

# PROJECT MANAGERS PERCEPTION OF RISK FACTORS IN HEAVY ENGINEERING CONSTRUCTION PROJECTS: CASE OF OFFSHORE PROJECTS

Tarila Zuofa<sup>1</sup> and E.G. Ochieng

Liverpool John Moores University, School of Built Environment, Liverpool, L3 3AF, UK

The increasing global nature of heavy engineering projects has highlighted the importance of risk management and the new challenges it brings to heavy engineering construction projects in developing and developed countries. However, there has been no previous research that explicitly examines how project managers involved in heavy engineering projects perceive risk management and in particular risk factors affecting offshore projects in these countries. This study examined how project managers involved in heavy engineering projects perceive risk management and in particular risk factors affecting offshore projects in Nigeria and the UK. Using evidence from Nigeria and the UK, the study highlights some of the barriers to effective risk management and demonstrates the critical importance of integrating key risk determinants through effective project leadership.

Keywords: heavy engineering, Nigeria, offshore projects, risk management, UK.

## INTRODUCTION

The heavy construction industry is an important sector of the global economy and contributes significantly to the Gross Domestic Product (GDP) of most nations. As observed from the literature reviewed, a total of \$97.7 trillion will be spent on construction globally during the next decade and by 2020 construction will account for 13.2 percent of world GDP. According to the Global Construction Report (2011), by 2020 emerging markets will account for 55 percent of global construction, up from 46 percent today. Construction will make up 16.5 percent of GDP in emerging markets by 2020, up from 14.7 percent in 2010 (Global Construction Report, 2011). Heavy engineering construction is an important industry in both emerging markets such as Nigeria and developed countries such as the UK (Global Construction Report, 2011). The literature reviewed in Nigeria, showed that approximately \$8 billion is spent annually on the servicing of heavy engineering projects (Ihua *et al.* 2009). These operations include front end engineering design, engineering procurement, construction and seismic studies. According to Ihua *et al.* (2009) the \$8 billion annual estimated expenditure within the Nigerian oil and gas sector is still projected to rise to about \$15 billion. In this paper, the perspective of heavy engineering construction projects will not be limited to those projects with just large financial investments but shall include projects with extreme complexities, substantial levels of risks, extended lifecycles and those having large number of participants from diverse locations with dissimilar cultural orientations. Ochieng and Price (2010) established that heavy

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<sup>1</sup> T.Zuofa@2011.ljmu.ac.uk

engineering projects, can range from very small to very large projects. They further classified this category of projects to include pharmaceutical, refineries, highway constructions, oil and chemical projects. According to the International Energy Agency (IAE, 2006) and McKenna *et al.* (2006), the majority of the aforementioned characteristics are typified in most offshore oil and gas construction projects. Irrespective of size, complexities or financial outlay, no construction projects are risk free. Several authors including Ward and Chapman (2003); Murphy (2008) are in agreement that project risks can at best be managed, mitigated, transferred or accepted by project stakeholders. They collectively discard the possibility of ignoring or denying the existence of project risks. Furthermore, Flanagan and Norman (1993) held that most construction projects are saddled with higher levels of risk than in any other industry. Their views are hinged on the numerous stakeholder contributions, long project lifecycles, prolonged interactions between internal and external project environments as well as organisational and technological complexities which are typical of most construction projects.

The aim of this paper therefore is to examine how project managers involved in heavy engineering projects perceive risk management and in particular risk factors affecting offshore projects in Nigeria and the UK. Current research as part of a PhD study is examining problems being experienced in the management of risk in the sector. Difficulties currently being encountered will be addressed and solutions proposed. The subsequent sections of this paper are organised to provide an overview of risk and a review of relevant literature, introduce the research method utilised in this paper, present, analyse and discuss the data collected and draw up conclusions.

## **BACKGROUND: PREVIOUS RESEARCH ON RISK MANAGEMENT**

To create greater contextual relevance to the review of literature on the classification/taxonomy of risks factors in the offshore oil and gas industry, it is pertinent to commence by classifying the inherent risks factors within the construction sector. Literature indicates that there are various risk classification/ taxonomy approaches. For instance, The Association for the Advancement of Cost Engineering (2004) identified the external and internal risks as the basic categories of project risks. Hargitay and Yu (1993); Brown and Matysiak (2000); Baum and Crosby (2008) classified risks into systematic risks and unsystematic risks. They noted that the systematic risks are caused by external factors that affect all investments while the unsystematic risk refers to those risks over which investors have limited control, and are company specific.

