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RISK RESPONSE TECHNIQUES IN OIL AND GAS CONSTRUCTION PROJECTS IN THE NIGER DELTA REGION OF NIGERIA

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ABSTRACT

Risks encountered in oil and gas construction projects are enormous and this is as a result of risky nature of the projects. Effective risk responses are vital if risk management is to be efficient by reducing risk exposure for our projects. This study sought to appraise risk response techniques adopted for oil and gas construction projects in the Niger Delta region of Nigeria. The specific objectives for the study are: To identify types of risks in oil and gas construction projects and to examine the risk response techniques adopted for oil and gas construction projects. Data on types of risks and risk response techniques were obtained through questionnaires administered to 70 oil and gas construction professionals. The study adopted a non-probabilistic sampling techniques which is Purposive sampling .Mean item score (MIS) was used to analyze identified types of risks while risk response techniques was through frequencies. The findings of the study revealed that "Environmental risks ranked highest among the twelve (12) identified risks followed closely by political risk, legal risks among other". Risk transfer was the most frequently utilized techniques adopted for oil and gas construction projects. It was concluded that risk responses should be planned and built into the project.

Keywords: *Risk, Oil & Gas, Projects, Response, Techniques*

INTRODUCTION

Background to the Study

Oil and gas sector is considered as the bedrock/backbone of Nigeria economy, as industrialization, agriculture, transportation and even domestic utilization of energy depends on oil and gas sector (Nwosu & Enyiche, 2011).Nigeria is a major player in the world energy market as it occupies seventh position as the largest producer of oil in the world and supplies a fifth of United States oil imports. It is further becoming an important supplier in the global liquefied natural gas (LNG). Instability in world oil supplies and the critical link of oil to the international economy has made Nigerian and more generally African oil to be more strategic Oil and gas is the lifeblood of the nation's revenues, economy and national survival. It accounts for about 40% of the Gross Domestic Product and 70% of government revenues. In 2003, Oil and gas accounted for 80.6% of total federal government receipts (Lawal 2004).

Nigeria's oil boom dated back to the mid-1960s, with proven oil and gas reserves of 38 billion barrels and 187 Trillion Cubic Feet(TCF), which ranks the country as the biggest producer of petroleum in Africa and 7th largest in the world (Michele et al. 1999). Unfortunately, such natural magnanimity has had a more negative impact on the economy irrespective of its contribution to 20% of the Gross Domestic Product (GDP), 65% budgetary revenue and 95% of foreign exchange earnings (Central Intelligence Agency, (CIA's) World Factbook, 2004). Nigeria's oil wealth has brought appalling physical and attitudinal hardship to the citizenry, especially people in the oil-producing communities. The Niger Delta reserve is the sole producing basin since the discovery of oil in Eleme in 1965. Physical adversities associated with oil production in Nigeria include gas flaring and oil seepages into the ecosystem.

Gas flaring is as old as oil production in the Niger Delta, and the waste involved in the practice prompted the 1967-1970 civil wars. Gas flaring is an anthropogenic activity involving the wasteful emission of greenhouse gases (GHGs) that causes global warming, fluctuations in the climate, and disequilibrium in the earth. Nigeria ranked 2nd to Russia in gas flaring in the world with about 23 billion m3 of gas flared (WorldFactbook, 2002). Conversely, oil spill is predominant in Ogoniland region; this activity involves the release of oil into the maritime environment from vandalized or old

pipelines. Consequently, oil spill destroys aquatic lives, contaminates drinking water, leaves fishermen jobless, and results in severe threat to public health.

Attitudinal effects related to the physical problems are accountable for the emergence of militia and pressure groups that are perceived to be individuals crying foul for their selfish interest rather than that of their immediate communities. Recent kidnap of construction workers, payment of ransom by multinationals, bombing of government establishments and construction sites are some of the socio-physical events emanating from such sociological change, no thanks to the marginalization of the region during the regime of the military, laissez-faire approach of the democratic government, and unethical operation of the multinational companies.

The bane of the Nigerian oil and gas industry is the environmental policies and regulations of the government. For example, lip-services was paid to the issue of gas flaring as demonstrated by the myriad of extension to the gas flaring deadline by the government, the latest being given as December 31st, 2012 (Ayoola, 2011). Furthermore, the regulating agencies are negligent of their responsibility as evidence from the recent subsidy scam in the Nigerian National Petroleum Corporation (NNPC) and corruption of the companies 'watchdog, the Department for Petroleum Resources (DPR).

