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The Critical Success Factors for Marginal Oil Field Development in Nigeria

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Abstract The purpose of this research was to assess the critical success factors of marginal oil field development in Niger Delta region. There are considerable potential of marginal oil field in Niger Delta region. However, it is sad to know that the development of marginal oil fields is lagging or have not been fully successful, despite policy initiative by the Federal Government of Nigeria. Many of the marginal field operators are battling with the issues of funding, social political, environmental and technical issues. Using data collected through document analysis and survey questionnaires from oil and gas experts and other government agencies, the research identified the success factors for marginal oil field development to include collaboration, infrastructure sharing, Joint ventures and partnerships and implementation of corporate social responsibility by the indigenous fields operating in the region. Technical issues associated with marginal field development and policies issues are addressed. The paper concludes that a policy shift and support to the marginal field operators are needed to enhance the development of marginal oil field in Niger Delta region. It also concludes that a favorable investment climate, the development of support infrastructure like refineries and power, financial institutions, as well as collaboration and integration by the stakeholders is essential for the sustainable development of marginal oil field in Nigeria.

Keywords: *marginal oil field, indigenous companies, collaboration, sustainable development, support infrastructure*

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1. Background to the Problem

In 2001, the Federal Government of Nigeria launched marginal fields programme and invited bids from indigenous companies for the 24 out of the 116 identified fields. Twenty four (24) of the identified 116 marginal fields were awarded to 31 indigenous companies in an openly contested bid round in 2003. So, in 2003 when the Federal Government handed over the operations of these fields to local hands, many had welcomed the development with the hope that the confidence of local experts would be bolstered in oil exploration and production activities. After the deal was finally formalised with the oil majors in 2004, it is disheartening to know that the status of the majority of these fields have not changed from the undeveloped state.

1.1. Problem Statement

According to Wood Mackenzie report [12] Since 2004, only ten of the 24 marginal fields awarded in the round have been brought on stream or are under development and account for just 2.1 percent of the country's total daily crude production It is against this background that this study was carried out to explore the critical success factors of marginal oil and gas fields in Nigeria. This study aims to examine the factors that are particularly catalytic in the development of marginal field in Nigeria with the aim of providing some insights for marginal field operators that have plans to promote the development of these fields in the country. In view of the above, the research seeks to find answers to the following questions:

- What are the necessary infrastructures required for the development of marginal oil field in Nigeria?
- What are the challenges and constraints to the development of marginal oil fields in Nigeria?

1.2. Research Objectives

The main objectives of the study are to explore the factors influencing the development marginal oil field in Nigeria and to examine the factors that are catalytic in the development of marginal oil field in Nigeria.

The specific objectives include the following:

- Examine the critical factors that are required for the development of marginal oil fields in Nigeria.
- Make recommendations for policy considerations

The study was conducted in the Niger Delta region the base of hydrocarbon resources in Nigeria where the marginal oil and gas fields were located.

The following null and alternate hypothesis were considered:

The null hypothesis Ho is: There is no significant difference between economic development of marginal field and adequate technology/support infrastructure.

The alternate hypothesis Hr: Economic development of marginal field depends on the availability of adequate/support infrastructure.

The null hypothesis Ho is: There is no significant difference between economic development of marginal field and collaboration between stakeholders

The alternate hypothesis Hr: Economic development of marginal field development depend on collaboration between stake holders

1.3. Research Methodology

A cross sectional survey was selected for the study because it was easy to undertake compared to longitudinal survey and the result from the sample can be inferred to the larger population. The study adopted a survey research and document analysis to examine the success factors of marginal field development in Nigeria. The target population in the study is the upstream oil and gas professional in Nigeria. A structured questionnaire was used to collect data from the respondent, the questionnaire was developed to capture the information on the level of the respondent knowledge on the main success strategy and constraints on marginal field development in Nigeria.

The objective of this thesis is to describe and analyze a contemporary process and to answer the research questions formulated. If research questions focused mainly on "what" questions, either exploratory research or survey can be adopted. Some types of "what" questions are exploratory, such as, "What are the challenges and constraints to marginal field's development?" This type of question is a justifiable rationale for conducting an exploratory study, the goal being to develop pertinent hypotheses and propositions for further enquiries [13]. Also, almost no research has been done on this topic; based on this difficulty, it became apparent that the research should be exploratory, attempting to obtain a deeper understanding of why the development of marginal fields awarded to the indigenous companies is lagging or have not been fully developed ten tears after the fields were awarded to them., why the challenges and constraints to marginal fields operations?

The analyzed data was presented using descriptive statistics, frequency tables and chi-square analysis. Descriptive statistics allow for generalization of the data to give an account of the structure or the characterization of population by the sample

1.4. Case Study Area and Justification

For the purposes of this study, upstream oil and gas companies and government establishments were chosen as the unit of analysis even though the surveys were answered by individuals who were experts in the oil and gas business. To give a comprehensive understanding of all issues, evidence from different perspectives were considered.

1.5. Sample Selection

Government institution were purposefully selected because of their unique roles they play in the in the oil and gas development as stake holders.

Table 1. Sample Frame

Name of population	Sample frame
International Oil Company (IOC)	5
Independent and medium Operators (IMO)	10
Marginal fields operators (MFO)	10
Government Institutions	8

Source: Author's Computation, May, 2016.

