

PROJECT PERFORMANCE AND CRITICAL SUCCESS FACTORS IN NIGERIAN UPSTREAM OIL AND GAS INDUSTRY: EVIDENCE BASED ON SEM APPROACH.

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Abstract

The study is on the effect of critical success factors on project performance in Nigerian upstream oil and gas industry, Primary employed data on the set of latent/construct variables identified, the raw information is therefore processed by the researcher to obtain coefficients for each of the constructs. The result of the estimated cost maintains a positive and significant relationship with project performance. Further result shows that quality control also has a positive and significant impact on the project performance in the Nigerian upstream oil and gas industry. Based on the empirical findings of the study, it is recommended that the management of the Nigerian upstream oil and gas industry should initiate effective planning process with periodic assessment to ensure that projects are executed within a record time, and in estimating the costs of projects, inflation and exchange rate factors should be incorporated. The study also recommends the developing a framework for the effective management of CSFs in the industry. This framework should include guidelines for identifying, tracking, and monitoring the CSFs throughout the project lifecycle, establishing a culture of accountability among project teams, where individuals are responsible for ensuring that the CSFs are met, and that any issues or challenges that arise are addressed promptly.

Keywords: Critical Success Factors, Project performance, Upstream Oil and Gas Industry.

1.0 INTRODUCTION

The Nigerian upstream oil and gas industry is a key sector of the Nigerian economy, accounting for a significant portion of the country's revenue. The industry's activities involved exploration, development, and production of crude oil and natural gas resources in the country (Uchenna, Chinedu and Musa, 2020). In recent years, there have been concerns about the performance of projects in the Nigerian upstream oil and gas industry, with many projects experienced delays leading to a significant loss of revenue for both the government and the private sector, one factor that has been identified as critical to the success of projects in the Nigerian upstream oil and gas industry is the identification and management of the effect critical success factors (CSFs) (Nazeem and Berenger, 2019). CSFs are those factors that are essential to the success of a project, and their effective management can significantly improve project performance. The identification and management of CSFs are particularly important in the Nigerian upstream oil and gas industry, given the complex nature of projects in this sector; these projects often involve large investments, long timelines, and significant risks, making effective management of CSFs crucial for project success (Uchenna, et al. 2020). Despite the contribution of the Nigerian upstream oil and gas industry to the nation's economy, the industry has experienced several challenges that have led to low project performance, such as cost overruns, schedule delays, and inadequate project outcomes. One of the reasons for these challenges is the inadequate identification and management of critical success factors. CSFs are essential elements that must be present for a project to succeed. They are specific to the industry and the project, and their absence can lead to project failure (Nolan & Garavan 2016). In another development, Poveda-Bautista et al. (2018) revealed that, the rapid growth in technology and improper delivery of the construction projects in the oil and gas sector in Nigeria has created a lot of interest to understanding the effect of critical success factors on project performance in the oil and gas sector. Some of the factors that affect the success of project in the oil and gas sector in the country can be traced to lack of use of a defined project management method, mismanagement, disconnection of policy formulation and policy implementation, improper regulation, political



diversity, design risk factors such as cost overrun, project time delay, quality defects and lot more. These factors and lot more have affected the performance of projects in the oil and gas sector (Poveda-Bautista et al. 2018). While Santos et al. (2019) has shown that variable with more effect on project success is top management supports, they believed that in order to address some specific complexities in project success the managers must acquire some specific competence development skills. Also, effective consultation with stakeholders influences the performance a project at each phase of the project life cycle. Thus there is need for adequate and regular consultation with clients and other stakeholders of the project (Santos et al. 2019).

