

RISK MANAGEMENT PRACTICE

IN THE NIGERIAN PETROLEUM INDUSTRY

Abstract: While in developed nations, risk management practices have become a norm in a bid to ensure project success, it is still unclear if its implementation has become common practice in developing nations. The paper aims to explore the current perceptions of risk management specifically in the Nigerian petroleum industry. The industry serves as a good platform to explore risk management in this context as it is the biggest in Africa and contributes significantly to the countries economy. With so much dependence on the industry, it reasons that all possible measures to mitigate risk will be put in place, especially because of the scale of major failures that have been recorded worldwide in the industry. A comprehensive literature review on risk management is carried out and presented. Empirical data was collected using semi-structured qualitative interviews from personnel in the Nigerian National Petroleum Corporation for analyses subsequently presented. Findings reveal the major risks commonly experienced in the Nigeria petroleum industry, the primary methods currently employed in the different stages of risk management, and the factors that impede the implementation of more advance risk management tools are identified. The work extends on the knowledge that is currently available on risk management practices in developing nations.

KEYWORDS: RISK MANAGEMENT, RISK TOOLS, RISK TECHNIQUES

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1. Introduction

Risk management is vital in petroleum projects because in the event of an accident, economic losses and environmental pollution can be tremendous. This is generally because of the high risk of petroleum operations (Yanting & Liyun, 2011). It is important to establish and implement the risk management process according to the characteristics of the petroleum operations.

Risk management in petroleum projects has grown from the implementation of simple risk analysis methods to a more detailed implementation of risk management (Yanting & Liyun, 2011). Project managers continuously face important decisions with regards to the allocation of scarce resources in projects that encompass geological risk, financial risk and uncertainty.

Recently there has been an increasing usage of analytic decision techniques to aid decision making in the petroleum industry (Suslick & Schiozer, 2004). This has made the industry an excellent choice to investigate risk. Technological advances have significantly aided exploration in deep waters. This new exploration and production cannot be achieved without the implementation of the risk management process.

The industry is known for major project failures of different categories. Some examples are the Deepwater Horizon drilling rig explosion in the Gulf of Mexico and the Piper-alpha rig explosion in the North Sea (Davies, 2010; Anderson & LaBelle, 1994). The results of such accidents have led to negative financial impacts for various companies and the surrounding communities where the explosion/spill took place.

The petroleum industry utilises various risk analysis and mitigation methods to minimise failures. For example, Failure Mode and Effect Analysis (FMEA), Fault Tree Analysis (FTA) and Decision Tree Analysis (AlKazimi & Grantham, 2015).

2. Literature review

2.1 What is risk?

There are many definitions of the term 'risk'. According to Murrey-Webster (2010), a risk is "an uncertain event or set of events that, should it occur, will have an effect on the achievement of objectives. A risk is measured by the combination of the probability of a perceived threat or opportunity occurring and the magnitude of its impact on objectives."

By the definition of the Project Management Institute (2013), risk is "an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives."

The International Standard Organization 31000 (2009) defines risks as the "effect of uncertainty on objectives." From this short definition, we understand that factors including both positive and negative effects are included.

All project-oriented organisations, no matter how big or small and regardless of industry/sector will face a few hiccups when trying to achieve their objectives. These unknown events can come from within the organisations or from any of the external factors that have an influence on project outcomes. Any event that can hinder the achievement of an objective is a risk. The extent of the potential effect of such risk on a project is known as risk "exposure."

The variety of definitions provide us with a better understanding of risk. By analysing the definitions, it is evident that there are sources of risk that can easily be evaluated using the probability of the risk occurring and its impact.

2.2 Risk Management

All organisations manage risks in a variety of ways and sometimes risk management must be handled delicately and consistently to ensure effective decision-making and project success. The aim of risk management is to provide a disciplined environment for risk-based decision-making.

The aim of risk management is to ensure that organisations have a better understanding and control of project outcomes through a better understanding of risks that arise during a project and the overall risk exposure during the project. Hence risk management according to Murrey-Webster (2010) refers to the "systematic application of principles, an approach and a process to the tasks of identifying and assessing risk, and then planning and implementing risk response."

