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RISK MANAGEMENT FACTORS AND OPERATIONAL EXCELLENCE IN THE OIL AND GAS SECTOR: A PILOT SURVEY

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ABSTRACT

This study is aimed at determining the appropriateness of the method and instrument to be used to measure the effect of enterprise risk management determinants and effect on operational excellence, as well as enterprise risk management implementation in the Nigerian oil sector. There are 70 questionnaires were used for the pilot survey analysis via SPSS. The findings further revealed the significant effect of all the risk management factors and implementation except staff capacity on operational excellence from the pilot survey. The article was able to develop a research framework and create, and tested measurement instruments for data collection for the current research and future studies in the area of operational excellence and risk management implementation. The implication of the study is that the importance of risk management in the operational performance of the oil and gas sector is key, it must therefore be prioritized for the achievement of operational excellence.

ABSTRAK

Penelitian ini bertujuan untuk menentukan kelayakan metode dan instrumen yang akan digunakan untuk mengukur pengaruh determinan dan pengaruh manajemen risiko perusahaan terhadap keunggulan operasional, serta penerapan manajemen risiko perusahaan di sektor minyak Nigeria. Ada 70 kuesioner digunakan untuk analisis survei percontohan melalui SPSS. Temuan lebih lanjut mengungkapkan pengaruh signifikan dari semua faktor dan implementasi manajemen risiko kecuali kapasitas staf pada keunggulan operasional dari survei percontohan. Artikel tersebut mampu mengembangkan kerangka penelitian dan membuat, dan menguji instrumen pengukuran untuk pengumpulan data untuk penelitian saat ini dan studi masa depan di bidang keunggulan operasional dan implementasi manajemen risiko. Implikasi dari kajian ini adalah pentingnya manajemen risiko dalam kinerja operasional sektor migas, oleh karena itu harus diprioritaskan untuk pencapaian operational excellence.

INTRODUCTION

The dwindling oil prices, the growing uncertainties of the oil and gas business, and pressure from all stakeholders for oil firms to perform have necessitated the adoption of a strategy to meet up the challenges. The level of uncertainties in relation to pricing, health and safety, regulations and business profitability of operation in the industry is alarming (Muazu & Tasmin, 2017). Operational excellence (OpEx) is seen as a suitable strategy necessary for curbing the uncertainties of oil businesses; improve the performance and competitiveness of oil firms (Ifeanyichukwu, 2010). The risky nature of operations in the sector made the requirement of dynamics of technology and risk management to blend with the implementation of the strategy. To achieve operational excellence in the oil sector, as opined by Bonvita et al. (2008) firms require modern technology. The technology could help integrate processes, sped up production thereby reducing costs. According to McCreery et al. (2013), the OpEx program facilitates the reduction of primary containment by 40% to 50%, lowers export deferrals by 98,5% and also bring down emergency and improve responsiveness by 80%-90%. Again Ostebo et al. (2018) argued that OpEx provides an opportunity for reducing and controlling cost, health, safety and the environmental problems as critical objectives of the oil and gas industry.

Nigerian economy is mostly oil and gas dominated. Nigeria is ranked twelfth in the world as a producer of high-value crude oil and first in Africa (Petroleum Technology Association of Nigeria (PETAN), 2016)). The country is endowed with oil reserve estimated at 37 billion barrels of oil and 188 trillion cubic feet of gas reserve (Natural Resource Governance Institute (NRGI) 2017). The Nigerian government has generated revenues from oil and gas production and has sold in recent years in whopping sums of N1.016trln, N587.6bn and N462.7bn in 2014, 2015 and 2016 correspondingly. The sector's contribution to GDP was over 50% years back, until recently that oil and gas contributed third to services and agriculture, although it still generated 77% of government revenues and 10,79% to GDP in 2014 (NEITI 2016).