Team capacity is necessary to the success of a project considering that the project manager and the project team are ultimately responsible for the success and quality of projects, it stands to reason that competent personnel would be recruited and trained regularly (Ziadat, 2019). Training related to creativity, team building, documentation skills and problem solving had a positive impact on the overall project performance. Training for individuals or managers to understand their roles or new roles for performing knowledge oriented tasks might be needed. It is equally important for them to equip themselves with the skills to foster creativity, innovation, and knowledge sharing, all will enhance the performance of a project. Managers can also be trained in areas such as business development, strategic management and in ICT. Ziadat (2019) further explained that effective monitoring and control as a direct function with performance. He also stated that facts about the project should be obtained and detailed data investigation should be carried out. Once weaknesses in the project plan are noticed, then necessary and preventative actions are certified to carry the project back into a pattern with the project plan. Time to time monitoring and control is useful in preventing incidents and in providing feedback. Furthermore, risk management in performance of a project is also important so as to meet up with the objectives of the project then minimizing or circumventing cost delays and overruns. However, the success of the project is premised on the plan and design of the project (Kassem, Khoiri and Hamzah, 2020).

The Nigerian upstream oil and gas industry has unique CSFs that must be identified and managed adequately for projects to be successful. However, there are limited investigations on the effect of CSFs on project performance in this industry. Therefore, this study is aimed to investigate the effect of critical success factors on project performance in the Nigerian upstream oil and gas industry, and also to identify the unique CSFs for the industry and explore how their effective management can enhance project performance. The study also seeks to identify the challenges that impede the identification and management of CSFs in the industry and suggest practical solutions to overcome them.

2.0 EMPIRICAL LITERATURE REVIEW

Ajibike, Adeleke, Muuka, Bamgbade, Darun, and Moshood (2022) investigate the impact of internal risk factors which include material, finance, management and design risk factors and the support of the government on the performance of oil and gas projects. The study used Structural Equation Modelling (SEM) method to analyze the data collected from employees of oil and gas firms within Peninsular Malaysia. About sixty-one employees were served the questionnaire to answer. The findings of this study showed that all the independent variables namely; management risk, design risk, material risk and financial risk factors and support of government have significant influence on project success. Consequently, it is also expected that project managers or the management team should be ahead of the triple constraint's essential qualities, which raise the possibility of project success. In addition, project managers should pay attention to any changes to the critical features, if it is unexpected or expected. While, Nasira, Mohd Nawib and Radzuan (2016) examined the relationship between time management in construction industry and project management performance in Malaysia. The results revealed that knowledge, commitment, cooperation are the main criteria in managing the project into a smooth process during project execution until the project is completed. The study also established that, in order to achieve good time performance these essential criteria are mostly required.



Jaafar and Behrang (2019) analyzed the relationship between critical project success factors and success criteria in construction projects in the United Arab Emirates construction market. The study used eight criteria to appraise the contribution and influence to the actual performance of the construction project. The researchers identified about thirty-three indicators from existing literatures and divided them into five unique factors and Partial Least Squares (PLS) estimation technique was adopted to test the casual links between the variables. The outcomes of the study showed that human related factors have the highest influence on the success criteria of construction projects in the United Arab Emirates (UAE). Furthermore, Nazeem and Berenger (2019) conducted a study on the extent to which Risk Identification leads to Project Performance of Small and Medium Contractors in Gauteng, South Africa. The population of the study included top management of SMEs (mostly owners, owner-managers, managers and project managers) these forms the total respondents for the study and they were selected from the Construction Industry Development Board (CIDB) register of contractors. The study used primary data that were collected through the use of questionnaire. Multiple regression analysis was conducted to establish the influence of project risk identification on project performance. The findings established that project risk identification has a positive and significant influence on project performance.

Vrchota, Rehoř, Maříková and Pech (2021) investigated the effect of critical success factors of the project management as it relate to industry sustainability in Czech Republic. Primary data were sourced through the aid of questionnaires; the correlation coefficients were used to examine the potential interconnectivity of the critical success factors. After this, the study compare these figures using the Mann-Whitney test with new corporate management trends. The study found out that in project management success, the firms often take flexibility, leadership, employees and experiences as the chief success factors. The finances that decide the implementation of projects is considered the optimal critical factor for the sustainability of projects concentrated on industry 4.0. The study also discovered that in the future the development of a method for appraising Industry 4.0 projects' success with reference to sustainability might be focused on critical success factors. Kassem, Khoiry and Hamzah (2020) investigate the effect of external risk factors on the success of oil and gas construction project. The study used Structural Equation Modeling and PLS-SEM approach. The data for the study was collected through a structured survey method, the respondents for this study were projects teams in the oil and gas sectors in Yemeni companies who are involved in mega construction projects. The authors used a hierarchical model for assessing causative external risk factors and their effects on project success was developed and examined by adopting the Smart PLS 3 software of SEM statistical package. The study found out that economic, political, force majeure and security-related risk factors had a strong impact on project success. The result of the R-Square is approximately 74 percent; this means that the explanatory variables were able to explain the variation of the dependent variable about 74 percent.