Change is everywhere and inherent in construction projects. For years the industry has had a very poor reputation for coping with the adverse effects of change, with many projects failing to meet deadlines and cost and quality targets. Change is normally regarded in terms of its adverse effects on project cost estimates and programs. In extreme cases, the risk of time and cost overruns can invalidate the economic case for a project, turning a potentially profitable investment into a loss- making venture. A risk even implies that there is a range of possible outcomes for that event which could be both more and less favorable than the most likely outcome and that each outcome within the range has a probability of occurrence. In construction projects each of the three targets of cost, time, and quality is likely to be subject to risk and uncertainty. It follows that a realistic estimate is one which makes appropriate allowances for all those risks and uncertainties which can be anticipated from experience and foresight. Project managers should undertake or propose actions which reduce or eliminate the effect of risk or uncertainty.

Projects are exposed to both internal risks (financial, design, contractual, construction, personal, involved parties and operational risks) and external risks (economical, social, political, legal, public, logistical and environmental risks). All the risks influence cost, schedule or quality of the project in negative ways (Charoenngam and Yeh, 1999). Therefore, risk management should be well recognized and handled as an integrated function of project management.(Smith 1999) defined risk as: Risk exists when a decision is expressed in terms of a range of possible outcomes and when known probabilities can be attached to the outcomes. Uncertainty exists when there is more than one possible outcomes of a course of action but the probability of outcome is not known.

Aim and Objectives

This paper aims at evaluating risk response techniques used in oil and gas construction projects The following objectives will be adopted to achieve this aim.

(1) To identify types of risks in oil and gas construction projects in Niger Delta area of Nigeria

(2) To examine the risk response techniques adopted for oil and gas construction projects

Risk Response Planning

Risk response is the process of developing strategic options, and determining actions, to enhance opportunities and reduce threats to the project's objectives. A project team member is assigned to take responsibility for each risk response. This process ensures that each risk requiring a response has an owner monitoring the responses, although the owner may delegate implementation of a response to someone else. The following are the criteria for risk response. Risk response must be:

- Proportional to the severity of the risk.
- Cost effective.
- Timely.
- Realistic.
- Accepted by all parties involved.
- Owned by a person or a party

Tools & Techniques for Response Planning

1.Strategies for negative risks (Threats)
2.Strategies for positive risks (Opportunities)

Strategies for negative risks (Threats)

Risk Response may be one of several strategies.
1.Avoid 2.Transfer 3.Mitigate 4.Accept

Risk Avoidance

Risk avoidance is done by changing the project plan to eliminate the risk or the condition that causes the risk in order to protect the project objectives from its impact. Also by relaxing the relevant objectives (extend the schedule, reduce specification requirements, and reduce scope). Not all risks can be avoided, but some may. Examples of Risk Avoidance may include the following:

- Add resources or time.
- Adopt a familiar approach instead of an innovative one.
- Avoid an unfamiliar subcontractor.
- Clarify requirements.
- Improve communication
- Obtain information
- Acquire expertise.
- Reduce scope to avoid high-risk activities

Risk Transfer

Risk transfer entails transferring the risk to a third party who will carry the risk impact and ownership of the response. Risk Transfer is *most effective in dealing with financial risk exposure.* Risk transfer nearly always involves payment of a risk premium to the party acquiring the risk. Examples of risk transfer are:

- The use of insurance, performance bonds warranties and guarantees.
- Contracts may be used to transfer liability for specified risks to another party.
- Use of a fixed price contract may transfer risk to the seller if the project's design is stable. A cost reimbursable contract leaves more of the risk with the buyer, but it may help reduce cost if there are mid-project changes.

Risk Mitigation

Risk mitigation aims at reducing the probability and/or impact of a risk to within an acceptable threshold. The probability/Impact should be mitigated before the risk takes place. Thus avoiding to deal with the consequences after the risk had occurred. Mitigation costs should be appropriate given the likely impact and probability of the risk. Examples of Risk mitigation are:

- Implementing a new course of action that will reduce the problem, e.g. adopting less complex processes, conducting more seismic or engineering tests, or choosing a more stable supplier.
- Changing conditions so that the probability of the risk occurring is reduced, e.g. adding resources or time to the schedule.
- Prototype development to reduce the risk of scaling up from a bench scale model.
- Where it is not possible to reduce probability, a mitigation response might address the risk impact by targeting linkages that determine the impact severity. For example, designing redundancy into a subsystem may reduce the impact that results from a failure of the original component.

Risk Acceptance

Acceptance indicates a decision not to make any changes to the project plan to deal with a risk or that a suitable response strategy cannot be identified. This strategy can be used for both negative and positive risks .There are two types of acceptance:

- Active acceptance: may include developing a plan to execute should a risk occur.
- Passive acceptance: requires no action. The project team will deal with the risk as it occurs.