The risk management practices in the Nigerian oil sector were mostly risk transfer through the insurance companies. According to Nwaeke (2008), the techniques often applied by the oil sector in Nigeria is risk transfer to the third party. This was agreed by Andeobu et al. (2015) that NLNG too is also involved in third-party risk transfer. On the other hand, health, safety and security as risk management tools were found to be highly cost-effective than buying insurance cover (Nwaeke 2008). However, Foster (2000) postulated that health safety and security program manages only those risks that are within the firms' control. Seemingly, there is a need to improve the risk management in the sector. This is further proven, as Zoufa and Ochieng (2014) opined that there is poor risk management literacy among staff and too much government interference makes risk handling much difficult in the oil sector in Nigeria. Thus, Dabup (2012) suggested the need for staff continuous capacity building in risk management to achieve excellence in health, safety and the environment (HSE) performance.

Efforts have been made in the implementation of OpEx in the Nigerian oil sector. The case of Nigerian LNG on OpEx implementation had proven that a firm that adopted and implemented the strategy achieved improved performance and stability in production, processes and systems (LNG 2016). The combination of processes and system comes with its enduring risks that also need to be managed. It is factual that operational excellence is implemented through cohesive performance across risk, revenue and cost (Heath et al. 2017). Therefore, the linkage between risks, operations cost, profitability automatically sets a firm on the corridor of operational excellence. In the light of these issues, Franke and Weber (2017) posited that achieving operational excellence could be impacted by a sound enterprise risk management approach that brings into line firm's operational competencies and the ability to execute the strategy reliably and consistently.

Total production of 718 million barrels of oil was accomplished at a projected average of 1,96 million barrels of oil each day. There was a 9,6% drop over the average production rate for 2015. Similarly,

the NNPC refineries performance was below ability, ranging from 5,43% to 15,52% in 2014 to 2016 (DPR, 2016). These poor refineries (KRPC, WRPC and PHRC) performance poses a disturbing operational problem, which impacted negatively on output, revenues and general efficiency of NNPC group of companies. There are increasing incidents of both oil spillage, accidents, plant and machinery breakdown in the Nigerian oil and gas sector (Mustapha et al. 2015). Several efforts were made to forestall the situation by the Department of Petroleum Resources (DPR) as the regulatory body responsible for monitoring and control of operations in the sector. DPR (2016) report indicated that there are still volumes of spills and accidents in the industry in 2015-2016, there were 86 and 38 fatalities respectively. Other accidents (work and non-work related) are still occurring, as 25 and 16 incidents were recorded in the said period. The report also shows that oil spillage incidents rose up to 4850 2010-2016 with 118.118,65 barrels of oil released to the environment. In spite of the DPR effort the situation prevails. Other studies revealed that the issue of inefficiency (technical and cost) in NNPC's operation, 0,51 rate as found by Oke and Kareem (2013). Again, Total Quality Management was found to have been adopted by the NNPC to curb cost and improve efficiency and as well transform the operations to like a private firm (Adam, 2014; Okoye, 2010). All these didn't solve the problem.

Given the preceding, the current study is aimed at determining the effectiveness of the framework and instrument to be used in measuring and testing the effect of enterprise risk management determinants on OpEx as the dependent variable, mediated by ERM implementation. Specifically, regulatory framework (RFR), Staff capacity (SCP), Firm characteristics (FCH) and Information technology (IT) are the independent variables. When the relationship among the postulated variables of the study is determine, it is expected to improve the general performance of the Nigerian oil and gas sector.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

In this section literature related to the study variables are being reviewed to show some of the dimensions to be used as well as measurement instrument.

Operational Excellence

Operational excellence (OpEx) has been widely used as a strategy for outstanding performance in many industries. OpEx has a varying definition across industries and sectors. According to (Franke, 2017; Ernst & Young, 2015; Eni, 2016; Chevron, 2010) OpEx in the oil and gas is about health, safety, and the environment. They maintained that the constructs explain the concept of OpEx in the industry. Others are of the view that yes, health safety and the environment explain OpEx but cost reduction, productivity, quality improvement and waste reduction are equally crucial in operationalizing the concept (Heath et al., 2017; Edgeman & Eskildsen, 2014; Fok-Yew & Ahmad, 2014). Therefore, OpEx as the dependent variable is regarded as the best in class performance in health and safety, operational efficiency, the reliability of assets and environment. These constructs were adopted from previous studies and professional understanding and real-life practices in the industry. Consequently, this study combined cost reduction, productivity, waste reduction and quality improvement to make up what was used as efficiency in the chosen constructs to measure OpEx. Again, it was further argued that assets performance and delivery time or lead time are important factors that also explain OpEx, and it is considered as the reliability of assets and process (Feblowitz. 2013; Deloitte, 2015; Elsevier, 2016; Asat et al., 2015; Chevron, 2010). These, therefore, were the basis for the adoption of safety and health, operational efficiency, reliability of assets and process as constructs for operationalizing OpEx as the dependent variable in the study.