While discussing risk management in large engineering projects, Miller and Lessard (2000) classified risk into three categories. These categories are market-related risks, completion risks and institutional risks. For construction risks, Edward and Bowen (1998) utilised the risk source as the primary source of classification and classified construction risks as natural risks and human risks. They described the natural risks as those risks which occur outside systems or human agencies while the human risks are those risks which arise within humanly organised systems. They also subcategorised human risks related to construction and project risks as follows: social, political economic, financial, legal, health, managerial, technical and cultural risks. Risks within the entire construction scenario were classified into three broad levels by Hastak and Shaked (2000). These broad levels are country, market and project levels. However, relating the offshore oil and gas industry in particular, Anderson *et al.*

(2008) identified political, market, transportation, legal and operational risks as risks that are acute in international offshore projects. Pollet (2008) also disclosed that operational risks, commercial risks, project size and execution risks are the risks commonly associated with the offshore industry. The classification also went ahead to further classify these identified risks. This classification by Pollet (2008) is pragmatic as well as simple and can be clearly comprehensible.

Most project management literature has described detailed and widely accepted risk management processes. For instance, Pinto (2009) defined risk management as the art and science of identifying, analyzing and responding to risk factors throughout the lifecycle of a project and in the best interest of its objectives. Kerzner (2009) also described risks management as the act or practice of dealing with risks. This act includes planning for the risks, identifying and analysing the risks, developing risks handling strategies and monitoring risks to determine how they can be mitigated. Although a myriad of risk management definitions are available and no standard definitions or processes may exist for what constitutes risk management, a commonality among most of the available risk management processes reveals the presence of systematic or unsystematic procedures aimed at identifying and mitigating inherent project risks.

Risk management can be construed as one of the most critical project management practices towards ensuring successful project completion. Thus, Royer (2000) concluded that experience has revealed that risk management should be of critical concern to project managers, since unmanaged or unmitigated risks are one of the principal causes of project failure. With this disclosure it will be appropriate to state that risk management is in direct relation to the successful completion of any project and the perception of risk is equally essential. The above analysis confirms there are number of studies that have examined risk management concepts. Nevertheless, there are still limited studies which explore risk factors affecting offshore projects in Nigeria and the UK. In exploring the attitudes and experiences of project managers the study examined how project managers involved in heavy engineering projects perceive risk management and in particular how the industry can prepare for the future. The findings from the study also facilitated an in-depth understanding of lessons learnt from risk management during heavy engineering project operations.

From the literature reviewed a number of broad conclusions can be drawn. These conclusions give a suitable context for the research's aim and objectives. The literature reviewed highlights claims that past research on risk management seems to be appreciated and well detailed in its entirety. Nonetheless, there are still some evident fragmentations in most of these contributions. For instance, none of these studies or others has explicitly focused on the perception of risk by the project manager involved in heavy offshore construction oil and gas projects. However, the need for studies on risk perception was emphasised by Mearns and Flin (1995). Findings from their study revealed that an individual's perception of risk has an integral role to play in the individual's approach to issues related to risk. As such it becomes imperative to examine the heavy offshore construction project managers' perception of risk. Furthermore, Dey (2009) noted that existing literature on construction risk management primarily consists of only empirical researches and conceptual frameworks utilising different risk management tools and techniques which are too generic and do not adequately provide risk management frameworks for specific projects. Relating the above instances to this present paper and considering the significant role of the project manager, it can be asked that how do project

managers' involved in offshore oil and gas construction projects perceive, engender and manage risks? In effect, the paper addressed this essential knowledge fragmentation.

## METHOD

The main form of data collection comprised of semi structured interviews with senior project managers in Nigeria and the UK. Twenty interviews were conducted with participants in Nigeria (10) and the UK (10). The interview grid consisted of 15 open-ended questions. These questions collectively provided information of individual participants back ground for statistical purposes and probed specific issues related to risk management in offshore projects. The interview notes were coded and managed using NUDIST Nvivo software. The use of the software led to the emergence of several themes. These themes were further clustered around the research objective thereby generating both descriptive and analytical data. The Nvivo software also enabled the establishment of connections and at the same time, it supported the exploration of the emergent patterns.