Muhammad, et al. (2017) studied control factors and measures in the oil and gas industries to reduce workplace risks and hazards in drilling processes. The study uses data from randomly selected health and safety experts and drilling crews of major offshore and offshore oil and gas industries in Malaysia, Saudi Arabia and Pakistan. Findings of the study showed that the implementation of proposed theoretical work to establish major control factors for the prevention of accidents and the efficacy of the proposed expert framework for drilling process safety training activities. In another development, Wahid (2020) examined the effects of competence, competitiveness and innovation on project success in construction companies in Indonesia. Class B construction companies with total population of 102 construction companies were used for this study. The study adopted Partial Least Squares Structural Equation Model (PLSSEM) to analyze the formulated hypotheses of the study. The study revealed that competence consistently has a significant impact on project success. It was also discovered that competence, competitiveness and innovation have about 80.2% influences on project success. However, the study showed that competence has about 57% influences on project success, meaning only competence has a greater impact on project success.

Molwus, Erodogen and Ogunlana (2017), used Structural Equation Modelling (SEM) to investigate the relationships among critical success factors (CSFs) for stakeholder management and project success



in construction. Data were collected from construction industry practitioners through questionnaire method of data collection. About sixteen critical success factors as indicators of four latent variables (stakeholder engagement/empowerment; stakeholder characteristics and project characteristics; stakeholder dynamics; and stakeholder analysis) were used. AMOS statistical package was used to analyze the collected data. The finding of the study revealed that stakeholder engagement/empowerment is the only variable that has positive influence on project success. Moreover, An Assessment in the Automotive Industry, conducted by Santos et al. (2019), the study carried out quantitative survey on a sample of 72 companies and the data was analyzed through confirmatory factor analysis. Result of the study indicated that variables that most influences project success are organizational culture and top management supports. The results also infer that culture of flexibility and climate that support innovations tend to influence project performance.

Ahbab, Daneshvar and Çelik, (2019) investigated the cost and time management efficiency assessment for large road projects using data envelopment analysis. This study was conducted based on projects implemented in Asia region, this included large road projects that had poor cost and time management. Data Envelopment Analysis (DEA, DEA is a non-parametric modern mathematical tool for measuring relative managerial performance and determining efficient DMUs) was employed to configured the projects selected as Decision Making Units). The results of study research revealed that inaccurate initial project scope, change or increase in the scope of the project; design changes and additional works were the four popular critical causes that have strong impact on both cost and time management efficiency. Unegbu, Yawas and Dan-asabe (2020) investigate the relationship between project performance measures and project management practices of construction projects for the construction industry in Nigeria. The study adopted a survey research design; questionnaires were structured primarily to collect data. The data were collected on fifty-three project management practices and nineteen project management performance measures on a five point Likert scale. The sample of the study was about two hundred and twenty-one respondents which comprise of contractors, clients and consultants from ten construction companies. Statistical Package for Social Sciences (SPSS 25) was employed to test for Crombach's alpha, the average variance extracted and composite reliability tests. Structural equation model (SEM) was also employed to test the hypotheses of the study. It was found out from the study that Time management directly influences project success and project performance. Cost management is also directly influences project success and project performance. Scope management directly influences customers' satisfaction and project performance.