Regulatory Framework

Businesses and industries are guided by rules and regulation all over the world. Regulations are rules governing conduct of human endeavour; they are guiding principles that defines how things should be done in a particular context. A regulatory framework is structured and outlined sequences of analyses

that outline the stipulation for regulations, the implementation instruments targeted at changing certain behaviours, and the assessment of the effectiveness and efficiency of the mechanisms in achieving policy objectives (Evans, 1998). These analyses are about the types of regulations, types of agencies, for which industry or business, review and enforcement. Regulatory framework was operationalized with regulatory bodies (international, national, state and local governments) (Viscusi 1986), nature and type of regulations (Abu Bakar et al. 2016), and the enforcement (supervisory, penalty or sanction) as recommended and used by (Bolu, 2011).

Staff Capacity

The competence and capability of staff to perform their duty is what staff capacity stood for. Staffs training and engagement are critical variables that must be developed to improve operational performance (Parast et al., 2011). Personnel training are an essential factor in growing firm productivity and capabilities (Ahire & Dreyfus, 2000). Staff capacity was considered as the staff level of technical know-how or expertise; they are measured by the training method, evaluation and the nature and content of the training. These measures were adapted from the work of Chileshe, Hosseini and Jepson (2016) and Cole (2002).

Firm Characteristics

Firm characteristics have several dimensions considered by many. Firm characteristics as maintained by Anderson et al. (2004), it comprises of organisations assets, complexity, and industrial affiliation. Other views were on the firm, size, number of assets as characteristics (Kheni et al., 2008; Hartley & Medlock, 2012; Grace et al. 2010), ownership structure (Grace et al. 2010; Gordon et al. 2009), and organisational culture. Parte-Esteban and Garcia (2014) regarded firm characteristics on market constructs, business strategy, ownership structure, audit function and control variables. Based on the position of scholars on firm characteristics, the current study operationalized it with firm size, ownership structure, culture, assets, board of directors and industrial affiliation.

Information Technology

Information technology (IT) is commonly used across sectors of human endeavour to carry out transactions, provide information, record data, make decisions or perform a task (Lucey, 2005). IT is defined as organization's computing and telecommunications hardware and software technologies, which offer automatic means of handling and communicating information (Amoah & Boateng, 2009). The knowledge of IT and its relationship with business integration refers to the professional ability to envision the means in which IT can contribute to organisational performance and to search for combined effect between IT and business undertakings (Bassellier & Benbasat, 2004). Earlier studies were considered for the adoption of the study constructs. Information technology was operationalised by process needs, infrastructure and security and control mechanism as opined by (Wilson et al., 2015; Pagach & Warr, 2011). The adopted dimensions or constructs were used in the instrument for data collection.

Enterprise Risk Management

The concept of risk has been vastly a debatable issue. The term risk varies according to the view, belief, attitudes, occupation and experiences of individuals or organisations (Baloi & Price, 2003). Nonetheless, the main issue under risk in every setting is its uncertainty nature. Risk management is defined as the process of conducting risk management planning, identification, analysis, responses, monitoring and control on projects, exploration, operation and distribution (Project Management Institute, 2008). Enterprise risk management is a holistic risk management approach that offers a framework for identifying circumstances that influence organisational objectives, evaluating risk prevalence, noting

responses and strategies that attenuate risks, and establishing a process to monitor risks (Ben-Amar et al., 2014). As the mediating variable, enterprise risk management implementation (ERM) constructs are governance, process and structure. The constructs were first developed and explored by Lai and Shamad (2011), they posited that to measure enterprise risk management there is the need to understand its governance, the structure and the implementation process. The scholars developed fourteen items, which was adopted and in earlier studies by (Ping & Muthuveloo, 2015; Shad & Lai, 2015). The study by Ping and Muthuveloo measured the impact of ERM implementation on the firm performance. This study, therefore, adapted the same constructs and items with some modification to operationalize ERM implementation in the oil and gas sector.

