, and to develop a framework that would facilitate effective risk assessment and management practices. The research carried out adopted a quantitative and qualitative approach involving both the administration of questionnaires and interviews with construction professionals within the Ghanaian construction sector.

The research focused on three categories of respondents within the industry. A total of 180 questionnaires were administered to professionals working for

contractors, consultants and clients with a resulting response rate of 57%. Interviews were also arranged with 10 experienced professionals who were randomly selected from a cross section of organisations. The interviews provided useful information on the awareness of risk assessment and management processes.

5 Development of Risk Assessment and Management Framework

In considering the practicality of a framework it was important to seek the opinions from respondents as to whether they agreed that the development of a risk assessment and management framework for the Ghanaian construction industry would greatly influence projects outcomes. The majority of the respondents (i.e. 85% of contractors, 91% of consultants and 100% of clients), believed that there was a need for a framework that could be effectively used by Ghanaian construction organisations. This indicated that most respondents were supportive of implementing a procedure that would guide them in carrying out the risk management process.

The framework shown in Fig. 1 was developed based on information from literature and research findings, together with information obtained on other approaches used by construction organisations in the UK (Agyakwa-Baah, 2009). The framework is composed of three major components which are; communication and monitoring, risk assessment and management processes, and risk management tools and techniques.

5.1 Communication and Monitoring

The results from the research indicate that team work and communication is critical in the process of risk assessment and management. The management style used will also have an effect on communication, and there is a need for effective monitoring throughout the whole process, especially when risk management measures are put in place.

5.2 Risk Assessment and Management Process

In utilising risk management, it is essential to identify all foreseeable risks, assess the likelihood of their occurrence and impact, and then decide on how to manage them, or avoid them completely. It is important to note that each project will require a bespoke risk management approach and a plan that will fit its specific requirements.

5.3 Risk Management Tools and Techniques

Throughout the risk management process, appropriate tools and techniques need to be adopted. Some common techniques for risk identification would include: influence diagrams, fault trees, cause and effect diagrams, in addition to checklists. For risk assessment, tools and techniques would include: probability impact, sensitivity analysis, Monte Carlo simulation, and Bayesian analysis. Additionally, algorithms, mean end analysis, Bayesian theory and decision trees, amongst others, are methods of decision analysis, which provide decision making tools for use in uncertain environments. Other tools needed for the process include, prior risk knowledge, decision support systems, qualitative and quantitative measures,

and risk mitigation planning. Several software tools are also available for risk management which can be used as part of the framework implementation.

The information required to carry out the process includes:

- Understanding of scope of work and site environment
- Client's planning supervisor's risk schedule
- Tendering team's risk schedule
- Subcontractors' perception of risk
- Site team's perception of risk
- Other stakeholders' risk both known and perceived
- The tender, with contract programme.

The issues in applying the risk assessment and management practices in each of the phases of Fig. 1 are addressed as follows:

Phase 1- Planning and Preparation

Organisation and Training - It is important for training to be organised which will help in the awareness of the overall process. The tools and techniques to be used need to be agreed at this stage.

Risk Management Plan - A risk management plan should be established to set out the type, content and frequency of reports, the roles of risk owners and the definition of the probability and impact criteria, covering time, cost, performance and quality.

Process Plan and Control - The plan for the risk management process needs to be drawn up so that it serves as a guide to control the process.

Phase 2- Risk Identification

Make a list all possible Risks - There is a need to make a list of all possible risks, known or perceived. This can be achieved through brainstorming, using prompts or lists, and historical records.

Identify Nature or Area - This refers to the nature of the risk and source of the risk.

Identify Owner of Risk - The owner of the risk can be the contractor, subcontractor, client, or a third party.

Phase 3- Risk Assessment

Identify Probability and Impact - It is important to identify the earliest and latest event dates.

Prioritise Risks - From the impact and probability of the risk, establish a rating e.g. 1-5 rating or high, medium and low risks.

Grade Priority - Select those that are high risk that needed immediate attention, disregarding those that are low risk, which can be ignored.

More Detailed Analysis - For risk factors that need more detailed analysis, other tools and methods such as Monte Carlo Simulation and Bayesian analysis may be used.

Phase 4 - Risk Response/Management

Assign Action for Priority Levels – establish appropriate actions related to the priority levels of risk.

Assign Levels of Authority – establish levels of accountability and authority to individual staff.

Ensure Risk Allowance in Cost Plan – Appropriate risk allowances must be included with cost plans.

Establish Control Measures/Actions – Identifiable control measures and actions to be established as appropriate.

Communicate measures to Risk Owners – All aspects of risk associated with the project should be communicated to appropriate risk owners.

Phase 5 - Monitoring and Control

Assess Risk Status – the status of risk level to occur must be assessed before its impact is experienced.