Jaafar, Vinesh, and Behrang (2017) evaluated the critical success factors that contribute to the delay of water infrastructure construction projects in the Abu Dhabi Emirate. Conceptual model was developed for this study. Six variables for project critical success was identified (Project Manager Competency (PMC), Project Team Members' Competency (PTC), Project Organizational Commitment (POC), Project Organizational Planning (POP), Project Resources' Utilization (PRU) and Project Management Process (PMP)). The study found out that all these variables have influence on infrastructure construction projects. In another investigation conducted by Jitpaiboon, Smith and Gu (2019) on the critical success factors affecting project performance: an analysis of tools, practices, and managerial support, the study examined the influence of three success factors (project management tools, project management best practices and managerial support on the performance of project, individuals and teams). The study carried a survey on one hundred and twenty-one (121) business students that have team project experience. Their study adopted the exploratory factor analysis to verify if three success factors respond more to team performance and project performance compare to individual team members' performance. The result revealed that during project implementation, project management best practices, project management tools and support are important to project success. The result also discovered that when team members relate with one another harmoniously, this will lead to extrinsic motivation within project teams and enhance team performance and project performance.

Nandjebo, Akande, and Olutuase, (2021) carried out an investigation on the effect of project cost management on project management performance. Their study was centered on Namibian MRCs.



They applied structural equation modelling (SEM) to analyze government projects. The model adopted in the study was the project management model and it was used to illustrate how quality performance of a project and project time can be enhanced by consecrating on the element of cost management that is essential. Therefore, the study used eighty-one respondents which were management officers in selected Namibian Ministries and Regional Councils (MRCs). The study findings revealed that the cost analyses of previous projects and financial management implementations are critical components of project cost management that could significantly improve the time and quality performance of public sector projects in Namibia. In the same vein, Adeleke, Ajibike, Muuka, Darun and Moshood (2020) conducted a study on the managing external risk factors on oil and gas project success: a dream for all firms. The study focus on the oil and gas sectors in Malaysian, project success served as the explained variable and the explanatory variables were economic risk, political risk, social risk, and environmental risk factors in addition to government support. The study adopted a primary data by collecting data from sixty-one respondents from the oil and gas sector. The method adopted by the study was structural equation modeling (SEM). The result revealed that economic risk, political risk, social risk and environmental risk factors are significantly related to project success. By implication means that, external risk factors have significant effect on oil and gas project success. However, government support has no significant moderating effect on the impact of economic, political, social, and environmental risk factors on project success.

Ishtiaq and Jahanzaib (2017) conducted a study on impact of project complexity and environmental factors on Project Success. The study was centered on the oil and gas sector in Pakistan. The study employed structural equation modeling (SEM) for analyzing the data. The results revealed that project complexity and project success are negatively related. However, better control over environmental factors increases the rate of project success. Similarly, Uchenna, Chinedu and Musa, (2020) examined the organizational factors influencing management of project complexities in the Nigerian Upstream Oil and Gas Operations. The study used a descriptive and quantitative survey research design with purposive sampling technique targeted about six key upstream companies and sixty-four experienced professional respondents. The study used questionnaire as the source of collecting the required data for the study using Likert five-point scale. The data collected were analyzed using Relative Importance and Severity Indexes (RII and RSI), together with, multiple regression and correlation analysis for hypothesis testing and in establishing the combined relationship that exist between organizational factors and successful management of project complexities in the Nigerian upstream oil and gas operations. The outcome of RII revealed that project complexities are mostly affected by uncertainty. While RSI result showed that the severest type, causes and incremental factor of project complexities are technological, interrelationship/interconnections and environment respectively. Furthermore, the results from the test of the formulated hypotheses of the study revealed that the variables that have more impact on successful management of project complexities in the Nigerian upstream oil and gas operations are information and communication technology (ICT) knowledge, training, resource allocation and top management support.

Denni-Fiberesima and Abdul-Rani (2020) examined the relationship of critical success factors and profit portfolio in the oil and gas industry in Nigeria. The study formed about 13 critical success factors, delivery schedule, budget regarding the project and strategy of portfolio management. These construct variables were represented with some set of questions and were regressed against the dependent variables project success. Two hundred respondents from ten oil and gas firms in Nigeria answered the question structured by the study. The result shows that precise proficiency and expertise are needed for almost all the critical success factors examined in the work. The study also showed that there are needs for advancement in technology and ability to interact with the external environment. The findings further revealed that there is a direct relationship between strategic project portfolio and the critical success factors. This relationship was also found to be significant. It was found out that the whole 13 critical success factors used in the study were seem to be of paramount important in the deep-water oil and gas management of portfolios of project. In the empirical work of Oruwari and Adewale (2017) the critical success factors for marginal oil field