Putting the independent and mediating variables in this study, it is aimed at determining their effects on operational excellence to improve general performance and some of the identified challenges in the Nigerian oil and gas sector, particularly in the Nigerian National Petroleum Corporation (NNPC). This pilot survey, therefore, gauges the organization of the response scale and the alignment between questionnaire items and the variables constructs. This pilot survey served as an opener for the overall conduct of the study in the subject area, which lay a foundation for many future studies in the field of operational excellence, particularly in the oil and gas sector. The conceptual framework is presented in Figure 1 to display the flow and direction of the hypothesized relationship between the variables of the study.

Hypothesized Relationship among Study Variables

The hypothesized relationship between risk management factors and operational excellence are depicted in Figure 1. The lines indicate hypothesis which is going to be tested when data is collected.

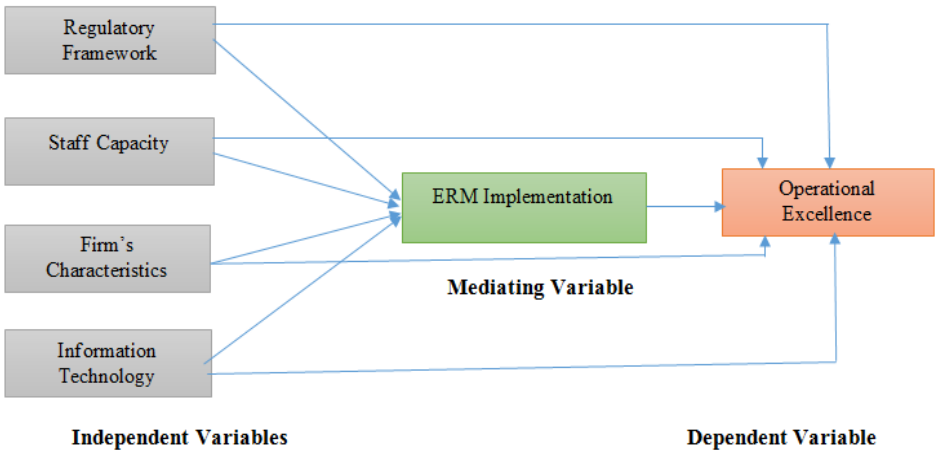

Figure 1. Proposed Study Conceptual Framework

RESEARCH METHOD

A purposive sampling technique was employed for the selection of sampled respondents from the seven wholly-owned subsidiary companies of NNPC that are operating within Nigeria's borders and that is the oil and gas production value chain business. They are comprised of exploration, refineries, distribution, pipeline marketing, and retail firms. A sample of 179 was targeted for the overall data collection for the study, however, 70 responses was used for the pilot survey. The choice of the 70 respondents was spread across risk management, health and safety, operations, engineering and maintenance, and human resources departments.

SPSS 23 software was used to conduct validity, reliability and regression tests in the current study. Specifically, factor analysis was used for measuring the validity of the instrument used in collecting the data. Cronbach's alpha was also used to test the reliability of the instrument. Validity is the degree to which an instrument measures an intended variable construct (Ridley, 2005; Kothari, 2009; Sekaran, 2010). This means that validity measures the relationship between data collected and variables of interest, both internal and external. In his view, Kothari (2004) viewed validity as the extent of dissimilarities found is measuring instrument to reflect differences among those being tried on. There are several levels of validity test or measures; they include; content validity, construct validity and criterion-related validity (Sekaran, 2006).