According to Murrey-Webster (2010), for risk management to be effective, risks should be:

- **Identified:** this is the first stage of risk management; it involves having an in-depth knowledge of the project. These stage deals with highlighting and describing the possible events that can affect a project.
- **Assessed:** This step takes a deeper look at the individual risks identified in the first stage where each risk will be assessed quantitatively or qualitatively for prioritisation and further understanding of the risk exposure of the risk on the project.
- **Controlled:** This stage involves the acts of identifying and implementing an appropriate response to a specific risk. This is achieved by assigning appropriate resources that can monitor and control the risk.

2.3 Importance of risk management

When it comes to projects, risk is inevitable. Organisations that initiate projects while implementing a formal/explicit risk management process have a better chance to foresee and manage potential risk (Chapman & Ward, 2003). Their ability to properly utilise this aspect can lead to project success, which is key to the growth of the business.

The benefits of effective risk management are not limited to the improvement of performance against aspects of project time, cost and quality but they also contribute to (Pryke & Smyth, 2012):

- Conflict reduction.
- Efficient use of resources.
- Seized opportunities.
- Reduced fraud.

2.4 When to use risk management

The main reason behind the risk management process is to manage exposure of uncertainty in a project over time (Pryke & Smyth, 2012). Risk exposure occurs because of various factors such as financial, economic or schedule; it can even be because of changes in relationships between stakeholders. The risk management process provides a structured way of mitigating uncertainties. The process is applied across all project phases in the project lifecycle.

The process is aimed at assisting project participants by enabling them to identify factors that can affect project delivery and the development of strategies that would help in cushioning the risk effect on the project.

The use of risk management in projects allows for efficient allocation of resources to manage risk (Pryke & Smyth, 2012). This will help projects progress smoothly as effective control measures are in place to mitigate possible risks outcomes.

2.5 Risk management process

The risk management process is divided into phases, some require more in-depth analysis than others. Some of the phases are divided into sub-phases to better aid the implementation of risk management in projects.

Various factors can affect the implementation of the risk management processes such as the maturity and experience of the organisation itself. Organisations that have a good experience in applying the risk management process are generally in a better position to implement more sophisticated processes and vice versa.

The Association for Project Management (2006), identifies 6 phases involved in the risk management process which are to: initiate, identify, assess, plan responses, implement responses and manage responses.

Initiate: This is the first step of the risk management process; the aim of this phase is to develop key information about the project such as scope and objectives. According to the Association for Project Management (2006) this stage is divided into two, which are "Define a project" and "Focused risk management process".

Identify: The aim of this phase is to ensure the identification of all possible risks for a project is as comprehensive as possible, practical and cost effective. When risks are identified, some mitigating options are sometimes identified at this stage (Murray-Webster, 2010). A systematic approach should be implemented for risk identification that will ensure an adequate and full set of risks is identified covering all aspects of the project. The tools currently available for risk identification are checklists, brainstorming, workshops, stakeholder analysis, assumption and constraint analysis, interviews, swot analysis and the Delphi technique.

Assess: In this phase, increasing the understanding of the risk identified in the earlier phase is paramount. To achieve this, risks should be broken down to a level that is more informative and enables a decision to be taken. The assessment of risk can be done using a quantitative or qualitative approach (Murray-Webster, 2010). This stage includes the determination of risk ownership, estimation of cost and evaluation of each risk. This phase allows implementers to view the risk exposure of a project at a

given time. The assessment is used as an input variable in determining what decisions should be made regarding risk prioritisation and the level of concern it should be given. There are currently various techniques used for risk assessment and they can be easily categorised into quantitative or qualitative methods. Some of the quantitative methods include Expected monetary value, Bayesian method, Sensitivity analysis, analytical hierarchy process (AHP), decision tree analysis, Failure mode and effect analysis (FMEA) and Monte Carlo method. While some qualitative methods are risk description, influence diagrams, risk breakdown structure, probability-impact matrices, expected value and risk registers.

Plan responses: This phase has the function of determining the best response to an identified project risk and ensuring that the assessment of the overall project risk is used to modify project strategy. According to the Association for Project Management (2006), this phase is divided into two sub-phases, 'plan risk event responses' and 'plan project risk responses'. Some tools and techniques used are threat avoidance, opportunity exploitation, reduction of threat probability, reduction of negative impacts, insurance, and risk acceptance.

