

## FACTORS INFLUENCING RISK MANAGEMENT IN CONSTRUCTION PROJECTS IN THE PETROLEUM INDUSTRY IN KENYA

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### ABSTRACT

In the Petroleum Industry worldwide, many negative safety incidents have occurred during the implementation of construction projects. Project Risk Management can play a key role in reducing the occurrence of such incidents. However, past research has established that project risk management has not been well integrated into project management, leading to a negative impact on the safety objective in many construction projects. The problem that this study sought to address is the occurrence of incidents in projects undertaken by contractors in the Petroleum Industry in Kenya and how such incidents can be reduced by the integration of Project Risk Management into the management of construction projects. The objective of the study was to determine the factors that influence construction projects risk management in the Petroleum Industry in Kenya. Knowledge of these factors and the implementation of the recommendations of this study can contribute towards the reduction of the occurrence of such incidents. The methodology used was a census survey of the project managers of the various contractors working for the petroleum Industry in Kenya using a questionnaire. The study found that there is a significant relationship between training of project managers on project risk management and risk management practice in construction projects in the Petroleum Industry in Kenya. Even though most contractors indicated that their project managers were trained in risk management, this training is not structured and often depends on training offered occasionally by the Petroleum Companies or on-the-job training. Important aspects of training that influence risk management were found to be training policy, type of training offered and the implementation of the learning at the workplace. The study also found that there is a significant relationship between attitude towards risk and risk management in the Petroleum Industry in Kenya. Safety committee meetings, incident reporting and executive management support for safety were found to be important aspects that influence risk management to a large extent. Lastly the study found that most companies rarely carried out all steps of project risk management which ought to include planning risk management, risk

identification, risk analysis, risk response and risk monitoring and control. They were weak in planning risk management, risk response and risk monitoring and control.

*Key Words: Training, Attitude, Project Managers, Risk Management, Risk Identification, Risk Response, Risk Analysis*

## Introduction

The Project Management Institute (PMI) has defined project risks as uncertain events or conditions that if they occur, they would have positive or negative effect on one or more project objectives. The objective of project risk management is the minimisation of the probability and consequences of negative events and the maximisation of the probability and consequences of positive events. This objective is achieved through Project Risk Management (PRM), which consists of the processes of conducting risk management planning, risk identification, risk analysis, risk response planning and risk monitoring and control (Barkley, 2004). Projects are dynamic and as they develop and evolve through their life cycles, the potential for risks could change. Thus the initial risk management strategy should be reviewed regularly throughout the project life cycle to ensure that it remains comprehensive and valid (Harrison & Lock, 2004).

In Kenya, safety at construction sites is regulated by the Occupational Safety and Health Act No. 15 (2007), contained in Kenya Law Reports (2013). The Act aims at securing the safety, health and welfare of workers and the protection of persons other than the workers against risks to safety and health arising out of, or in connection with, the activities of persons at work. However the enforcement of this Act has been weak as is seen from the numerous violations in many construction sites in Kenya (Muiruri, 2012).

## Statement of the Problem

The problem that this study seeks to address is the occurrence of negative incidents in construction projects undertaken by contractors in the Petroleum Industry in Kenya and how such incidents can be reduced by the integration of Project Risk Management into the management of construction projects. The International Association of Oil and Gas Producers Publication has given data on the past incidents that have occurred globally in the Petroleum Industry. Among the incidents that occur in construction sites is falling from height due to use of poorly designed and constructed scaffolding (Wong et al, 2009). In the petroleum industry, another type of incident which has occurred in many sites is the outbreak of fires and explosions since this industry handles flammable products. Other incidents that have occurred are being struck by moving or falling objects, incidents arising from confined space entry, excavation works, electrocution, and injury from pressure release.