Acontingency planis developed in advance to respond to risks that arise during the project. Planning would reduce the cost of an action should the risk occur. **Risk triggers**, such as missing intermediate milestones, should be defined and tracked. The most usual risk acceptance response is to establish a contingency allowance, or reserve, including amounts of time, money or resources to account for known risks. The allowance should be determined by the impacts,

computed at an acceptable level of risk exposure, for the risks that have been accepted.

Strategies for positive risks (Opportunities)

Strategies for positive risks are: 1.Exploit 2.Share 3.enhance

Exploit the opportunity

Ensure that the risk event happens by eliminating the uncertainty to take advantage of the opportunity. Examples: assign qualified personnel, select an appropriate project delivery, provide better quality.

Share the risk

Allocate ownership to a third party who has a better chance of achieving the required results. Examples: joint ventures, partnerships, rewards.

Enhance

Increase the likelihood of occurrence or the impact of the of the event, Improve chances for the event to happen so the opportunity becomes more certain and Consider how the impact can be increased and choose a course of action that in the increased impact.

Results from Risk Response Planning

Project Management Plan Updates

The project management plan is updated to incorporate response activities including reflecting impact on cost and schedule.

Contractual agreements

Contractual agreements are prepared to specify each party's responsibility for specific risks, should they occur. This includes agreements for insurance, services, and other items as appropriate in order to avoid or mitigate threats.

Risk response Techniques

This third step of the RMP indicates what action should be taken towards the identified risks and threats. The response strategy and approach chosen depend on the kind of risks concerned (Winch, 2002). Other requirements are that the risk needs to have a supervisor to monitor the development of the response,

which will be agreed by the actors involved in this risk management process. (PMI, 2004)

Winch (2002) claims that the lower impact the risk has, the better it can be managed. Most common strategies for risk response are: avoidance, reduction, transfer and retention (Potts, 2008). Beyond those types of responses, Winch (2002) describes that sometimes it is difficult to take a decision based on too little information. This may be avoided by waiting until the appropriate information is available in order to deal with the risk. This way of acting is called "Delay the decision" but this approach is not appropriate in all situations, especially when handling critical risks. Those need to be managed earlier in the process.

Avoidance/prevention

If the risk is classified as bringing negative consequences to the whole project, it is of importance to review the project‟s aim. In other words, if the risk has significant impact on the project, the best solution is to avoid it by changing the scope of the project or, worst scenario, cancel it. There are many potential risks that a project can be exposed to, and which can impact its success (Potts, 2008). This is why risk management is required in the early stages of a project instead of dealing with the damage after the occurrence of the risk (PMI, 2004).

The avoidance means that by looking at alternatives in the project, many risks can be eliminated. If major changes are required in the project in order to avoid risks, Darnall and Preston (2010) suggest applying known and well developed strategies instead of new ones, even if the new ones may appear to be more cost efficient. In this way, the risks can be avoided and work can proceed smoothly because strategy is less stressful to the users.

Cooper *et al*. (2005) list some activities that can help to avoid potential risk:

- More detailed planning
- Alternative approaches
- Protection and safety systems
- Operation reviews
- Regular inspections
- Training and skills enhancement
- Permits to work
- Procedural changes

- Preventive maintenance

Reduction/mitigation

By having an overview over the whole project it is easy to identify problems which are causing damage. In order to reduce the level of risk, the exposed areas should be changed (Potts, 2008). This is a way of minimizing the potential risks by mitigating their likelihood (Thomas, 2009). One way to reduce risks in a project is to add expenditures that can provide benefits in the long term. Some projects invest in guarantees or hire experts to manage high-risk activities. Those experts may find solutions that the project team has not considered (Darnall and Preston, 2010).

Mitigation strategies can, according to Cooper *et al.* (2005), include:

- Contingency planning
- Quality assurance
- Separation or relocation of activities and resources
- Contract terms and conditions
- Crisis management and disaster recovery plans

Those risks which should be reduced can also be shared with parties that have more appropriate resources and knowledge about the consequences (Thomas, 2009). Sharing can also be an alternative, by cooperating with other parties. In this way, one project team can take advantage of another‟s resources and experience. It is a way to share responsibilities concerning risks in the project (Darnall and Preston, 2010).