Implement responses: This phase ensures that adequate actions are taken based on the decisions adopted in the previous phase (Plan Response). This includes the actions to implement risk responses targeting specific risks in the register and actions affecting the directions of the project based on the continuous assessment of risks. The tasks for the implementation of the planned response should be well defined and easy to implement. Responses should be verifiable, and response owners should be accountable for the outcomes. The conditions that led to the risk should be monitored so that if the risk changes, risk responses can also be modified to resolve it. This will usually entail the re-implementation of all previously established approaches for that risk. Structured criteria should be available to enable explanation as to when a risk can be removed from the risk management process.

Manage process: In this Phase, the aim is to ensure that the risk management process remains effective in identifying, assessing and controlling the risks that could occur in a project. It gathers input throughout the risk management process and reviews each approach selected at each phase. The phase covers all aspects of the implementation of the process, which includes the tools and techniques, roles and responsibilities, communication and reporting requirements. It also ensures the integration of the risk management process with other project management activities. The project manager oversees this process; they ensure that the risk management process adopted for the project is effective in addressing all the risk faced in the project. This process is performed in two

ways: via a risk management review, or informally throughout the project.

The risk management process is not a simple linear process. At the start of a project, the process adopts a swim lane model till project completion. As a project goes through its lifecycle and the risk management process is implemented, the areas of uncertainty in the project will start to decline.

3. Research Methodology

A literature review was conducted to understand the process of risk management and the tools and techniques used in the risk management process. For the investigation, a qualitative approach was implemented for data collection. An open-ended questionnaire was presented to participants to collect the required information from interviewees.

The questions used in the interview were semi-structured as to allow for respondents to provide their own answers and opinions to the questions based on their experience and background. This is a similar approach taken by Kang et al. (2015) to identify the current risk management practice in the Malaysian Construction industry. The first section of the questionnaire collects background/demographic information of the respondent, while the second section consisted of a total of 10 questions relating to risk management in the Nigerian petroleum industry. After the design of the questionnaires, a pilot study was conducted to ensure the questions were clear, concise and understood by the respondents. Before the interviews started the respondents were assured that the information provided would only be used in this research. A total of 10 interviews was conducted. During the interviews, notes and voice recording were taken to capture the information. Before recording starts permission must be granted by the interviewee. Once all data was collected, the data analysis followed and the results are discussed in the coming section. All the participants of the study work in the Nigerian National Petroleum Corporation (NNPC).

4. Analysis and Findings

The participants of the study comprise of 6 project managers and 4 project engineers. They all have master's degrees and an average of more than 15

years of project experience (not all of which are in the role of project manager). They have participated in more than 15 projects with an average value of 1 million American dollars, delivering a variety of projects such as hardware, operational, and service projects. The questions and generalised answers are discussed in this section.

Question 1: Are you familiar with the term risk management?

The results from this question showed that all the respondents/ interviewees are familiar with the term 'risk management'. Majority (8 out of 10) of them came to know the term through their experience as project managers in projects and the remaining came across the term during their studies in university. A follow-up question was brought up to see if risk management was implemented in the petroleum industry and all the interviewees claimed that they have implemented some form of risk management in the projects they have participated and delivered.

Question 2: Are you familiar with the risk management process?

The results of this questions shows that all the respondents of the interviews have a high-level understanding of the process. A follow-up questions was asked to see in interviews have implemented the entire risk management process, 6 out of 10 of the respondents agreed that they have not fully implemented it but they have implemented some sorts of risk management process in the projects that have worked. The implementation was not fully documented as a lot of the decisions on risk and its mitigation was done as they occur (fireman approach). The remaining 4 respondents fully implemented the process in the projects they have worked on but they have never used complex or more detailed quantitative methods for risk assessment.

Question 3: How familiar are you with the following terms: identify, asses, plan response, implement response, and manage process?

This question was aimed at seeing if the respondents are aware of the risk management process and terms. The results show that majority (8 out of 10) of the respondents are aware of the terms but the remaining 2 did not know all the terms but are familiar with just three terms. The terms they are familiar with are identify, assess and implement responses.

Question 4: What are the most common risk in the Nigerian petroleum industry?

From the interviews, the most common risk that occur in the Nigerian Petroleum industry are:

1. Price risk
2. Supply and demand risk
3. Operational cost risk
4. Lack of skilled workers
5. Interference of militant groups.