One of the most publicised incidents in the Petroleum Industry was the Piper Alpha Oil Platform incident in Britain on the 6<sup>th</sup> of July 1988 where 167 fatalities occurred and the platform was totally destroyed by a fire (UK Oil & Gas, 2013). The more recent incident was the Deepwater Horizon Rig explosion at the Gulf of Mexico on the 20<sup>th</sup> April 2011 (Meredith, 2012) where 11 lives were lost, the platform destroyed by the fire and a massive oil spill into the sea occurred (Vann & Meltz, 2013).

In Kenya, the Sinai Slum Fire Incident in Nairobi on the 12<sup>th</sup> of September 2011 was widely publicised. It resulted in over 130 fatalities and massive destruction of property and dwellings inhabited by the slum dwellers (PIEA, 2012). Several other incidents have occurred in this industry in Kenya, most of which have not been reported and others have not received much publicity.

The occurrence of such incidents is a matter of concern because these incidents have caused fatalities, lost time injuries, damage to assets and the environment. This has brought the need for contractors who undertake project work to adopt Project Risk Management. Research done in the UK (Chileshe & Dzisi, 2012) has established that the adoption of risk management can contribute to the minimisation of the incidents in construction sites. Most of the accidents that occur could have been foreseen during the risk identification phase of risk management and thus response mechanisms could have been put in place to prevent them from happening (Hide, et al., 2003). This study will determine the factors which influence risk management in construction projects in the petroleum industry. The understanding of these factors and the adoption of project risk management can lead to the minimisation of the occurrence of these incidents to a large extent.

### Research Objectives

The general objective of this study was to determine the factors that influence project risk management in construction projects in the Petroleum Industry in Kenya. The specific objectives of this study were; to inquire on the influence of training of contractor's project managers on project risk management; and to establish the influence of contractors' attitude towards risk on project risk management.

### Literature Review

#### Theoretical Framework

This section is a review of three theories that are relevant to this study. These are the Theory of Constraints, Path-Goal Theory and Contingency Theory. The Theory of Constraints (TOC) is a management philosophy introduced by Dr. Eliyahu M. Goldratt in his 1984 book titled 'The Goal'. According to Goldratt, organisational performance is dictated by constraints (Mabin, 2003). Constraints prevent an organization from achieving its performance goals. This theory is applicable to project management, not only in project scheduling but also in risk management. Any project risk is either a constraint or has the potential to become a constraint. Often, when project risks are identified and assessed at the early stages of the project life cycle, the project team prioritises the risks according to severity (Steyn, 2001). There is a tendency that the lower severity risks are not given much attention and are eventually neglected, with the team focusing on say the top two or three risks.

The Path-Goal theory states that leaders can increase the satisfaction and performance of their team by clarifying and clearing the paths to goals and by increasing the number and kind of rewards available for goal attainment. Leaders need to clarify how followers can achieve organisational goals, take care of problems that prevent them from achieving goals and then find more varied rewards to motivate followers to achieve those goals (Williams, 2013). The

leader behaviour must be a source of immediate and future satisfaction of followers. The things you do as a leader must either please your followers today or lead to activities or rewards that will satisfy them in future. The leader behaviour must also complement and not duplicate the characteristics of followers work environment (Silverthorne, 2001). The behaviour of leaders must offer something unique and valuable to followers beyond what they are already experiencing as they do their jobs.

The Path-Goal theory is relevant in Project Risk Management because Project Managers who are responsible for risk management are leaders of teams. Risk management is a team exercise and in most cases led by the project manager. The project manager as the team leader has to provide a clear goal and a sense of mission through the development of the objective which is understood, important, worthwhile and personally and collectively challenging. He has to provide a results driven structure in the team with a unified commitment. He has to foster a collaborative climate and maintain high standards of excellence and institute principled leadership. The project manager as a leader can achieve greater success if he adopts this theory, particularly if he is directive and supportive to the team in the risk management practice (Maylor, 2010).