The construct validity shows the extent of how a measure could genuinely represent a construct it supposed to operationalize (Bhattacherjee, 2012). Construct validity is about the fitness of a measure about an external criterion founded by experimental observation. According to Wainer and Braun (1998), construct validity is suitable for quantitative research work. Criterion-related validity measures discriminant and convergence in which assessment is done in quantitative analysis using statistical techniques such as correlation and factor analysis on an observed data (Bhattacherjee ,2012). In this study, two validity (construct and criterion) test tools were employed for the validity assessment and exploratory factor analysis was used to do the test.

Reliability is an indication of the extent of how an instrument works without bias which provides consistent measurement at different time intervals and on various items in the instrument (Sekaran, 2010). However, Kothari (2004) argued that reliability is not as valuable as validity but can efficiently be conducted, and once it is satisfied, one could be confident to say the instrument is valid too. It is the measure of the degree of how a research instrument yield results tried on different occasions. In the current study, Cronbach's alpha was used to test the reliability of the instrument (questionnaire) for internal consistency. In testing reliability using Cronbach's alpha, there are coefficient points .00 to 1.00 and that when it is nearer to 1 the better the internal consistency (Tavakoi, 2011). A Cronbach alpha coefficient that exceeds 0.7 value is acceptable but above ,80 or ,90 is good and excellent respectively (Sekaran, 2006; Goerge & Mallery, 2003). In this study, a threshold of ,70 Cronbach alpha coefficients was adopted for a reliability test on all the postulated variables. The adoption of the said threshold of ,70 was supported by studies conducted by Fok-Yew and Ahmad (2014) on the effect of change management on OE and that of Hoyt and Liebenberg (2009) on the value of enterprise risk management.

To effectively measure both construct validity and reliability of internal consistency of instrument used for data collection, is to conduct a pilot survey and test. According to Cooper and Schindler (2011) pilot test is done to establish the correctness and suitability of research instruments in measuring a variable or construct. The targeted respondents were from the sample, specifically, early responses across all the NNPC subsidiaries selected as shown in Table 1 below at section 6.0. It is noteworthy that the pilot study selection of respondents must not be statistically carried out (Cooper & Schindler, 2011). However, some scholars are of the view of having 40% of the sample as appropriate for a pilot survey (Mugenda & Mugenda, 2003). This study adopted 40% of the sample for the pilot survey and as such 70 responses were used for the pilot study.

Regression was used for the pilot data analysis to establish the relationship between study variables. It is with the view to pre-empt likely outcome of the relationship between risk management factors, enterprise risk management implementation and operational excellence.

Table 1. Selected NNPC Subsidiaries

1	Kaduna Refining and Petrochemical Company (KRPC)
2	Port Harcourt Refining Company (PHRC)
3	Warri Refining and Petrochemical Company (WRPC)
4	Nigerian Petroleum Development Company (NPDC)
5	Pipeline and Products Marketing Company (PPMC)
6	Nigerian Gas Company (NGC)
7	NNPC Retail

RESULT AND DISCUSSIONS

Factor Analysis of Operational Excellence (Dependent variable)

Kaiser-Meyer-Olkin (KMO) measures the sampling adequacy, and the closer is the value to one the better the size of the sample. The nearer the KMO value is to 1 the better the sampling adequacy. In Table 2 below at section 7.0, the KMO stood at ,733, and the significance was also ,000, which indicates a perfect significance. These points were arrived after running the factor analysis seven times. The KMO ,733 justifies that the sample used for the pilot survey was adequate. Hair et al. (2014) maintained that with KMO ,50 it means the sample is adequate for factor analysis. In this study we maintained the ,50 as our threshold, which means that anything less than that, would have been rejected and consider additional sample to improve the sample adequacy.

Table 2. KMO and Bartlett's Test for OpEx

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,733
Bartlett's Test of Sphericity	Approx. Chi-Square	508,387
	df	171
	Sig.	,000

In Table 3, the rotation matrix indicated that the constructs of OE as the dependent variable are four, with a minimum of ,516 and a maximum of ,795. This is an indication that the constructs are suitable for measuring the variable (Yong & Pearce, 2013). There were seven iterations to arrive at the above rotation matrix, where freestanding and cross-loading items were deleted and retried after every single action. The rotation matrix now represents the final instrument items to be issued out for further data collection. Hence the questionnaire is to be adjusted to fit the statistical findings of factor analysis in the current pilot survey. However, the refinement of the instrument would further depend on the reliability test outcome, which would further strengthen the validity of the instrument. The number of iterations shows how the instrument items were reduced and merged with the ones that are similar in a statement and that measure similar constructs. A times there are cases where some items of different constructs measure a similar thing, in this case, the factor analysis streamlines them and sometimes indicates the need for deletion of such items.