Table 1: Summary of the participant's profile (Nigeria)

Nigeria			
Participant	Organisational Role	Gender	Frequency of participation in heavy engineering projects
A	Project Manager	Male	9
B	Senior Project Manager	Male	11
C	Offshore Project Manager	Male	5
D	Project Manager	Male	8
E	Construction Project Manager	Male	7
F	Project Manager	Male	10
G	Project Manager	Male	5
H	Technical Manager	Male	6
I	Project Manager	Male	5
J	Offshore Constructions Manager	Male	6

Table 2: Summary of the participant's profile (UK)

United Kingdom			
Participant	Organisational Role	Gender	Frequency of participation in heavy engineering projects
K	Project Manager	Male	8
L	Senior Project Manager	Male	13
M	Project Manager	Male	5
N	Technical Project Manager	Male	5
O	Project Manager	Male	13
P	Project Manager	Male	17
Q	Project Manager	Male	6
R	Project Manager	Male	8
S	Project Manager	Male	10
T	Technical Project Manager	Male	5

Only information rich participants were utilised for this study. This facilitated a greater understanding about issues of central importance to the study. To achieve this, purposive sampling was used to recruit all participants. There was diverse pool of participants, including managers who were residents of highly developed areas and

cities in Nigeria and the UK. All organisations were selected based on their excellent track records in the heavy engineering construction sector. The main criteria for the selection for all participants included being senior project managers with above 5 years practical understanding and experience in managing heavy construction engineering projects in the respective countries. Consequently, their entire views were considered as those of well informed practitioners. The profile of the participants is summarised in Table 1 and 2. Statistical evidence in this study indicated that all participants were male. This to an extent suggested the relative male dominance in the sector. Seventy percent of the respondents had managed above five heavy engineering projects and this further guaranteed the reliability of all their disclosures.

## **FINDINGS**

This section summarises findings on how project managers involved in heavy engineering projects perceived risk management and in particular risk factors affecting offshore projects in Nigeria and the United Kingdom. The findings were based on different broad themes that emerged from the interviews.

### **Theme 1: Risk and Risk Management:**

Participants exhibited differences in their perception of risk and risk management. This was clearly apparent in their various descriptions of risk management. From their accounts, it was recognised that most project managers viewed risk management as a management of loss or adverse circumstances. This was largely attributable to individual judgment of risks and by extension, its management. Furthermore, participants agreed upon the relative success of current risk management process within the heavy construction industry. Nevertheless, a few participants disclosed common barriers hindering the effective implementation of risk management process within the industry in the two countries. These barriers included the use of inexperienced personnel, contractual loopholes, use of obsolete risk management techniques and lack of adequate management support.

### **Theme 2: Identification of risk factors**

In identifying the risks factors in heavy construction projects, most participants gave robust details of various risk factors. Some participants identified contractual, economic operational, factors while others included vessel management, resource experience, team communication, political risks, economic, issues emanating from sub contractors, and technological risks as risks factors. Consequently, an extensive list of risk factors was developed based on the plethora of risks identified.

### **Theme 3: Perception of Risk Factors**

To reduce ambiguity and to aid clarity while examining the project managers' perception of risk factors, a unified set of risk factors was developed. This was because most participants identified a wide-ranging list of risk factors. The unified set of risk factors was largely based on earlier classification by Pollet (2008), with the inclusion of force majeure. Within the context of this paper, force majeure encompassed any other risk factors which were not readily classifiable or predictable. The category of risks referred to as force majeure here, include but are not limited to kidnapping, riots, terrorist attacks, industrial actions etc. Based on this classification, the participants rated the risks factors according to their perceived level of significance. Participants from both countries established that operational risk factors were more likely to affect offshore projects. However, majority of the Nigerian participants still emphasised on the significant importance of the Force Majeure

category of risk factors. Conversely, most participants in Nigeria perceived that project size and execution risks will have the least affect on project whereas participants in the United Kingdom perceived that risk factors categorised as force majeure will have the least affect on heavy engineering projects. Table 3 below summarises the list of unified risk factors:

Table 3: Summary of the major identified risks factors

Unified risk factors	
Operational	Geological, Marine, Engineering , Infrastructure Technological concerns, Resource, Security, health, Safety, and environment
Commercial	Insurance, Tax, Contractual/legal/political, and Finance
Project size and execution	An overlap of the commercial and operational risks
Force majeure	This category of risks comprises of any other risk factor that had been hitherto unclassified

**Theme 4: Project leadership style and its role in the management of risks factors**

Majority of the participants from both countries recognised that the effective management of majority of the identified risk factors is contingent on the leadership style. Additionally, the importance of project team leadership style during the management of projects was highlighted. The findings also indicated that project managers within the offshore oil and gas project environment are usually instrumental for the attainment of overall organisational goals. It can be argued that most of these goals often times are prerequisites for project success and such goals may include the effective management of project risks. Leadership skills characteristic of the transformational leadership style were noted to be capable of promoting internal compatibility among project team members while also gravitating towards the aspirations of the project and its sponsoring organisations.