Further, the Contingency Theory takes into account the interaction and interrelation between the organisation and its environment. This includes the recognition and accommodation of those elements that cannot be controlled. It also involves recognising that those elements that can be controlled and influenced must be addressed in ways that vary in different situations, that the correct approach in one case is not a prescription to be applied to others (Pettinger, 2007). It is a behavioural theory that claims that there is no best way to organize a corporation, to lead a company, or to make decisions. Instead, the optimal course of action is contingent upon the kind of task or environment with which one is dealing. It states that organizations are open systems that need careful management to satisfy and balance internal needs and to adapt to environmental circumstances. Management must be concerned above all else, with achieving alignments and good fits.

Contingency thinking recognises complexities of organisations and attempts to identify practices that best fit with the unique demands of different situations. The application of various management tools and techniques must be appropriate to the particular situation because each situation presents unique problems. This is very applicable where culture and attitudes cannot be taken for granted (Cassidy & Kreitner, 2011)

### **Training of Project Managers**

Research was carried out for the Vietnamese Petroleum Industry construction projects to determine the specific risks that affect construction projects in the oil industry. It was carried out by questionnaire survey of the senior managers in the Oil Industry. It established that the lack of training of the client project management teams is a major factor that influences risk management practice (Thuyet et al, 2007). This research evaluated the level of risk management practiced by the client project teams in construction projects but not the contractors' project teams.

In Nigeria, research was carried out to determine the usage of risk analysis techniques by construction companies. The research utilised questionnaire survey and in-depth interviews of the key contractors. It was empirically shown that the usage of the techniques of risk analysis by project management teams of many construction contractors was low. This was attributed to lack of training of the contractor project management teams on the discipline of risk assessment, which is one of the fundamental pillars of risk management (Adedokun et al, 2013). Thus training was identified as an important factor that influences risk management practice. It is necessary for this research to be extended to Kenya contractors and to determine whether this is also an important factor, and to what extent it is important and specifically for the Petroleum Industry.

In Swedish construction companies, research was carried out using a questionnaire interview of project and site managers from the client and contractors companies in smaller construction companies. The main objective was to determine the tools and techniques employed by smaller companies in carrying out risk management. The research revealed that there was a low level of project risk management. This was mainly as a result of lack of training of project teams in small construction projects. Risk management education and training was low, almost non-existent, in the studied projects (Simu, 2006). This study covered 10 projects carried out by small contractors. It is necessary to research the situation in Kenya and to focus on both small and large contractors in the Petroleum Industry construction projects.

### **Attitude towards Risk**

Attitudes are defined as evaluative statements either favourable or unfavourable concerning people, objects or events. They reflect how one feels about something (Robins et al, 2008). Research work has established that attitude towards risk is a factor that influences risk management in construction projects. A study done in Shell Bonny Terminal Integrated Project in Nigeria revealed that a positive culture towards safety risk in an organisation has a positive impact on project risk management and consequently on reduction of safety related accidents on sites. This research was carried out in a large Petroleum Industry project in Nigeria to determine whether the organisation was inculcating safety culture and the extent to which safety culture in the organisation influenced performance. This performance included risk management and reduction of safety incidents (Agwu, 2012).

In China, research has established that the attitude of contractors towards risk is a major factor that influences risk management in construction projects. The research was carried out by a survey of professionals involved in the construction and insurance industry projects (Liu et al, 2007). The research found that Chinese traditionally are risk takers and prefer to accept risks. They are hesitant to incur expenditure on risk response mechanism like transference to the insurance. This National culture has been manifested in construction companies and thus the companies do not give risk management the importance it deserves. However, the situation is changing and the Chinese are already appreciating the critical role played by risk management.