development in Nigeria was evaluated using primary data. The study specifically analyzed the critical success factors for marginal oil field development in the Niger Delta region. Data used for this study were sourced from the experts in oil and gas and government agencies. These data were collected through the use of open ended questions and through document analysis. The study found that the success factors for marginal oil field development were partnership and joint ventures, sharing of infrastructure, implementing corporate social responsibility (this is done by allowing indigenous fields operation in the region) and teamwork. The study also identified that there were some technical issues associated with marginal field development.

Menhat and Yusuf (2018) conducted an exploratory study on the determinants that affect the type of performance measures to be taken by the oil and gas supply chain practitioner. The study conducted five comprehensive interviews with professionals in supply chain in the industry. These respondents were those involve on the upstream sector. The study found out eight determinants affecting performance measures. Primarily, all the participants stated that local contents requirement is the major factor to achieve supply chain performance. Lastly, Kassem, Khoiry and Hamzah (2019) conducted research to identify and evaluate the significant risk factors contributing to cost and time overrun in oil and gas construction project in Yemen. The study identifies the primary risks which affect the success of construction projects. Relative important index method (RII) Method and Spearman's rank correlation were adopted. The result of the study further discovered that external risk factors are the most significant in the oil sector construction projects in Yemen and project management risk factors are the most effective among the internal risk factors.

3.0 THEORETICAL FRAMEWORK

Diamond Framework Model of Project Management Theory by Shehar and Dvir

Shenhar and Dvir (2007) presented an approach for successful management of projects by introducing the Diamond Framework Model, an approach consisting of four-dimensional aspects: novelty, technology, complexity, and pace. The model was developed to provide a tool for analyzing the expected benefits and risks of a project by a set of rules and behaviors for each project type. The Diamond Framework uses four bases to analyze projects. If we place these four bases on a four-axis graph, we can get the Diamond Framework. If each factor is in the moderate range, the graph will be shaped like a perfect diamond. The purpose of the graph is to figure out the structure of the project compared with the present capabilities you have on hand to execute the project. The differences between the two will show the gaps that have to be filled to make the project a real success. Project managers can use the diamond framework model when making decisions regarding the selection of the right projects and their managers, allocating resources, planning, assessing risk selecting the project management style, selecting the project's structure, building processes, and choosing tools

4.0 METHODOLOGY

The study will be analyzed base on descriptive statistics and also multiple linear regression models to establish the relationship between stakeholder engagement and organizational performance. Simple percentages method of data analysis will be used for the descriptive statistics base on the respondent bio-data and issues rise in the questionnaire. The analysis will be presented in tabular form for easy understanding which consist the number of respondents and the corresponding percentage using the stated formula below.

$$\frac{\text{Number of Respondent}}{\text{Total Number of Questionnaire}} \times \frac{100}{1}$$

The other method of data analysis known; as the multiple linear regression models will be estimated using ordinary least squares (OLS) technique. The rationale for using OLS method is based on the fact that its estimates possess the desirable BLUE properties. The OLS estimation will be carried out using econometric views (E-Views) 10 software package.



Descriptive statistics are central tendencies and summaries from a set of data. These central tendencies are mean, median, standard deviation, maximum, minimum, skewness and coefficients of variations. Descriptive statistics is an important first step for conducting statistical analyses because it gives an idea of the data distribution, helps detect outliers and identify associations among variables. It is also used to describe basic features of the data in a study. They form the basis of every quantitative analysis. The data from the proposed questionnaires will be converted as quantitative and analyzed using descriptive statistics.

Multiple linear regressions on the other hand are a statistical technique that uses two or more independent variables to predict the outcome of a dependent variable. It is a statistical technique that can be used to analyze the relationship between a single dependent variable proxy and several independent variable proxies. The objective of the analysis is to use the independent variable proxies whose values are known to predict the value of the single dependent value. This technique is suitable for this research as the research questions of this study involves the effect of four independent variable proxies on one dependent variable proxy.