Table 2. List of selected Nigerian upstream Operators and government institutions

Majors operators	Independent and medium operators	Marginal field operators	Government institutions
SPDC	Moni pulo	Umusadge (Mid-Western oil and Gas Corporation)	Department of petroleum Resources (DPR)
Exon- Mobil	Seplat	Umusati (Pillar Oil limited)	National Petroleum Investment Management System (NAPIMS)
Agip	Conoco exploration and production	Ibigwe (Walter Smith Petroman)	Central Bank of Nigeria (CBN)
Chevron-Texaco	Amni	Egboma (Platform)	Nigeria Content Development and Monitoring Board (NCDMB)
Total Elf	Oriental energy	Obodugwa/Obodeti (Enrgia Petroleum/Oando)	NNPC-Abuja
	Peak petroleum industries Nig. Ltd	Ajapu (Btrtania-U)	Nation Oil and Gas higher Institution
	Con oil producing	Ogbelle (Niger Delta Petroleum resources)	Consultants to oil and gas company
	Pan ocean	Ebok (Oriental energy	Federal Inland Revenue FIR
	Nigerian Petroleum Development Company	Oando PLC	
	Afren	Universal energy service	

Sources author's Construct May, 2016.

1.6. Selection of Respondents

Selection of participants does favor those who are professional in the oil and gas. They include engineers, geologist, petroleum economist, and other occupying management position in the upstream oil and gas. Also professional in the government institutions like the central bank, national local content board NCDMB, the nation university and the Federal Inland Revenue were selected as participants.

1.7. Data Collection Technique

A multiple approach of data gathering was adopted for the purpose of this research which includes: questionnaires, document analysis, and case study. The obvious reason for adopting the multiple approaches is the possible combination and integration of strengths and weaknesses concerned with each method. No single source of data has a complete advantage over the others and that the various sources of data collection are highly complementary. This not only increases the validity of the study, but increases the enriching and completes the knowledge and increases scope, depth, and consistency of methodological proceedings [4]. The techniques used to collect the empirical data were:

1.7.1. Documentary Analysis

A literature review of marginal field development was undertaken to explain the relevant requirements. In addition, all relevant information were analyzed to construct a precise summary of background information, which included the different methods or techniques for managing or developing marginal oil fields and advantages and limitations.

1.7.2. Questionnaires

Two types of questionnaires were designed: one for marginal fields, IOC and Independent operators the other for government institutions. Both closed and open ended questions formed part of the questionnaires administered to address the objectives stated in the study.

1.8. Data Analysis

Both qualitative and quantitative analyses were employed in this study. Data was edited and coded for entry into the computer using Statistical Package for Social Scientists (SPSS). Data was categorized and cross-tabulated according to concepts in order to address the purpose of the study. Tables and bar charts were also used. In some cases, chi-square analysis was adopted to test relationships between some variables.

2. Results and Discussion

2.1. Profile of Respondents from Oil and Gas Companies and Government Agencies

From Figure 1 17% of the respondents have less than 5years overall working experience in the oil field operations, 19% of respondents have above 5years and below 10years experience, with the majority of the respondents are above 10years and below 20years combined in the field having 50%, and 14% for those with above 20years experience in the oil field operations.

From Figure 2 majority of the respondents have less than 5years overall experience with 31%, 10% of respondents have above 5years and below 10years experience, while 14% and 19% of the respondents respectively have above 10years and below 15years; above 15years and below 20years respectively, 26% for those with above 20years experience in the oil field operations.

From the above, we can therefore conclude that Figure 1 and Figure 2 show that the correspondents are well skilled and have acquired much experience in the oil field operation. Therefore, response from them will not be biased.