Transfer

If a risk can be managed by another actor who has a greater capability or capacity, the best option is to transfer it. Potts (2008) states that the risk should be transferred to those who know how to manage it. The actors that the risks can be transferred to are, for example, the client, contractor, subcontractor, designer etc, depending on the risk‟s character. As a result this could lead to higher costs and additional work, usually called risk premium (Potts, 2008). It must be recognized that the risk is not eliminated, it is only transferred to the party that is best able to manage it (PMI, 2004). Shifting risks and the negative impacts they bring is also an option when the risks are outside the project

management‟s control, for example political issues or labor strikes (Darnall and Preston, 2010). The situation may also consist of catastrophes that are rare and unpredictable in a certain environment. (Winch, 2002) Such risks that are beyond the management‟s control should be transferred through insurance policies.

Retention

When a risk cannot be transferred or avoided, the best solution is to retain the risk. In this case the risk must be controlled, in order to minimize the impact of its occurrence (Potts, 2008). Retention can also be an option when other solutions are uneconomical (Thomas, 2009).

Monitoring

This final step of RMP is vital since all information about the identified risks is collected and monitored (Winch, 2002). The continuous supervision over the RMP helps to discover new risks, keep track of identified risks and eliminate past risks from the risk assessment and project (PMI, 2004).Also states that the assumptions for monitoring and controlling are to supervise the status of the risks and take corrective actions if needed.

Tools and techniques used to risk monitor and control may be (PMI, 2004):

- Risk reassessment – identification of new potential risks. This is a constantly repeated process throughout the whole project.
- Monitoring of the overall project status – are there any changes in the project that can effect and cause new possible risks?
- Status meetings – discussions with risk‟s owner, share experience and helping managing the risks.
- Risk register updates

By managing the whole RMP, the process can be evaluated. This is a method of creating a risk register where all risks and their management can be allocated in order to facilitate future projects (PMI, 2004). This is also a way to improve the project work, since the advantages and disadvantages will be brought up.

RESEARCH METHOD

This paper presents a part of the findings of a major research work which investigated risk response techniques adopted for oil and gas construction projects in the Niger Delta region of Nigeria. The specific objectives for the

study are: To identify types of risks in oil and gas construction projects and to examine the risk response techniques adopted for oil and gas construction projects. To this end, types of risks and risk response techniques were obtained through a literature search which were then transmitted into questionnaires that was administered to 70 oil and gas construction professionals. This study adopted a non-probabilistic sampling technique which is Purposive sampling. Mean item score (MIS) was used to analyze identified types of risks while risk response techniques was through frequencies.

ANALYSIS AND RESULT

Types of Risk in Oil and Gas Construction projects

Objective 1: To identify types of risks in oil and gas construction projects in Niger Delta area of Nigeria.

Table 1.0 shows the mean item score of the identified types of risk in oil and gas construction projects in descending order of the mean item score, using the scale below for ranking.

Table 1.0: Ranking of the identified types of risks

Risk Types	N	Mean	Rank
Environmental risks	70	4.41	1
Political risks	70	4.00	2
Legal risks	70	3.94	3
Technological risks	70	3.87	4
Geographical risks	70	3.84	5
Social risks	70	3.80	6
Construction risks	70	3.79	7
Investment risk	70	3.77	8
Geotechnical risks	70	3.76	9
Financial risks	70	3.74	10
Demand/ product risks	70	3.69	11
Others (please specify)	70	3.69	11
Communications risks	70	3.50	13

Source: ***Authors' Field Survey (2020)***

Table 1.0 shows the ranking of the identified types of risk in oil and gas construction projects. Environmental risk ranked the highest amongst the other with a mean item score of 4.41. This is followed closely by political risks with a mean item score of 4.00. legal risks ranked the 3rd with an MIS of 3.94. technological risksranked 4th among the identified types of risk in oil and gas construction projects. Geographical risks, social risks, construction risks, investment risk, geotechnical risks, financial risks, demand/ product risks, others (please specify) and communications risks were among the identified types of risk in oil and gas construction projects with communication risk ranked least on the table. Every other types of risks identified also has a high degree of importance and cannot be ignoredThis is in line with the work of (Mubin, & Mubin, 2008).Thus in achieving the next objective, factors responsible for the risks associated with oil and gas construction projects were investigated and respondent perceptions were measured and further subjected to correlation.

Risks Response Techniques adopted for Oil and Gas Construction Projects

To examine the risk response techniques adopted for oil and gas construction projects, analysis of frequencies was done to determine the number of usage of each of the techniques and the result is as presented in Table 4.10 below.