Question 5: What tools are commonly used for risk identification at NNPC?

This question was asked to determine the techniques currently implemented to identify risks in the Nigerian petroleum industry. The findings show that the most implemented technique used is brainstorming and drawing from experience from pervious projects. Stakeholder analysis, assumption and constraint analysis, and Delphi technique were not mentioned by the interviewees. When asked why this was so, the respondents believe the methods were more complex, time consuming and more difficult to implement.

Question 6: What tools are commonly used for risk assessment at NNPC?

In the aspect of risk assessment, the interviewees mostly used qualitative risk assessments methods and the most predominately used of this type of assessment were probability impact metrics and risk registers. This was because of the easy of implementation and simplicity of the method. It was surprising that none of the interviewees mentioned any quantitative assessment methods. When the respondents were asked as to why they don't implement quantitative risk assessment methods, they believed that the methods were difficult to implement and would take more time to do so. The respondents also suggested that they do not have adequate knowledge of the quantitative methods to implement them..

Question 7: What tools are used for the risk response?

From the data, 6 out of 10 interviewees preferred to use risk threat avoidance method, reduction of threat probability, and insurance as their preferred choice of responding to risk. When asked why they prefer these tools, the interviewees responded that the methods reduced the overall risk to a project and they are easy methods to eliminate risk.

Question 8: What tools do you use for the risk monitoring?

Interesting, only 3 out of 10 of the interviewees have monitored risk in projects to a certain degree. They mentioned document review and reference to risk register as the tools/documents they mostly refer to. The other interviewees (7 out of 10) were not able to mention the tools used for risk monitoring and they also believed that once a risk has been mitigated there was no need to monitor it.

Question 9: Is it Important to apply the risk management process in a project?

Majority of the interviews (7 out of 10) agreed that risk management is important and essential for petroleum projects. The interviewees also believe that full implementation of the risk management process will enable project managers to implement a proactive approach to risk. This would in turn improve the success rate of projects as all risk (positive or negative) would be identified, assessed and mitigated or exploited.

Question 10: What are the limitations for the implementation of risk management?

The interviewees believed that there was need for more training in the aspect of risk management and its implementation in the Nigerian context. They also believed that the cost of full implementation of the risk management process in a project would distract the project manager from handling other concerns that they deemed were more important in the project delivery. Other factors that hindered the implementation of the risk management process in the projects are: the managers prefer using their experience and gut feeling in handling situations rather than implement the risk management process and the project managers believe that there is need for more professionals to be added to a project to ensure full conformance with the process.

5. Conclusion

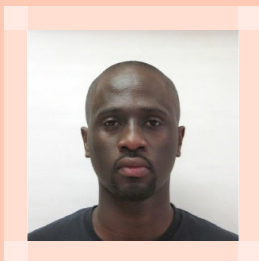
The top 5 risks in the Nigerian petroleum industry have been identified. These are: price risk, supply and demand risk, operational cost risk, lack of skilled workers, and interference of militant groups on oil installations.

The results also show that for risk identification, the most used methods are brainstorming and drawing from experience from previous projects. For risk assessment, qualitative methods are preferred and the most widely used are probability impact metrics and risk registers. In the aspect of risk response, the interviewees prefer to use risk threat avoidance method, reduction of threat probability, and insurance as their preferred choice of responding to risks. For risk monitoring, the preferred method is document review and reference to risk register meanwhile most of the respondents did not use any tool.

The factors that limited the implementation of risk management in the Nigerian petroleum industry have also been identified. These are: lack of knowledge, cost of implementation, believe that risk management implementation would divert project managers from the main objective. The managers prefer using their experience and gut feeling in handling situations rather than implement the risk management process, and the project managers believe that there is a need for more professional to be added to a project to ensure full conformance with the process.

In conclusion, the Nigerian petroleum industry is at its early stages of risk management implementation. There should be more complex methods of risk management implemented in the industry especially in the areas of tool implementation. Knowledge of proactive risk management needs to be improved as this would enable more practical applications in projects. As the importance of risk management has already been showcased (Tsiga, Emes, & Smith, 2017), more tools need to be developed to assist in the implementation and understanding of risk management in projects (not only for the petroleum industry or for Nigeria).

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