Table 3. Factor Analysis of Operational Excellence Constructs

	Component			
	1	2	3	4
OSH2	,795			
OSH3	,758			
OSH6	,712			
OSH7	,695			
OSH8	,656			
OSH9	,639			
OSH10	,557			
OSH4	,541			
ORA4		,785		
ORA3		,729		
ORA8		,685		
ORA7		.654		
OEF2			,787	
OEF7			,707	
OEF3			,654	
OEF5			,516	
OEP2				,756
OEP1				,698
OEP5				,612

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 7 iterations.

Factor Analysis for the Independent and Mediating Variables

Kaiser-Meyer-Olkin (KMO) and Bartlet's test results in Table 4 below at section 7,000, shows that 0,690 was the measure of sampling adequacy and significance of 0,000. It is a clear indication that both independent and mediating variables met and even exceeded the required KMO of ,50 and as such factor analysis define and measure the constructs into 9 after 11 times trial and retrials. The 9 constructs structure provides stable and generalizable measures of the independent and mediating variables. Hair et al. (2014) upheld that with KMO 0,500 a sample is adequate for factor analysis. In this study the all the latent variables were combined in the factor analysis and the result of ,690 was quite above 0,500 threshold adopted.

Table 4. KMO and Bartlett's Test of ERM Determinants and Implementation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,690
Bartlett's Test of Sphericity	Approx. Chi-Square	1619,048
	df	595
	Sig.	,000

In table 5 below, factor analysis result showed that independent and mediating variables combined together have 9 constructs. Firm characteristics (FCH) have a single construct, regulatory framework (RFR) has 2 constructs, staff capacity (SCP) has 2 constructs, information technology (IT) has 2 constructs and enterprise risk management implementation (ERM) also have 2 constructs. The minimum rotation point is ,516, and the highest was ,856, the nearer to 1 the better the coefficient of the validity. There are eleven rounds of iterations were carried out before the current one was achieved; it was done and repeated after every single removal of free-standing or cross-loading items in the constructs. It can thus be argued that the instrument is fit to measure the variables in the above manner subject to further confirmation of the internal consistency via a reliability test. In the following section, the results of the reliability are presented.

Table 5. Factor Analysis of ERM Determinants and ERM Implementation Constructs

	Component								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
FCH2	0,843								
FCH3	0,814								
FCH1	0,808								
FCH5	0,745								
FCH7	0,647								
FCH6	0,557								
FCH8	0,541								
FCH4	0,516								
IT6		0,790							
IT5		0,762							
IT4		0,715							
SCP12			0,806						
SCP9			0,690						
SCP8			0,685						
SCP7			0,621						
ERM5				0,760					
ERM14				0,703					
ERM4				0,655					
ERM8				0,618					
ERM7				0,586					
SCP1					0,856				
SCP2					0,849				
SCP3					0,670				
SCP5					0,569				

	Component								
	1	2	3	4	5	6	7	8	9
RFR4						0,855			
RFR5						0,728			
RFR8						0,633			
ERM10							0,792		
ERM9							0,780		
ERM12							0,611		
ERM3							0,604		
RFR9								0,813	
RFR10								0,597	
IT2									0,756
IT3									0,612

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 11 iterations.