5.0 MODEL SPECIFICATIONS

The study utilized multiple regression models as adopted from the work of Nkobe, et al. (2015) in the study effects of stakeholder engagement and organizational performance: A Case of Kenya Power and Lighting Company, Eldoret Branch, Uasin-Gishu County Kenya. The model for their study is captured as follows;

$$FPF = f(EMI, PMS, EMD, PCM, CRE, CRM) \dots \dots \dots (0.1)$$

Where;

- FPF= Firm Performance
- EMI= Employee Investment
- PMS= Performance Management Systems
- EMD= Employee Participation Decision
- PCM= Product Customization
- CRE= Customer Recognition
- CRM= Customer Relationship Management.

However, equation 0.1 above is adopted and modified to suit this research work, to have the following functional equation:

$$PFM = f(STP, STC, STM, STF) \dots \dots \dots (0.2)$$

However, the linear equation of the model in 0.2 is specifying as follows;

$$PPF = B_0 + B_1TIM_{t-1} + B_2CSO_{t-2} + B_3QDE_{t-3} + B_4TMA_{t-5} + \varepsilon_t \dots \dots \dots (0.3)$$

Where;

- PPF= Project Performance
- TIM= Time management
- CSO= Cost optimization
- QDE= Quality of delivery
- TMA= Top management action
- B₀ - B₄= Coefficients
- ε_t= Error Term

6.0 DATA TYPES AND SOURCES

The study employs primary data on the set of latent/construct variables identified in this study. These are project performance, top management action and satisfaction, time schedule, estimated cost, quality control, environment, health and safety, use of resources and scope & specification Structured questionnaire that reflects the basic characteristics of these variables is administered to the respondents who are typically employees of the selected oil and gas local industry. The raw information is therefore processed by the researcher to obtain coefficients for each of the constructs.

Population of the Study



The study is conducted within the domain of the oil and gas sector of Nigeria with a spread of companies majorly in four states of the countries, Warry, Port Harcourt, Abuja and Lagos. The target population is the upstream industry, where project developments of different types are concentrated. However, we only focus on the local companies in the upstream, excluding the international ones from this population, because our desire is to explain project performance in the domestic country. To be precise, 30 companies are involved with their teeming population size for employees and employers.

Sample of the Study

The target population of this study covers the Nigeria Upstream Oil and Gas Industry by considering the following companies: Nigeria Upstream Petroleum Regulatory Commission (NUPRC), National Petroleum Investment Management Services (NAPIMS), Shell Petroleum Development Company (SPDC) and Total Energies for a sample of data/information on the indicators of critical success factors and project performance. Thus, the sample size comprises the employees and employers of these companies, who are the accessible respondents for the study. The estimated number of these respondents is approximately 1000 members from rank/file to managerial level. Out of this number, samples of 300 respondents are employed. Therefore, to reduce human error to beeriest minimum, we limit the study to a sample of 300 respondents.

7.0 ESTIMATION PROCEDURE

Construct Equations/Structural Equations

In the spirit of Wyngaard, Pretorius and Pretorius (2012), with modification, the econometric model that captures the conceptual framework of the study is defined as follows.

$$pp_i = \alpha_0 + \alpha_1 ts_i + \alpha_2 ec_i + \alpha_3 qc_i + w_{i1} \tag{1}$$

Measurement Equations

$$pp_i = \sum_{i=1}^n ppinstrm_i + e_{i1} \tag{2}$$

$$ts_i = \sum_{i=1}^n tsinstrm_i + e_{i3} \tag{3}$$

$$ec_i = \sum_{i=1}^n ecinstrm_i + e_{i4} \tag{4}$$

$$qc_i = \sum_{i=1}^n qcinstrm_i + e_{i5} \tag{5}$$

Definition of Variables

pp-project performance, ts-time schedule, ec-estimated cost, qc-quality control, ppinstrm-instrument relating to project performance, tsinstrm- instrument relating to time schedule, ecinstrm-instrument relating to estimated cost, qcinstrm- instrument relating to quality control, and n is the number of instruments in each case.