Assess Control Measures – establish appropriate control measures appropriate to the status of risk occurrence.

Elapsing of Event Time – constant monitoring of risk throughout its period of occurrence until the event time has elapsed.

New Risk Identification - New risks identified would have to go through the whole process. If the control measures adopted for any of the risk factors is not effective, these will need re-assessment.

6 Implementing Risk Management Measures

A critical evaluation of risk factors in the research led to the development of possible risk management measures that can be applied to Fig. 2. in order to manage identified risk. The risk factors were placed under groupings: Stage 1: All stages, Stage 2: Planning & Design, Stage 3: Construction.

For example in Stage 1: All stages, risk factors include: change of government, change in government policy, poor communication amongst the project team, lack of commitment, local laws, and quality and performance control.

Corresponding risk management measures include: obtain insurance for political risks, adopt effective quality control procedures, review risk management processes with all project team members, review project plans with all stakeholders, and adopt a non-adversarial procurement strategy and form of contract.

Risk factors and corresponding risk management measures were also established for stage 2 and stage 3.

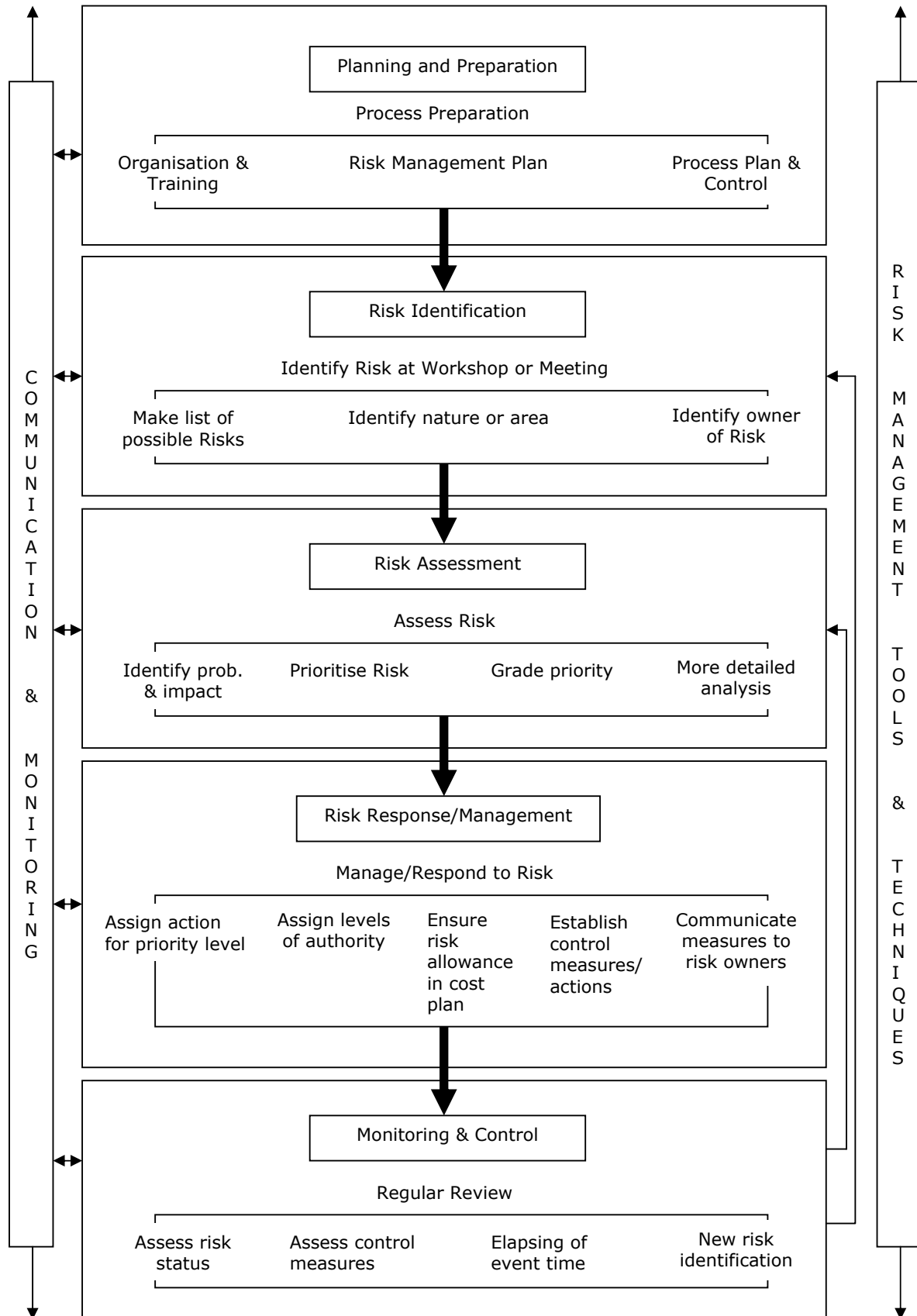


Fig. 1: Risk Assessment and Management Framework

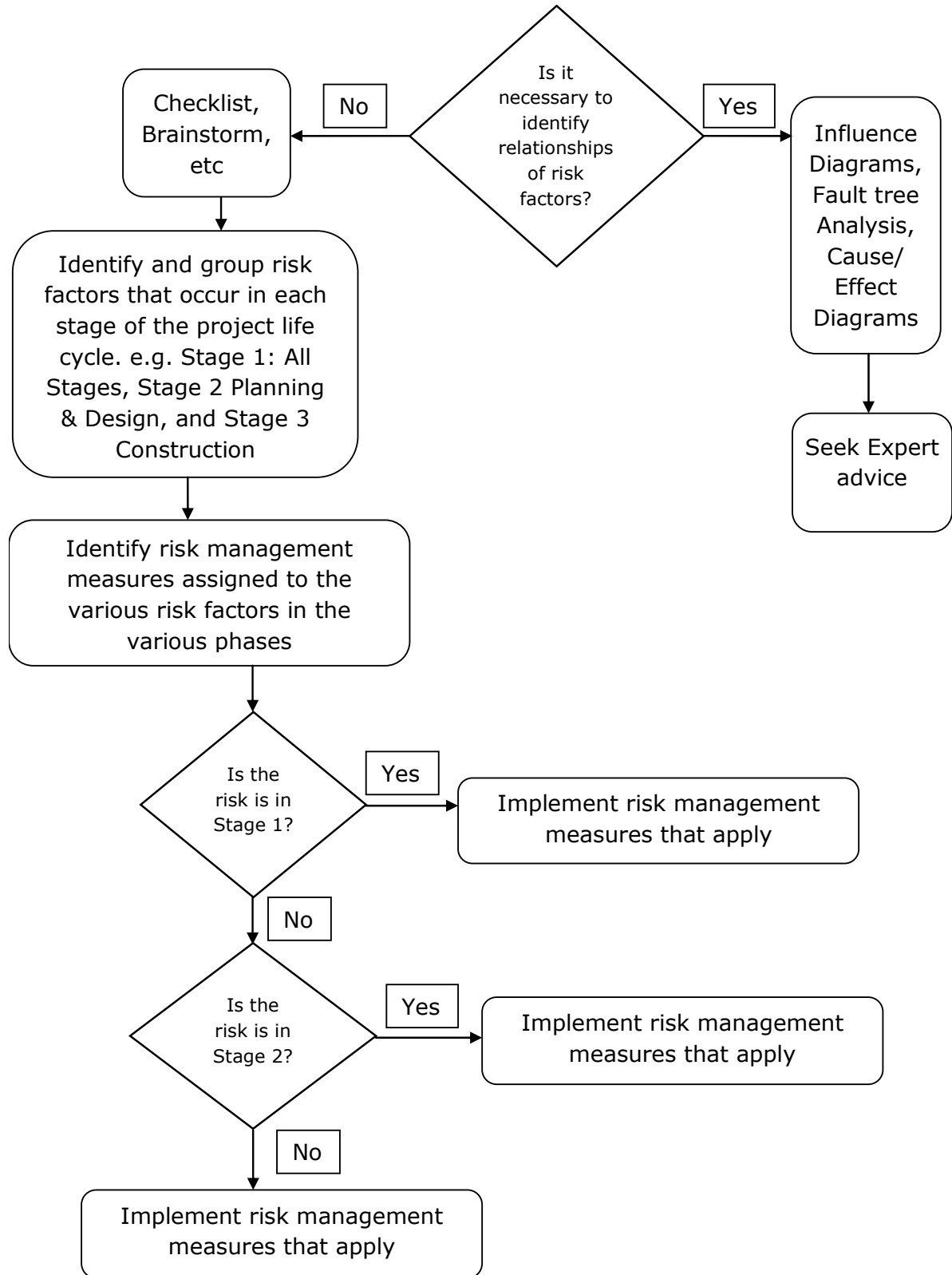


Fig. 2: Risk Assessment and Management Framework (Manage Identified Risks)

7 Conclusion

The study into risk assessment and management in the Ghanaian construction industry has revealed that there is a need for construction organisations as well as project stakeholders to be made aware of the benefits of using risk management processes. The research findings show that the majority of respondents believed that there is a need for the development of a risk assessment and management framework that can be used efficiently and effectively. Construction organisations in Ghana need to organise and deliver training programmes on risk management in order to equip staff with the tools and techniques they will need in managing projects. The use of such tools within a risk assessment and management framework will be an essential requirement to avoid cost and time overruns, and support future project delivery.

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