Reliability Test Results of the Study Instrument

Under this section, the statistical findings from the survey are presented to show the internal consistency of the study instrument constructs in measuring the respective variables of the study. Table 6 shows the summary of the reliability test of the instrument used and the items of all the variables. The mean ranges between 3,620–3,942, which means the responses on the instrument are near to agreed and the closer they are to 5,00 (Likert scale) the better the responses. As for the Cronbach's Alpha result on the table, the nearer the coefficients are to 1 the better the internal consistency of the items in the instrument. However, some authors like Goerge and Mallery (2003) are of the view that the Cronbach's Alpha coefficients shouldn't be too close to 1,000 or even 0,960 because it will mean the instrument is 96% - 100% perfect to measure a variable. For this pilot study, Cronbach's Alpha statistics shows that 0,756 for RFR was the lowest among the entire variables and 0,871 for FCH was the highest because it had only one construct.

Nonetheless, some people are of the belief that a one construct variable should not be run for reliability test (Goerge & Mallery, 2003) but it is reported here to show readers and potential adopters of the measure for their consumption. All other remaining variables such as OE, SCP, IT and ERM were all above ,800, which means that the threshold of ,700 coefficients adopted for the study was met and as such the instrument is considered acceptable for further data collection (Sekaran, 2006; Sekaran, 2010). By implications, it means that future studies covering any of the variables, in any context and combination not necessarily like the current study can adopt the measures. Having higher Cronbach's Alpha coefficients, it means that the item statements on particular variable in the study were measured correctly and stand the chance of measuring a variable effectively.

Table 6. Reliability Test Result of Study Variables Constructs

Variable	Position	Items Mean	Standardized Cronbach's Alpha	Items
Operational Excellence (OE)	DV	3,620	0,848	19
Firm Characteristics (FCH)	IV	3,779	0,871	8
Regulatory Framework (RFR)	IV	3,901	0,756	5
Staff Capacity (SCP)	IV	3,942	0,844	8
Information Technology (IT)	IV	3,840	0,835	5
Enterprise Risk Management Implementation (ERM)	MV	3,821	0,859	9

Pilot Regression Result

The result shows that Regulatory framework has a relationship with Operational excellence (β=0,215, t=3,081, sig 0,002). The findings indicated that the hypothesized relationship was true and remains valid as far as this study is concerned. It is so because all the measures (β, t, and p) were within the acceptable thresholds. The variable appeared to be having the most robust relationship with operational excellence among all the variables as shown in Table 7.

The result of the hypothesis testing indicated that Staff capacity has no significant relationship with Operational excellence (β=0,082, t=1,294, sig. =0,198). The result had contradicted that the hypothesized relationship between staff capacity and operational excellence is inferentially not justified. It is an indication that statistically it does not cause variation in operational excellence as indicated in Table 7. However, the practical implication is when peoples' capacity is built their productivity is expected to be enhanced but the result of the pilot goes insignificant, perhaps because of the sample size used for the pilot survey.

The effect of Firm characteristics on Operational excellence was significant at (β=.178, t=2.749, sig.=.007). Their relationship was positive, as such the formulated hypothesis remained true and confirmed in the current study. The relationship was significant relative to other factors of enterprise risk management as shown in Table 7 below.

Information technology relationship with Operational excellence was significant at (β=.294, t=4.144, sig.=.000), as all the adopted measures were within the acceptable benchmark. The variable was the strongest in weight of the relationship with the dependent variable (OpEx) in the current pilot study.

The rule of thumb has it that a mediating variable must have a relationship with the dependent variable before it mediates between relationships. However, the mediating effect was not tested at the pilot survey level because of the size of the data collected, but for the purpose of the current work, the relationship between ERM and OpEx was tested to ascertain the future outcome when the final data collection has taken place. The result of the relationship between ERM implementation and operational excellence (β=.213, t=3.047, p=.003) showed a significant and positive relationship as shown in Table 7.

Table 7. Regression Coefficients Results on OpEx

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	0,681	0,257		2,649	0,000
RFR	0,166	0,054	0,215	3,081	0,002
FCH	0,151	0,055	0,178	2,749	0,007
SCP	0,080	0,062	0,082	1,294	0,198
IT	0,224	0,054	0,294	4,144	0,000
ERM	0,174	0,057	0,213	3,047	0,003

a. Dependent Variable: OPEX

Discussion

The result indicated that regulatory framework could significantly influence positive change in operational excellence. Regulations, regulatory agencies and enforcement were the measures used to test the effect on operational excellence. The oil and gas as one of the most regulated sectors because of the risky nature of its operations, health safety and environment are key to its operations. The findings show the importance of regulatory framework in the operational undertakings of the oil and gas sector.