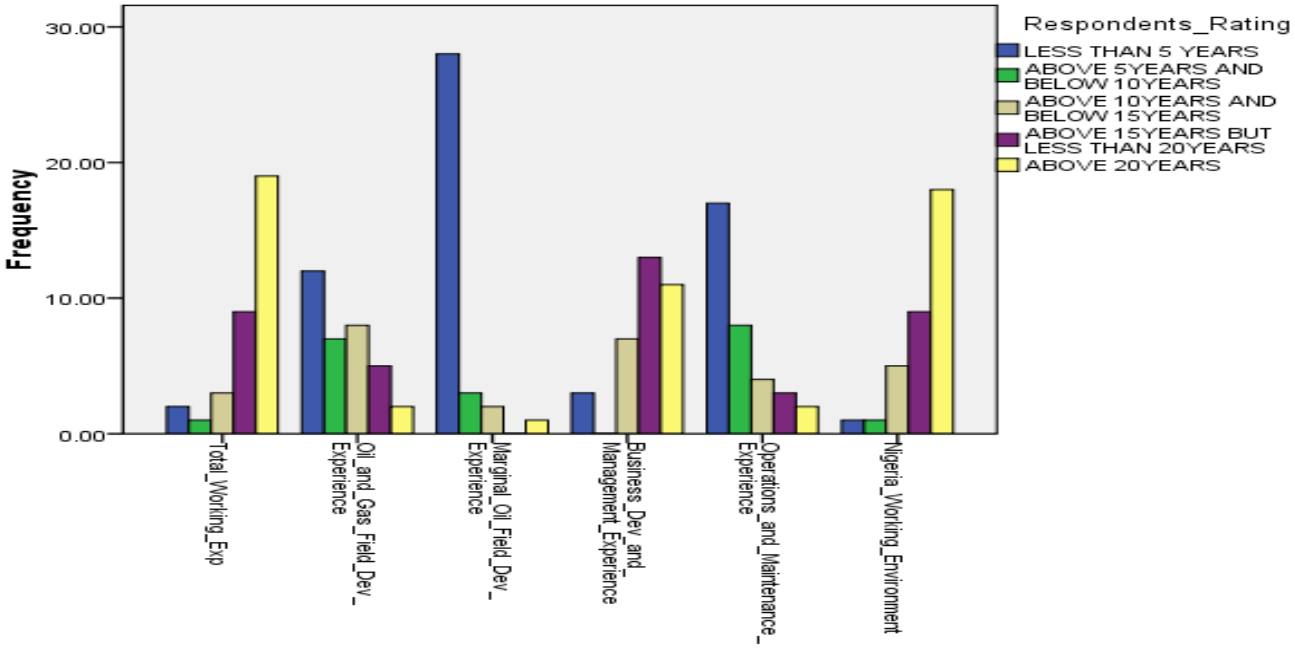

Figure 1. Respondents rating on working experience (MFO, IOC and IMO Respondents)

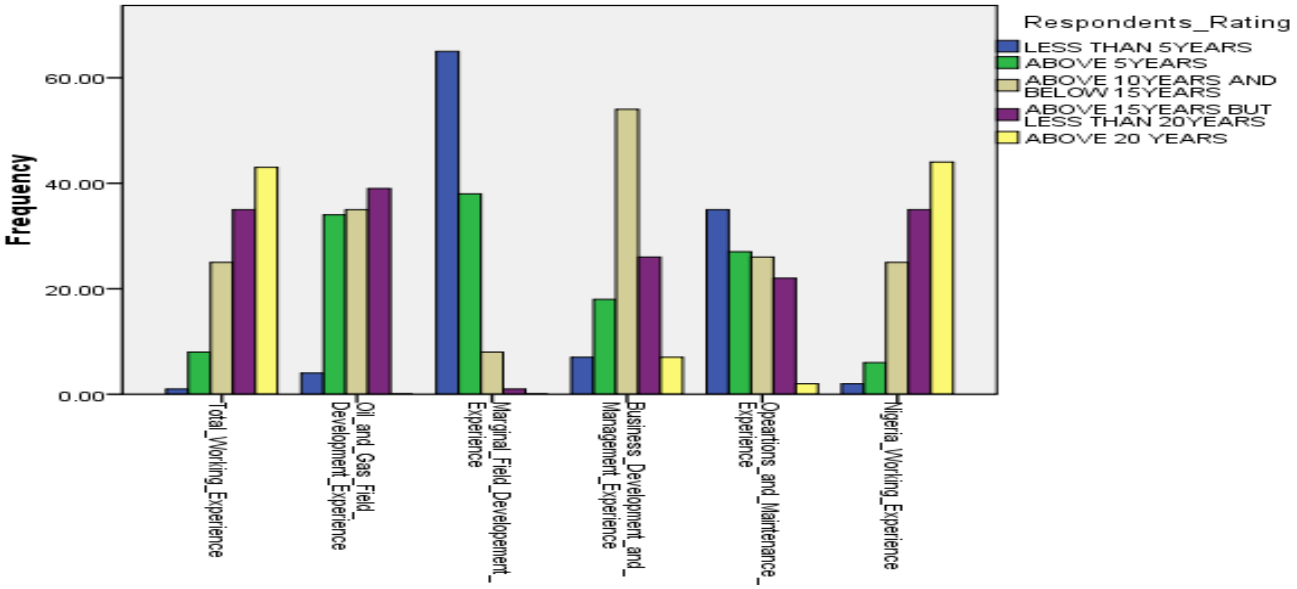

Figure 2. Respondents rating on working experience (Government agencies Respondents)

Table 3. Distribution by factors the success strategies for marginal oil field development Number of response (N=106)

Factors	5(VH)	%	4(H)	%	3(NS)	%	2(L)	%	1(VL)	%
Collaboration/JV	46	43.40	34	32.07	03	2.83	14	13.21	09	8.49
Corporate social responsibility	52	49.06	54	50.94	-	-	-	-	-	-
Outsourcing	18	16.98	24	22.64	11	10	34	32.08	19	17.92
Equipment/facility Leasing	36	33.96	39	36.97	08	7.55	16	15.09	07	6.60
Integrated development	55	51.89	30	28.30	04	3.77	11	10.38	06	5.66
Clustering	40	37.74	35	33.02	11	10.34	16	15.09	4	3.77
Use of innovative technology	38	35.84	48	45.28	9	8.49	8	7.55	3	
Related and support industries	35	33.01	46	43.39	15	14.15	4	3.77	6	5.66
Mergers and acquisitions	29	27.35	49	46.23	13	12.26	12	11.32	3	2.83

Table 4. Summary of significance tests and conclusion for factors responsible for success in marginal field development

Factors	R	D.f	L.S	X^2tab	X^2cal	Conclusion
Collaboration	6	4	0.05	9.488	61.83	Significant
Corporate social responsibility	1	4	0.05	9.488	159.1	Significant
Outsourcing	8	4	0.05	9.488	9.19	Not significant
Leasing	7	4	0.05	9.488	43.04	Significant
Integrated development	2	4	0.05	9.488	87.3	Significant
clustering		4	0.05	9.488	45.64	Significant
Use of innovative technology	3	4	0.05	9.488	73.19	Significant
Related and support industries	4	4	0,05	9.488	65.01	Significant
Mergers and acquisition	5	4	0.05	9.488	62.35	Significant

2.2. Discussion of Finding from Phase One Questionnaires

2.2.1. Objective One

'**Investigate the development support strategies for the successful development of marginal oil fields in Nigeria.** To investigate the first objective respondents of the questionnaire were asked to rate their agreement with attitude statements towards the success strategies for marginal oil fields development.