Table 2.0:Risk Response Techniques used for Oil and Gas Construction Projects

Code	Risk Factors and Types	Response Techniques				
		Avoid	**Transfer**	**Mitigate**	**Accept**	**TOTAL**
	Political risks					
A	Unstable Govt. Policies	22	15	16	17	70
B	Change in labour policy	6	16	23	25	70
C	Delay in approvals from regulatory	11	20	27	12	70
D	Strikes, lockout, lawlessness	19	22	23	6	70
	Socio-economical risks					

E	Change in economic parameters	24	23	13	10	70
F	Rise in inflation and material prices	10	14	27	19	70
G	Seasonal unavailability of labour	13	30	17	10	70
H	nge in economic policies stem	22	18	21	9	70
	Organizational risks					
I	Breach in contractual relationship	31	17	9	13	70
J	Loss of venture or partnership	15	10	27	18	70
K	Unrealistic SWOT analysis	28	14	20	8	70
L	Fine or compensation	15	11	22	22	70
	Investment risk					
M	Unrealistic cost baseline and	17	33	10	10	70
N	Exchange rate risk and rise in	15	29	8	18	70
O	Disinvestment from market	21	18	23	8	70
P	Strong credit policy	21	20	18	11	70
	Technological risk					
Q	Inefficient communication	21	14	17	18	70
R	Inefficient and conventional	25	20	10	15	70
S	Insufficient resources and equip	17	15	30	8	70
T	Quality risk and rework	19	24	17	10	70
	Security risk					
V	Accident during construction	10	26	16	18	70
U	Not use of HSE policies	20	25	22	3	70
W	Terrorism or war	15	30	10	15	70
X	Human error (Damage or loss)	18	23	18	11	70
	Natural and climatic risk					

Y	Earthquake	10	30	20	10	70
Z	floods	14	22	14	20	70
AA	Landslide, hurricanes	10	30	20	10	70
AB	Weather conditions e.g. humidity	30	12	14	14	70
	Environmental risk					
AC	Damage to natural resources	14	10	22	24	70
AD	Damage to surrounding environment	14	22	12	22	70
AE	Depletion of hydrocarbon resources	18	19	17	16	70
AF	Damage to ecology and wildlife	19	13	20	18	70
	Construction risks					
AG	Construction cost overrun	13	23	19	15	70
AH	Construction time delay	9	21	20	20	70
AI	Availability of appropriate laboul	9	29	15	17	70
AJ	Late design changes	14	20	24	12	70
AK	Poor quality of workmanship	12	23	18	17	70
AL	Excessive contract variation	13	24	18	15	70
AM	Insolvency default of subcontract	7	26	19	18	70
AZ	Others (Please specify)	12	28	20	10	70
	TOTAL	**653**	**839**	**736**	**572**	**2800**
	Source: ***Authors' Field Survey (2020)***					

Table 2.00 presents the frequencies of risk response techniques adopted for oil and gas construction projects. Risk can be avoided, transferred, mitigated and accepted as presented in the table.2.0, construction risks are broken down into construction cost overrun, construction time delay,availability of appropriate labour, late design changes,poor quality of workmanship,excessive contract

variation, Insolvency default of subcontract and others aremostly responded to through risk transfer with frequency of 194, followed by mitigation 153, Acceptance 124 and the least frequent is avoided with 89.Political risks are broken down into unstable Government policies, change in labour policy, delay in approvals from regulatory, strikes, lockout and lawless. For political risk the frequencies are: Risk Avoided is 58, Transferred 73, mitigated 89 and acceptance is 60. Summarily, as presented in the Table 4.10, Risk transfer is the most frequently used response techniques for oil and gas construction projects with frequency of 839, followed by mitigation 736, avoidance 653 and the least frequently applied is acceptance with 572. This is in agreement with the findings of (Dada, 2010) which he ascertained that Nigerian construction industry considered risk transfer as the highest risk response strategy used followed by mitigation. But in contrasts to (Tang, W., Qiang, M., Duffield, C.F., Young, D. & Youmei, L. 2007) conclusion where they stated that construction industry has shifted from risk transfer to risk mitigation.

CONCLUSION

The study assessed the risk response techniques adopted for oil and gas construction projects with the objectives of identifying types of risks associated with oil and gas construction projects and to examine risk response techniques used for oil and gas construction projects. This study concludes on the following premises that, Financial risks, construction risks, demand/ product risks, political risks, environmental risk, technological risks, geographical risks, geotechnical risks, communications risks, legal risks, social risks and investment risks are the identified types of risk in oil and gas construction projects.

Risk transfer was the most frequently utilized techniques adopted for oil and gas construction projects as favored by the respondents, this is reasonable, because oil industry prefers to transfer the risks financially. Insurance and exclusion or indemnity clauses in contracts are the most popular way of transferring risks financially

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