In Sri Lanka, an Asian country, research was carried out to determine the strategies that could help to instil a positive safety culture in the construction industry. This was done through a

questionnaire survey covering the professionals responsible for safety (De Silva & Wimalaratne, 2012). This was done because the attitude of the construction site employees towards risk management and adherence to regulations was a major problem affecting over ninety percent (90%) of the construction project sites. The approach taken by management to resolve this problem was of a disciplinary nature and it was found not to be effective. It was found that changing the attitude towards safety through education and awareness training was more effective. Thus the attitude was found to be an important factor in management of risks in construction sites.

### **Research Methodology**

The research design for this study was descriptive as it involved the accurate description of the characteristics of the population for the study with respect to the variables of the study. However, exploratory research was also carried out where literature search was done to get an insight into the variables of the study. This study was also census survey of the project managers of the contractors who carry out construction projects in the Petroleum Industry in Kenya. In this study, the accessible population consisted of thirty nine (39) contractors only. Since this was a small population, a census survey of all these contractors was carried out thus avoiding selection bias (Saunders et al 2009).

The instrument that was used in this study was a questionnaire. Data collection was done by direct communication with the respondents through the use of the questionnaire. The questionnaire was self administered and was hand delivered or sent by email to the respondents through a transmittal letter.

The raw data collected was processed by editing, coding, classification and tabulation so that it was made amenable to analysis using the statistical software SPSS. Analysis of data was started by summarisation of the data using descriptive statistics. Frequency distribution tables that show the distribution of scores for a given variable were drawn. Graphical representation of the distribution of scores was done through the use of bar charts and pie charts (Lind et al, 2011). Percentages were also greatly used to show proportions. Karl Pearson correlation analysis was used to describe the relationship between variables and to determine whether there was enough evidence to infer that the variables relationship was significant. It was done at a 0.05 level of significance. Cross tabulation and the chi-squared test was done at 0.05 level of significance used to determine whether there was enough evidence to infer that the independent variables and the dependent variable were related (Argyrous, 2011).

### **Research Findings and Discussion**

#### **Training of Project Managers**

The study found that most of the project managers (61%) were actually trained on risk management before they took responsibility for managing projects. Further, it was found that 42% of the project managers were trained on risk management after every two years, 37% after every one year and 21% after every six months. It was also established that 95% of the project managers depended on training organised by the Petroleum Companies that they work for. Additionally, 84% depended also on on-the- job training at their place of work. Only 11% of the project managers are trained by hired experts and none are trained in colleges or

institutions. Thus although most are trained, the type of training is not a structured training by experts or institutions but mainly it is on the job and the very basic training offered by the companies mostly after 2 years.

The study also found that the aspects of training that influence risk management to the largest extent are policy to train project managers, the type of training offered and the implementation of the learning. However the budget for training of project managers on risk management was found to influence risk management to a low extent.

Training and the adoption of risk management were found to be significantly related from cross tabulation and the chi-squared test. This is because at the 0.05 level of significance, the calculated chi-squared value was 16.124 with a p-value of 0.000 while the chi-squared critical value was 3.84. Additionally, correlation analysis at 0.05 confidence level established that there is a significant relationship between training of project managers and risk management with a correlation value of 0.427 and level of significance of 0.017. Thus there is a significant relationship between training of project managers and risk management in construction projects in the Petroleum Industry in Kenya.

#### **Attitude towards Risk**

The study found that 71% of the contractors had safety committees in their companies and that most of the safety committees (63%) met monthly. To enhance the adoption and practice of risk management in the companies, 94 % of respondents indicated that the attitude towards risk of contractor employees requires to be improved. It was also established that incident reporting, management commitment to safety and having safety committees with regular meetings influence project risk management in the Petroleum Industry in Kenya to a very great extent. However induction of new employees influences project risk management in the Petroleum Industry in Kenya only to a moderate extent.

From cross tabulation and the chi-squared test, the relationship between attitude towards risk and adoption of risk management was significant as the p-value was 0.001 which was less than 0.05, while the calculated value of chi-squared test was 10.444 against a critical value of 3.84 at  $\alpha=0.05$ . The Pearson coefficient of correlation at 0.05 confidence level was found to be 0.387, which also showed that the relationship was significant at 0.05 confidence level. Thus there is a significant relationship between attitude towards risk and risk management in construction projects in the Petroleum Industry in Kenya.