The results were presented using the following factors: the use of innovative technology, sharing nearby process platform, leasing of equipment, collaboration and strategic alliances, mergers and acquisition/business restructure, integrated oil and gas development, effective project management, corporate social responsibility, cluster development for economies of scale, local content development as the success strategies for marginal field development

Table 3 and Table 4 present distribution of factors responsible for the success of marginal field development in Nigeria and a summary of statistical tests respectively. The response table indicates that over 75% agree that collaboration is an important factor while, 21.7% does not

share this view. More over the chi square test reveals that collaboration is a significant factor success strategies in marginal field development X2 calculated>X2 table value (61.83>9.488) at 5 percent confidence interval. In a case study on Production Sharing Contract (PSC) contract for marginal field development in Equatorial Guinea Antonio (2008) suggested that a win-win business relationship by the use of a flexible system that can honour the mutuality of interest between the host government and contractor and make available an equitable arrangement for both the highly profitable and the less profitable discoveries.

A strategic partnership between marginal field operators and other stake holders for example the banking sector, power, refineries and the government in the economy is critical to marginal field development. The formation of such strategic alliance will not only provide a common focal point but will also provide economies of scale for the development of marginal oil field in Nigeria. The banking sector being the links between marginal field operators and the market in the oil and gas Value Chain are critical to the successful development of marginal oil field. The strategic partnership can be promoted between marginal field operator and the other stake holder through revenue sharing.

The successful development of marginal fields is also possible through joint cooperation among the stakeholders of the oil and gas industry since the tasks needed to be accomplished can also be solved by adopting sustainability principle. Sustainable management strategy lies on partnerships capable of providing an efficient oil and gas network structure which supports marginal field development. Sustainability is a process of change in which technological development and institutional change in which the exploitation of resource, the direction of investment, the orientation of technological development and institutional change are made consistent with future as well as present needs in a broad sense sustainable development must enhance the long term productivity of the resource base with acceptable environmental impacts [11].

According to the respondent 83.88% agree that technology is a significant factor while 16.12 disagree. Technology is the key element from fundamental exploration all the way to refinement of oil. Innovations and improvements of technologies in the upstream processes have made it possible to extract bigger volumes or improve the recovery of oil and gas, and to extract maintaining reserves in some fields which were previously considered exhausted. This has allowed for increasing profitability and gains from existing oilfields.

Corporate social responsibility appears to be one of the most significant factors responsible for success in marginal field development in Nigeria. 100% of the respondents agreed that corporate social responsibility is more significant. X2(159.1.) calculated >X2 (tabulated (159.1>9.488).

Companies' social responsibility is yet another factor affecting companies' operations in this industry, mainly through their image. This finding is in line with Emma et al (2010) that:

Corporate social responsibility (CSR) had been identified as critical success factor of oil and gas production. However, there could be some critical factors that could affect the CSR associated with oil and gas production in the Nigerian Niger Delta. This was predicated on the fact that Nigeria was a developing nation with very high population density that concentrated more in the rural areas. Thus, the development of the rural communities that accommodated the oil and gas needed to be of priority in order to meet world energy demand. Thus, the factors that threaten peaceful environment in the Nigerian Niger Delta were as important as exploration and production of oil and gas itself. Moreover, companies are required to spend shares of their profits in environmental restoration and remediation, when cleanups of inactive sites are made.

Development of marginal oil field projects requires a major level of community involvement. Evidence about the relationship between beneficiary involvement in project design and management, the efficiency of implementation, cost recovery and project sustainability is accumulating. Hence involving key players would enhance the sustainability of marginal field development project. Therefore, development of marginal oil field projects requires a major level of community involvement. In the past, those projects with a high level of community involvement - consensus, support, and participation - have been the ones which have proven the most successful. Community participation creates ownership, and ownership leads to success and security of investment.

Security is a significant factor in the marginal oil and gas operation operations. This components indicates the key driver of change in in the Nigeria marginal field development based on the study finding. This implies that a major factor that will guarantee the sustainable development of marginal oil field in Nigeria is peace. The Ogbelle JV participant decided that in order to benefit the local communities from the development of the Ogbelle field a community and environment development trust for development project be set up for the benefit of the local communities where the project was based (including such communities situated along the routes that the project pipelines and flow line traversed.

The most interesting and revealing is the statistical insignificance of outsourcing since X2 calculated <X2 table value (9.19<9.48) at 5 percent level of test. Moreover, apart from over 10 percent of respondents who are undecided, over 50 percent agree that out sourcing is not a significant factor.

Outsourcing does not eliminate risk; it merely relocates it, and out sourcers depends on others caring as much about the product as they do. And like everything else in business it needs to be done and managed properly. Available literature indicates that out sourcing is one of the strategy for development of marginal oil fields. However, it is likely that in Nigerian most marginal field operators do not embrace outsourcing as one of the strategies because it may be too expensive for the indigenous companies to outsource their fields to the oil servicing companies. Factors influencing the development of marginal oil fields in Nigeria are increasingly recognized as key contributing variables for understanding why some marginal oil field projects are developed and others are not.

Table 5. Hypothesis testing

Hypothesis	Decision	Premise
The null hypothesis Ho is: there is no significant difference between marginal field development and collaboration between stakeholders	Rejected	Data are statistically significant at 5% sampling error. An association exists between the variables since the calculated value of 61.83 is greater than the critical table value of 9.48 there by validating the alternate hypothesis.
The null hypothesis Ho is: there is no significant difference between marginal field development and adequate technology/support infrastructure.	Rejected	Data are statistically significant at 5% sampling error. An association exists between the variables since the calculated value of 65.1 is greater than the critical table value of 9.48 there by validating the alternate hypothesis.