Validity

Howell et al (2005) illustrate that validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. Moreover, measurement validity is mainly concerned with the assessment of the scales to make sure that the scales measures what it is supposed to measure. Based on that, Haron (2002) argues that validity is the degree to which the measure captures the construct it was designed to measure and indicates whether the research instrument is used accurately to measure what it is supposed to measure or not.

Reliability Test

According to Nunnally (1978), the estimation of reliability is based on the average correlation between items within a dimension which is concerned with internal consistency. The statistical technique used in determining the reliability based on this internal consistency is called Coefficient Alpha and known among researchers as Cronbach alpha. Cronbach's alpha is a coefficient of reliability (or consistency) first named as alpha by the American educational psychologist Lee J. Cronbach (1916- 2001) (Kupermintz, 2003), Cronbach alpha technique is based on the calculation of the mean reliability coefficient for all possible ways of splitting a set of items into two halves (Haron, 2002).

8.0 RESULTS AND DISCUSSIONS

The results of the study are classified to three, namely pre-estimation, estimation and post-estimation results respectively. The pre-estimation results are based on validity and reliability tests, estimation results focus on the test of the hypotheses of the study and they are extracted from the SEM estimation outputs, lastly the post-estimation results are on the fitness and explanatory power of the SEM specification adopted in this study.

Validity Test Results

Validity refers to whether instruments measure or capture the underlying construct variable perfectly. We conducted content validity test based on factor loading. Table 1 presents the results of the validity test.

Table 1 Validity Test Results

Instrument	Initial	Extraction
PP1	1	0.59
PP2	1	0.50
PP3	1	0.59
PP4	1	0.64
TS1	1	0.60
TS2	1	0.66
TS3	1	0.41
EC1	1	0.69
EC2	1	0.67
EC3	1	0.054
QC1	1	0.75
QC2	1	0.544
QC3	1	0.51

Note that the acronyms or abbreviations are defined in the model specification section

About thirteen (13) instruments or manifest variables are proposed for the study. No of these instruments has loading score/coefficient that is less than 50 percent except TS3. This means that all the instruments are well loaded, and measure their respective construct variables well, except TS3. This instrument is not valid since it does not significantly measure the underlying construct variable (TS).

Reliability Test

The researcher conducts reliability test for each set of instruments. Reliability test is a test that reveals whether a set of indicators are consistent internally. Consistency means no change at all time. The Cronbach's Alpha is used for this purpose, and the coefficients of the Alpha are reported in table 2.

Table 2 Reliability Test Results

Construct	Acronym	Cronbach Alpha	No of Instruments
Project Performance	PP	0.76	4
Time Schedule	TS	0.62	2



Estimated Cost	EC	0.57	2
Quality Control	QC	0.70	3

Apparently, there are four construct variables for this study, which are project performance, time schedule, estimated cost and quality control. Two of these construct variables have Cronbach’s value equal or greater than 70 percent. This implies that the instruments of these variables are internally consistent. All other construct variables have Cronbach’s Alphas that are approximately close to 70 percent, and as such we consider the test appropriate for the study.

Estimated Result and Test of Hypothesis

In this study, the researcher employs three competitive estimation methods, MLE, GLS and Asymptotically Distributed Free Estimate (ADFE), to test the hypothesis that project performance is influenced significantly by critical success factors. The ADFE is used as the benchmark technique, while the MLE and GLS are used as robustness checks. The results of the ADFE method are presented in table 3.

Table 3 ADFE Results

	Estimate	S.E	C.R.	P-Value
PP <---TS	-0.13	0.08	-1.70	0.09
PP <---EC	0.43	0.15	2.80	0.00
PP <---QC	0.24	0.11	2.16	0.03
X ² /DF	6.23			
RMSEA	0.12			
RMR	0.12			
GFI	0.90			

Note that the dependent variables are PP (Project Performance), while predictors are TS (Time Schedule), EC (Estimated Cost) and QC (Quality Control)