#### **Risk Management**

The study found that 55% of the contractors had not adopted risk management. The study also found that only 10% of the contractors carry out all the steps of risk management. In particular, planning risk management, risk response and risk monitoring and control are poorly done by most companies. From Karl Pearson correlation analysis, it was found that there is a positive and significant relationship between project risk management in construction projects and training of project managers and also between project risk management and attitude towards risk at the 0.05 level of significance. The relationships between project risk management and financial capacity and enforcement of regulatory framework was found not to be significant at the 0.05 level of significance. Thus the most

important factors that influence risk management in construction projects in the Petroleum Industry in Kenya are training and attitude towards risk.

### Correlation Analysis

Karl Pearson correlation analysis was carried out at 0.05 level of significance using SPSS to further determine the relationships between the variables in this study. From the results, there is a significant positive correlation between training of project managers and risk management with a correlation coefficient of 0.427 and p value of 0.017. There is also a moderately significant positive correlation between attitude towards risk and risk management with correlation coefficient of 0.387 and a p value of 0.031.

**Table 1: Correlation Coefficient of Relationship between Variables**

	Risk Management	
Training of Project Managers	Pearson Correlation	.427*
	Sig. (2-tailed)	.017
	N	31
Attitude towards Risk	Pearson Correlation	.387*
	Sig. (2-tailed)	.031
	N	31

### Conclusions

This study concludes that there is a positive relationship between training of project managers on project risk management and risk management practice in the Petroleum Industry in Kenya. It also concludes that most project managers (61%) are trained on risk management before they take responsibility for managing projects. However, the training in most of the companies mainly depends on the training offered by the petroleum companies, which is mostly conducted once every two years and also on- the-job training, not on structured formal training in an institution. The study also found that policy to train project managers, the type of training offered and the implementation of learning from the training influences the adoption of project risk management in the Petroleum Industry in Kenya to a great extent. However the budget for training influences risk management to a low extent.

The study also concluded that there is a positive but moderately significant relationship between attitude towards risk and Project Risk Management. Attitude of contractors and their employees towards risk is an important factor that can influence the way contractors practice risk management in projects to a large extent. The study also established that most contractors (71%) had safety committees in their companies and for most contractors (63%), the safety committees met monthly. It also established that the three aspects of incident reporting, management commitment to safety and safety committee meetings influence project risk management in the Petroleum Industry in Kenya to a very great extent. Most of the contractors (94%) agreed that the change of attitude towards risk of employees can facilitate the adoption and practice of risk management.

## Recommendations

Due to the significant relationship between training of project managers and risk management, it is recommended that the contractor companies ought to put in place a formal policy in their companies to train project managers on risk management. Consideration should be given for sending their project managers to attend formal structured short courses in institutions where such training is offered. This is because the study found that the type of training offered was an important factor and also that the various steps involved in risk management are poorly covered. Alternatively they could invite experts to conduct such short courses in their companies. The finding that most contractors did not undertake key steps in risk management process indicates that their knowledge of the subject is scanty and this can best be addressed through structured training. It is also recommended that the companies should have a mechanism to monitor the implementation of learning from the training since it was found that implementation of learning influences risk management in the Petroleum Industry in Kenya to a great extent.

This study found that training of project managers and attitude towards risk were the most significant factors influencing project risk management in construction projects in The Petroleum Industry in Kenya. This study therefore suggests that further studies should be conducted on the role of training of project managers and attitude towards risk in enhancing the adoption of project risk management in the other sectors of the construction industry in Kenya. It is also suggested that further research should be conducted on whether financial capacity and enforcement of Safety regulations could be important significant factors in other construction sectors. They were found to be insignificant in the petroleum sector.

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