In the context of oil and gas field development, the marginal field operators do not have the financial capability to carry on research in the oil and gas, rather, operators go into collaboration and strategic alliance to do so. Collaborate with major oil companies and oil service companies to develop marginal oil fields. Collaboration may be in the following area: sharing of infrastructure, development through Joint venture partnership, data management, knowledge sharing and research, development and innovation, entering into production sharing contracts with service providers with attractive terms and so on. Also the basic sharing of existing platform concept is to improve the project economics by use of existing nearby infrastructure such as processing platforms and pipelines as opposed to building or buying a new facility. This strategy enables utilizing the benefit of economies of scale.

2.2.2. Analysis of Phase Two Questionnaire Data

From Figure 3, shows that the major prevalent challenges facing marginal oil fields comes from high cost of fund from Nigeria banking sector (21 high); inadequate level of industrialization (23 high); local organization incompetence (17 high) have prevalent challenges facing the development of marginal oil fields in Nigeria with Lack of national centre of excellence (20 very high) posing the greatest challenges facing the development of marginal oil fields except for strict implementation of local content policy which most respondents (i.e. 17 of 34) were not sure on its being a challenges facing the development of marginal oil fields in Nigeria.

Okechukwu [9] posited that indigenous oil companies lack adequate financial resources and key technical capabilities to operate their acquired oil fields and license and are therefore faced with challenges of shortage of operational funds and technical expertise.

Most winning bidders had weak management structures and limited industry experience in other words most executives of marginal field company are incompetent because they lack the management skill and prior business experience in the chosen line of business. Not having competent, experience and efficient management team is one of the most devastating set back any business establishment could suffer, since the success or failure of any enterprise rest squarely on the management. This is in line with the adage that the head cannot lay claim to good health when the head is sick. Most of the operators awarded license lacked technical competence, knowledge of business of operating environment and had no financial capacity.

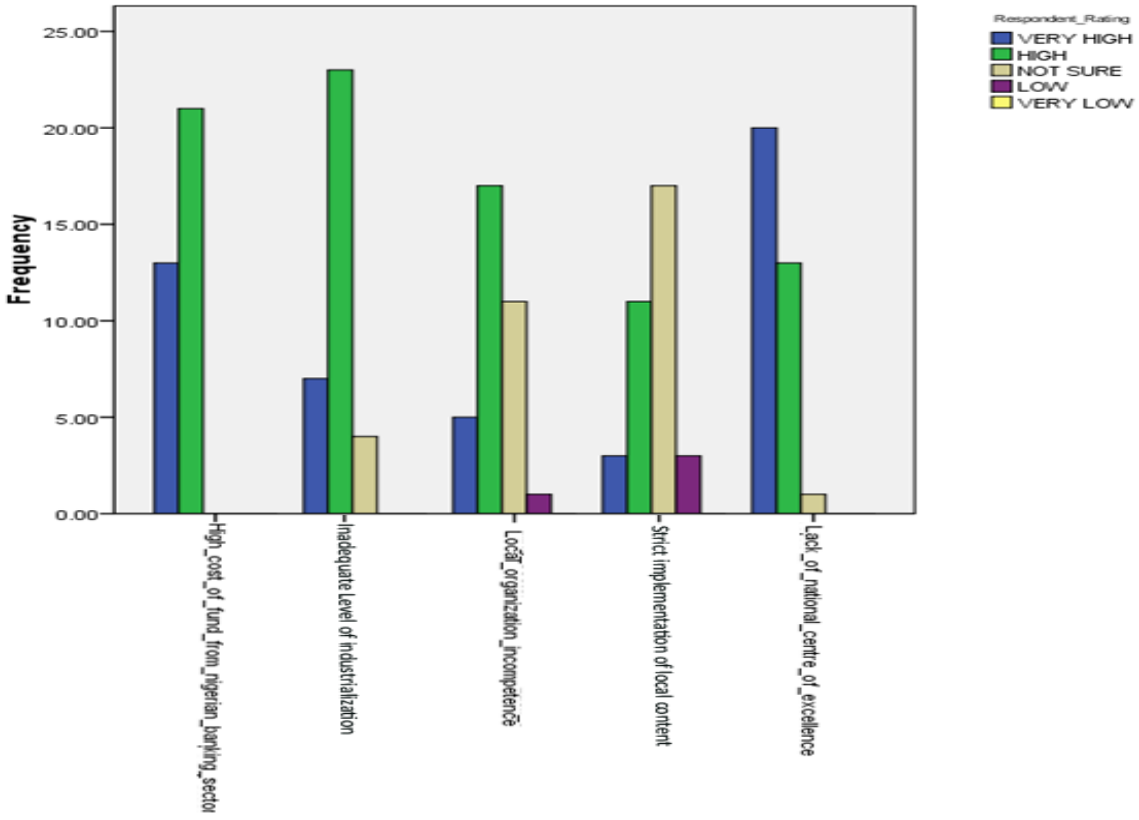

Figure 3. Respondents responses on the prevalent challenges facing the development of marginal oil fields in Nigeria