The results of the current study offer new proof on the significance of staff capacity on the effective implementation of the operational excellence program. However, statistically the relationship was positive but insignificant, which means the opposite of what is proposed in the conceptual framework. It is understandable that staff competency is a vital ingredient for the achievement of operational performance of organisations in general and specifically excellence. It is most important that staff capacity is tailored towards the objectives of the organisation to achieve operational excellence in the oil and gas sector.

Firm characteristics are about the industry to which an organisation operates its nature of business undertakings, the structure of ownership, volume of assets, size, the complexity of operation and organisational culture. This study's finding shows significant effect of firm characteristics on operational excellence. The influence of ownership by the state often comes through general interference of who gets what contract, lack of private sector driven strategies, corruption and so many to mention a few. Firm characteristic is a factor that made the dimensions of operational excellence in the oil and gas industry different from what is obtained in other sectors.

The importance of information technology spread across industries, education, communication, security, health and so many human endeavours. The findings of this study that empirically proven that information technology could positively and significantly influence operational excellence, which is in tune with what IT does to organisations. It is important to note that IT had been used for work process integration, such that people on the high sea could communicate certain problems with those at the headquarters and be guided via video conferencing in real time, which by implication helps in achieving operational excellence.

The study results indicated that ERM implementation had a significant and positive relationship with operational excellence in the Nigerian oil and gas sector. The findings of this study are further proof that the operations (exploration, refining, processing and delivery to final consumer) of the oil and gas sector indeed require an effective risk management strategy. The operations are characterised by risks, such as health and safety, environmental, compliance, cyber, natural disaster to mention a few, which needed to be tackled to achieve OpEx. The importance of ERM in this regard cannot be underestimated. It provides decorum to an organisation that managed environmental issues appropriately in the face of

the hosting communities, health and safety to the workforce, improved quality and delivery time to the end users, reduces wastage and cost for the owners.

CONCLUSION

The pilot study report presented in this article had shown the findings of both validities using factor analysis and reliability. The survey evaluates the arrangement of the response scale and the alignment between instrument items and broader variables constructs. The findings indicated that all the constructs are well defined and found fitted to measure the respective variables of the study. The thresholds adopted for the two tests were met, which means they are accepted for further data collection after adjustments necessary in the instrument. Several iterations were made to arrive at the current rotation matrixes, in the process free standing and cross-loadings were removed to have a clear definition of constructs. The reliability was done based on the factor analysis results and had also proven that the instrument could adequately measure the variables of the study. Variables such as operational excellence that is the dependent, regulatory framework, staff capacity, firm characteristics, information technology and enterprise risk management implementation are measured with high validity and reliability coefficients. It also means that the 4 and 9 constructs structure provide stable and generalizable measures of the dependent, independent and mediating variables and by extension, it offered an improved set of constructs that can be used for future studies. For that purpose, a sample questionnaire was drawn and presented as an appendix for use mainly in the oil and gas sector, as regards operational excellence, enterprise risk management implementation. The instrument has established and tested validity and reliability results; in a way is one of the significant contributions of this article. A pilot analysis was done to pre-empt the effect of these risk management factors and ERM implementation on Operational excellence after the final data collection and was presented in the current work. A lot has been done in terms of pilot study; however, some of the limitations of the study were the focus on NNPC as public company for data collection, instead of combining both private and public firms. Again, the study use of purposive sampling technique could affect generalization of the final result in different context. Other limitation was the inability of the researchers to conduct deeper analysis to establish the relationship between the variables of the study at the current stage. As only a few percentages of the representative sample response were utilized for the pilot survey. The study stopped at the factor analysis because the sample of 70 used for the pilot survey will not be enough to explain certain variation in the dependent variable (operational excellence). The implication for future study is that the enterprise risk management factors and implementation will be suitable for explaining change in operational excellence in the extraction industry.

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