**Theme 5: Senior management role**

Generally, most findings indicated the indispensable role of senior management in the effective management of risk factors. The participants confirmed both proactive and passive levels of senior management involvement in the management of risks factors. Some participants from Nigeria and the United Kingdom noted that senior management instigates the setting up of unique syndicate risk advisory units for heavy engineering projects whilst in other cases risks management activities for projects were purely within the remit of the project team. Nevertheless, three participants from Nigeria disclosed that senior management’s direct role in the management of risk factors was questionable. They argued that within their various organisations, the primary role of senior management in risk management activities was mostly centred on the mitigation of strategic organisational risks. These strategic organisational risks were usually external to the project context and were more concentrated towards the realization of huge profits and turnover rather than on those salient factors which were of direct concern to the projects. From this disclosure, it was broadly concluded that the role of senior management in the effective management of risks factors may not be well entrenched within some heavy construction organisations in Nigeria.

**DISCUSSION**

The findings from this study have identified various risks factors and revealed the perceived significance of these risks factors to project manager’s involved in heavy

construction projects in Nigeria and the UK. While most Nigerian participants emphasised that risk factors classified as Force Majeure were also significant, the United Kingdom participants did not. This can be largely attributable to the fact that the United Kingdom may have developed and maintained a more responsive insurance industry, which can effectively cater for such category of risks, should they occur. However, in Nigeria risks under this category may not usually be insurable and should they occur, result in cost overruns and project delays which sometimes culminate in project abandonment. Therefore it is understandable if most Nigerian participants perceived the force majeure category of risks to still be highly significant. However, regardless of the perceived degree of significance, majority of the identified risk factors occur during different phases of a project life cycle, while others may possibly occur during only one project phase. This indicates that the management of risk factors must constitute one of the foremost tasks for the heavy construction industry as it affects project outcomes.

Most participants also highlighted the importance of senior management and leadership style in the heavy construction industry. However, some participants from Nigeria still expressed discordant views on the exact role of senior management. Therefore, to effectively address these and other issues relating to the successful management of risks factors in heavy engineering construction projects, it became apparent that the following key strategies should be considered:

- All project stakeholders in the heavy construction industry must work cooperatively from the feasibility phase to the handover phase to promptly manage inherent risks factors as they occur.
- Project managers should aspire towards the embracing of a more transformational leadership style.
- An adoption of a more robust risk management structure to cater for both the organisations and contractors.
- Sustaining the entire risk management process throughout all the project phases with regular updates and reviews and the introduction of a risk management monitoring mechanism to appraise its performance.
- An early assessment and prioritisation of identified risk factors by all project stakeholders.
- Increased management support in terms of boosting resource competency through constant training and capacity development.
- Reinvigorating the Nigerian insurance industry so as to facilitate a more adequate support system for the transfer of certain perceived risks factors in heavy engineering construction projects.
- Given the flaws identified by some Nigerian participants on the role of the senior management, their role should be reconsidered to reflect a greater commitment towards the management of risk factors in their entirety.

## **CONCLUSION**

The findings have established that project managers in Nigeria and UK perceive that operational risk factors were more likely to affect offshore projects. On the other hand, project managers in Nigeria, perceive that project size and execution risks will have the least affect on project whereas project managers in the UK perceive that risk factors categorised as force majeure will have the least affect on heavy engineering projects. Therefore, the broad implications of all the above is to further the research on how to effectively manage these risk factors. To achieve this, the current authors

suggest the need for further research exercises aimed at developing advanced risk management techniques to mitigate these risk factors. Based on the findings, it is believed that the embracing of a more transformational style of leadership for heavy engineering construction project teams will directly and indirectly inspire vision and create genuine motivation of the workforce. Hence leadership, and particularly that of senior management within heavy construction engineering organisations should regularly instigate risk management audits and performance audits as fundamental aspects of their duties. With an ongoing increase of heavy engineering construction projects, senior managers in multinational engineering organisations must be aware of global risk factors in order to function effectively and achieve high levels of project performance. Finally, all project stakeholders in the heavy construction industry must work cooperatively from the feasibility phase to the handover phase to promptly manage inherent risks factors as they occur.

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