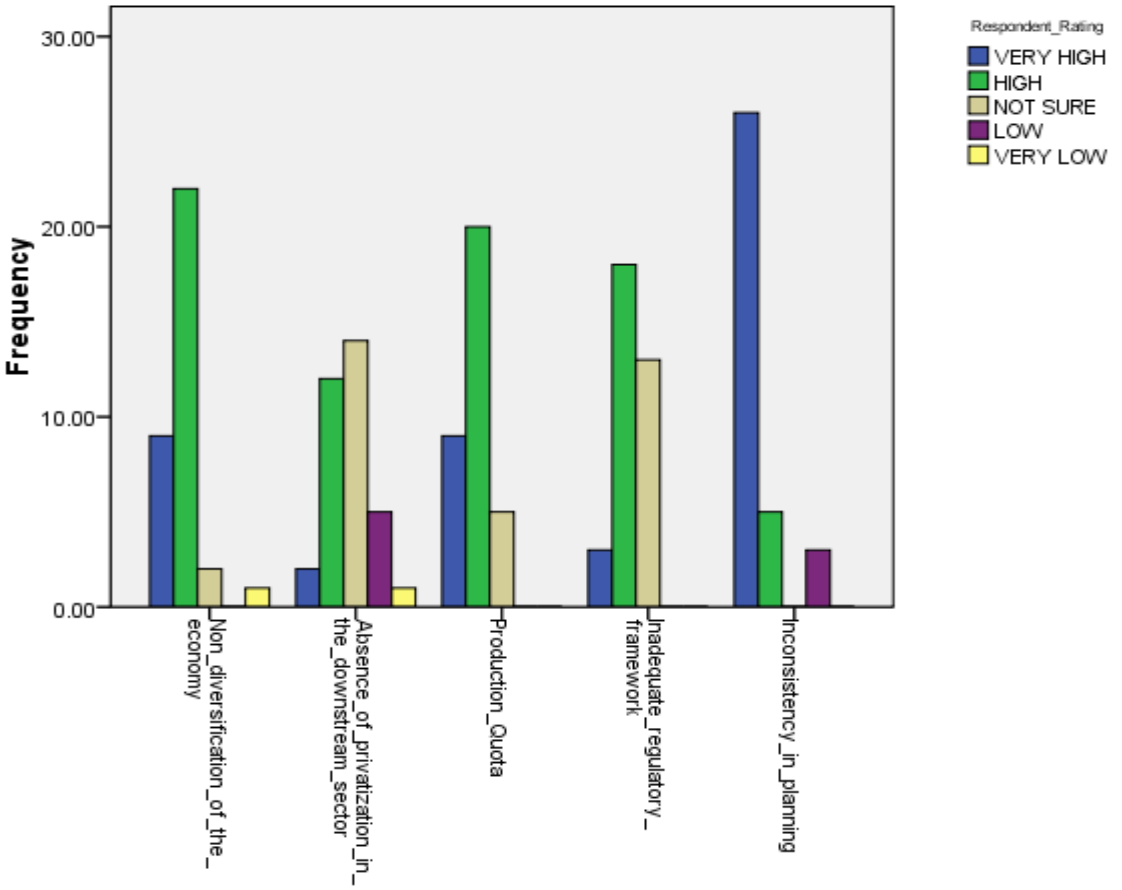

Figure 4. Respondents' opinions on what undermine the development of marginal oil fields in Nigeria