The ADFE results provide evidence that time schedule has a weak negative influence on project performance. Since the relationship is significant at 10 percent, we deduce that there is 90 percent confidence that the performance of a project in the Nigerian Upstream Oil and Gas Industry declines with increase in the schedule of time. The result shows that a longer time schedule is detrimental to project performance in this Industry. Estimated cost maintains a positive and significant relationship with project performance. The result of the study corresponds with result of work conducted by Mukerjee and Prasad in (2017). These results suggest that performance of a projects increases with a rise in cost. A very low cost estimate leads to “White Elephant Project” particularly in the face of inflation. Most of the projects abandoned or neglected in the Nigerian Upstream Oil and Gas Industry has direct link with estimated costs that their monetary value has been eroded by inflation due to long executing time. Quality control as a critical success factor has a positive impact on project performance. Meaning that performance of project increase with a rise in the quality control, a poor quality control reduces the performance of projects. Thus, there is evidence that the lackadaisical attitude of project operators in the Nigerian Upstream Oil and Gas Industry spurred poor quality control and consequently poor project performance. We observed a good fit of the model with GFI statistic.

Robustness Checks

We conduct robustness checks using MLE and GLS methods due to potential endogeneity problem. The results are reported in tables 4 and 5 respectively.

Table 4 MLE Results

	Estimate	S.E	C.R.	P-Value
PP <---TS	-0.07	0.10	-0.66	0.51
PP <---EC	0.07	0.16	0.45	0.65
PP <---QC	0.61	0.11	5.23	0.00
X ² /DF	7.09			
RMSEA	0.13			



RMR	0.07
GFI	0.90

Note that the dependent variables are PP (Project Performance), while predictors are TS (Time Schedule), EC (Estimated Cost) and QC (Quality Control)

The MLE result confirms the negative relationship between project performance and time schedule. However, the relationship appears insignificant and weaker. Both estimated cost and quality control still have positive impact on project performance; but the results show that quality control is the most sensitive variable to project performance; this result supported the study conducted by Ziadat in (2019). To the contrary, ADFE affirms that estimated cost is the most sensitive factor. Based on the statistics of the GFI and RMR, the model has good fit.

Table 5 GLS Results

	Estimate	S.E	C.R.	P-Value
PP <---TS	-0.13	0.12	-1.10	0.27
PP <---EC	0.33	0.19	1.74	0.08
PP <---QC	0.70	0.18	3.97	0.00
X ² /DF	5.0			
RMSEA	0.11			
RMR	0.11			
GFI	0.90			

Note that the dependent variables are PP (Project Performance), while predictors are TS (Time Schedule), EC (Estimated Cost) and QC (Quality Control)

There is strong evidence that time schedule maintains inverse relationship with project performance, and that quality control is the most sensitive factor to project performance in the Nigerian Upstream Oil and Gas Industry. The model has good fit based on the statistics of the chi-square-degree of freedom ratio and GFI. In view of these findings, the following conclusions and recommendations are made.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The estimation methods applied to the study provide overwhelming, and unanimous evidence to claim that a long time schedule reduces project performance. This claim is in tandem with the result of the study conducted by Mukerjee and Prasad (2017). Furthermore, the study concludes that estimated cost and quality control have positive impact on project performance. This finding is also partly in consonant with the study conducted by Ziadat (2019), who revealed that effective control and monitoring have a direct link with project performance.

The study recommends that the management of the Nigerian Upstream Oil and Gas Industry should initiate effective planning process with periodic assessment to ensure that projects are executed within a record time. Also, in estimating the costs of projects, inflation and exchange rate factors should be incorporated. The costs of projects that will take longer periods to accomplish should be higher than those with shorter periods.

The study further recommends developing a framework for the effective management of CSFs in the industry. This framework should include guidelines for identifying, tracking, and monitoring the CSFs throughout the project lifecycle, Establish a culture of accountability among project teams, where individuals are responsible for ensuring that the CSFs are met, and that any issues or challenges that arise are addressed promptly, Provide adequate training and resources to project teams to ensure that they have the skills and knowledge necessary to manage the CSFs effectively.

Establishment of clear communication channels between project teams, stakeholders, and management to ensure that everyone is aware of the CSFs and their importance in project success and lastly, regularly review and update the CSFs to ensure that they remain relevant and aligned with industry best practices.

By implementing these recommendations, project performance in the Nigerian upstream oil and gas industry can be improved through the effective identification and management of critical success factors.

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