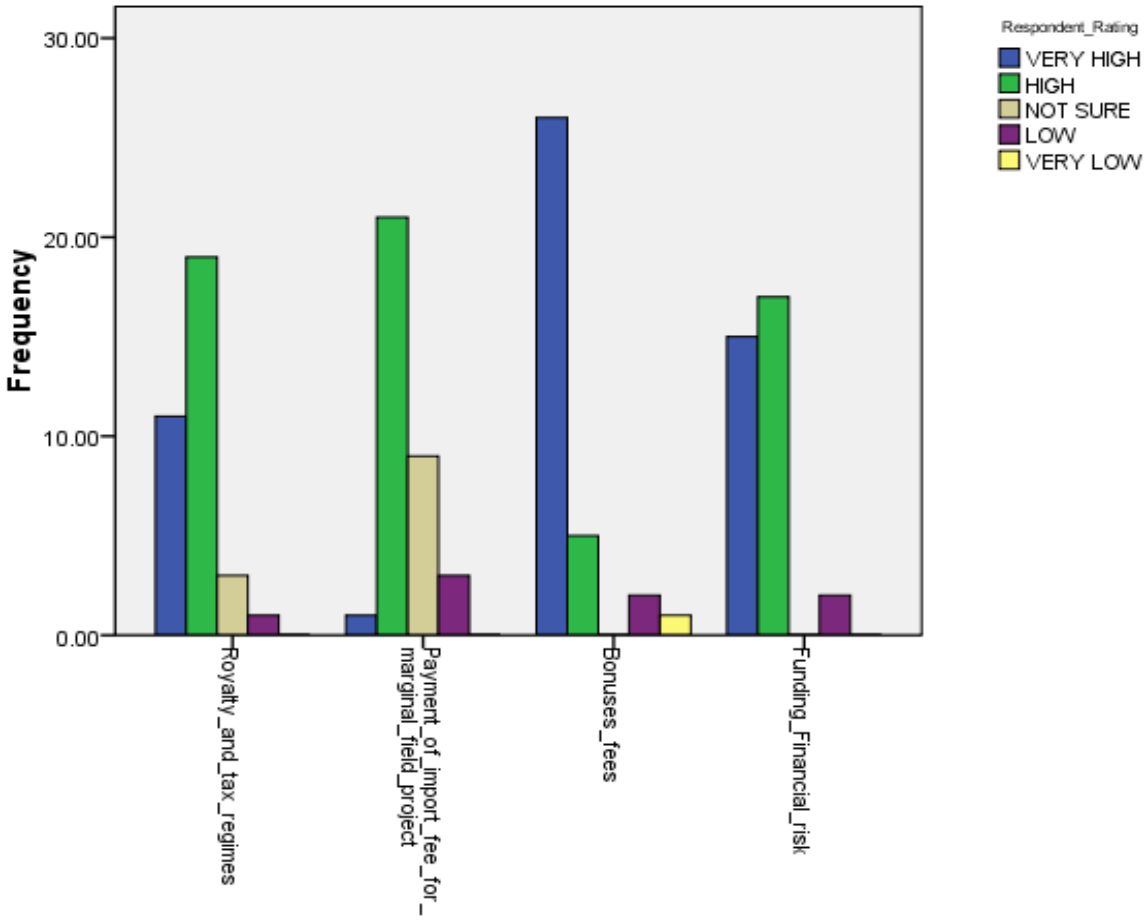

Figure 5. Respondents' responses on the action/occurrence that hinders the profitability of marginal oil field development in Nigeria

The inability of the oil industry to establish national competitive advantage in the global energy scene is one of the hindrances to the development of marginal oil fields. In order to achieve a dominant position in a given market, a firm must develop the core competencies that allow it to produce and deliver goods and services that meet market requirements in a competitively superior manner Porter [10]. In with Grant [5] observation many of these core competencies can only be honed through experience. In short, market pioneers can gain a competitive advantage over slow market entrants by learning from early experiences and adopting better practices.

From Figure 4 it was gathered that Non-diversification of the economy, production quota and inadequate regulatory framework pose a high opinion from respondents on the development of marginal oil fields in Nigeria from respondents. While respondents were not sure whether absence of privatization in the diversification sector aids the development of the marginal oil field. However inconsistency in planning represents a very high impact on what undermine the development of marginal oil fields in Nigeria.

From Figure 5 it was discovered that business fees/charges is major action that contributes to the profitability of marginal oil field development in Nigeria. While others such as royalties and tax regimes, payment of import fee and funding/ financial risk are key occurrence that contribute to the non- profitability of marginal oil field development in Nigeria

The oil and gas industry is highly technical and capital intensive and therefore requires collaboration in terms of fund raising and technical know-how.

Uncertainty is the enemy of planned, rational, and forward looking investment in any industry. Firms make investment decisions based on expectations about cost. This uncertainty has a number of potential implications for firms.

For example, it might cause them to invest in different types of equipment than they might otherwise as noted by Henning et al [6]. High operational cost may make marginal field operators to put-off a decision until the market is more stable. For example the problem of multiple taxations by local, state and federal government is affecting start-up of the asset being developed by marginal field operators in the country.

Fatona [3] posited that multiple taxations have rendered the marginal business unattractive in Nigeria and is a serious threat to the smooth operation of marginal fields as this contributes to the high cost of doing business in Nigeria. Lower profitability, due to high operational cost might force some operators out of business. The end product of high operational cost will be inflationary pressures that continue to challenge the country's business as they struggle to the new economic conditions. The marginal field operator's revenues are likely to be impacted in the face of high cost of operational expenses. They must shift more of their revenues to cover expenses. This action will decrease their profitability, result in job losses, and reduce the competitiveness of their industries. Facing an increasingly unequal playing field, the extreme high cost will only create larger financial burdens.

2.2.3. Policy Considerations

The potential for marginal field include employment opportunities, increase in oil and gas reserve, technology transfer/ diffusion and revenues generation. The sustainable development of marginal oil field is often hampered by social, political and environmental, economic and technical factors. The key factors specifically, social, political and environmental factors are often overlooked. The investment in oil and gas is mainly focused on technical and economic factors, these are beneficial but are insufficient without the local content and social political context that govern that context.

The basic conditions for the development of marginal oil and gas field in all countries is what economics will be favourable to the development of these resource bases and the key success factors that have contributed to the rapid development of marginal field program are:

i. Technology and adequate support infrastructure
ii. Favourable fiscal regime
iii. Low development cost
iv. Oil price
v. Hydrocarbon resource.

The need for the government to create an enabling environment for businesses to thrive cannot be overemphasized. For example the need to provide enabling environment and enthronement of democracy as noted by Ibibia [7]. The Amnesty program of the Federal Government, was designed to minimize the disturbances in host communities of oil and gas operation [8]. A point often taken for granted in any discourse on sustainable management is the establishment of democracy. Law can often flourish under a popular participatory and democratic system, which guarantees an independent judiciary. It is suffices to say that only a congenial political climate can breed the socio-economic environment necessary for formulating and implementing quasi- sustainable policies in petroleum operations and hence marginal field development. Alaneme and Igboanugo [1] highlighted that processing facilities inadequacy could be another area of risk requiring huge investment.

3. Conclusions and Recommendations

Problems of marginal field development are not confined to just one constraint, although the mixture of constraints that marginal field operators face varies from one country to another. Some of the major factors hindering marginal field development in the country are low level of support infrastructure, funding constraints, high operational and capital expenditure, insufficient policy, and institutional framework.

There are several gains to be made in the development of marginal oil fields. Some of the potential benefits include: employment opportunities, revenue generation, and technology transfer, increase oil and gas reserves in the country. However these benefits, alone, will not give the operators enough incentive to develop marginal oil fields. Government support for marginal field development should be based on the beneficial impact and profitability to the investors. Profitability is one of the sustainability indicators to marginal oil fields development.

3.1. Recommendations

For marginal field development is recommended that the attention should be focused on the following:

3.1.1. Short Term

• Local organization competence/ world class management

Marginal field developers can turn marginal fields into financial success through the development of solid competence. The indigenous companies should put in place a world class management team that would be capable of translating the asset of the organization to a bankable value. For example with relative small asset, Afren PLC could raise $500 million with ease that many indigenous giant with far greater assets would not raise even $ 100 million. This is attributed to Afren great potential to attract international capital to its world class management team.

• Develop strategy for peace/ security by Increasing the dissemination and exchange of information between marginal field operators and host communities:

Government should develop a strategy for the promotion of peace as the foundation for development of the oil producing regions, making local governance effective and responsive to the needs of the people, promotion of social inclusion and improvement in access to social amenities, promotion of environmental sustainability to preserve sustainable livelihoods for host communities, and mobilisation of the people for sustainable development in the Niger Delta. This would involve performing sustainable social corporate responsibility and stakeholder engagement. Such measures would improve the dissemination of information and keep communities informed and up-to-date.

3.1.2. Medium Term

• Revision of Policy

Another obstacle to the development of marginal oil field is the fiscal and regulatory framework. It is recommended that due to the significant role that marginal field development will play by way of providing employment opportunities and increasing revenue generation in the country. The government could take steps, in reforming the marginal field fiscal and regulatory frame work to attract investment in the area. Overcoming unfavourable economic condition through effective policy and efficient policy measure is vital to the success of marginal oil fields, for example high interest rate and exchange rate by the banking sector impede the development of marginal field development.

• Creation of conducive investment climate and right pricing of gas market

This can be done by providing enabling environment to the development of marginal oil fields, by investing in oil and gas infrastructure. Also on the development of the gas market, the emphasis is right pricing of gas. If the gas sector does not answer the question satisfactorily, it compromises its sustainability. Pricing is a sensitive issue but there are key principles that make a framework for gas pricing in marginal field legitimate and acceptable. First pricing must focus on recovering prudent cost. Producers of gas from marginal fields should be able to freely price their output and choose buyers under a proposed policy to ensure the development of the gas market.

Marginal field operators should aims to further develop and lead the natural gas and electricity market in Nigeria on an integrated basis, enhanced integrated operations improve profitability. Frontier Oil Limited emerged as the first indigenous operator to develop a non-associated gas field and project in sub-Saharan Africa by supplying natural gas to Calabar cement industry and also supplying natural gas to Ibom power plant for power generation and Platform petroleum has demonstrated the monetization of natural gas in development of its marginal oil field the Asuokpu/Umutu field which lie in the Northern Delta Depobelt, in Shell's OML 38.

3.1.3. Financing

The findings of the study suggest that funding is a very significant factor facing marginal field operators in Nigeria. The concept of reserves-based lending accepts 'oil in the ground' as collaterals and more of the local banks in Nigeria should be willing to embrace this concept for their lending decisions in regard to marginal fields' development. Reserved based lending can work together for the indigenous companies. The idea is that for contiguous fields and reserves that are not of commercial quantities, they can be brought together as portfolio. So what this implies is that if you have multiple field operators even if one fails, the others can be relied on. Therefore in a way, RBL is seen to thrive on portfolio and not necessarily on one field" RBL has a place in the finance of operations in the industry. It can be used as a veritable tool for maximizing production in Nigeria in the immediate and distant future."

Infrastructure Development (Pipeline connectivity, storage and processing facilities)

Another important reason for the inability to develop marginal oil fields is the inadequate infrastructure. The refinery capacity of the country should be increased. Limited capacity of the refinery has led to frequent shortages. There should be new investments in the refinery capacity, either through expansions at existing sites or through construction of new facilities. Additional storage will help insulate investors from economic effects of volatile prices and from temporary supply disruptions.

An efficient network of oil and gas infrastructure is crucial to the success of marginal field development in order words the development of common infrastructure for example pipeline, terminals export and refineries. A somewhat simplistic and often neglected measure is the construction of oil and gas depots. This could act as a price stabilisation measure during oil glut, avoiding waste and retaining excess for future use, Apart from the fact that conserved petroleum can be very handy during national emergencies; it has the additional potential of sustaining rather marginal wells, which could have been abandoned during period of low oil price. Essentially, the object is economic and is advantageous to both marginal field operators and government. The temporary storage plinth, export tankers, shuttle tankers and low cost sub-sea tie back well are among the storage and export options to carter for the different requirement of marginal fields.

3.1.4. Long Term

Increase coordination between the IOC, NNPC and DPR

The petroleum ministry should petition the IOC and NNPC to fulfill their obligation to turn over geo data to DPR. Increased coordination and the formation of networks between the stakeholders will benefit all parts.

This will help ensure that critical resources—human, technical, and financial—are in place to facilitate a project's success. Such coordination can be increased through improved outreach efforts, planning meetings, educational forums, and more frequent .communication between all the stakeholders. In order to meet this goal and level of coordination, it would require an increase in staff and financial resources from the state.

Develop comprehensive statewide energy plan and policy.

Without a clearly defined statewide energy policy and plan there is no explicit pathway to, not to mention to guide all energy planning and development statewide. A statewide energy policy would provide set goals and guidance on the direction the state should move regarding energy infrastructure. The statewide energy plan would more clearly pave the way for how to meet these goals, including providing financial and training plans and programs to expand local capacities to develop and maintain oil and gas infrastructure.

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