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A FACTORIAL STUDY OF CORPORATE PERFORMANCE OF NIGERIAN REFINERIES

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ABSTRACT
Realizing that the Nigerian refineries are dysfunctional and therefore are unable to meet the optimal production output, a survey was undertaken as to identifying and ascertaining the inter correlations among a range of variables that influence the operation of the Nigerian refineries. Accordingly, a statistical approach, involving a combined use of Kendall's coefficient of concordance, which ranks variables in merit order sequentiality, and Principal Component Analysis (PCA), that tries to perceive similarity in dissimilarity by achieving parsimony through factor reduction, was adopted. Our results show that a null hypothesis claiming that the ranking of the range of factors by forty (40) judges is discordant was rejected at a p-value of 0.05, thus suggesting that the computed index of consistent ranking (coefficient of concordance W = 0.56909) is a middling. Besides, the PCA deployed was successful in achieving parsimony by clustering a plethora of sixty-one (61) variables into mere nineteen (19) collections or enfoldments. To boot, an outstanding sturdy cluster wielding remarkable positive factor loadings, which was creatively labelled omnium-gatherum came up trumps as most significant and it's quite needful as policy instrument. Thus, if NNPC is to square away (neaten up) the dysfunctionality alluded to at the outset and have to nudge their operations towards a decent future, this paper importunes that the omnium-gatherum, in the first instance, needs to be factored into their aggregate planning.

Key words: *Omnium-gatherum, Principal Component analysis, Coefficient of Concordance, Refinery, Subsidy.*

1. INTRODUCTION
Nigeria operates four refineries that contribute to a gross output of about 222.5 bpd of crude out of the 445 bpd of installed capacity [1, 2]. The current output which still fluctuates widely is considered grossly inadequate to meet the total demand of about 35 million litres per day of premium motor spirit (P.M.S). Consequently, the nation is as it were, pushed to the precipice of energy crises that has manifested in frequent acute shortage of petroleum products, a situation that is in itself rather embarrassing, being the seventh oil producer in the world.

There are oodles of factors that contribute to this kind of anomaly. Among others, they include inadequate manpower planning, operational dysfunction, paucity of innovative drive, re-engagement of retired staff on contract basis, exportation of crude oil and subsequent buying back of the refined products, as well as approval and payment of subsidy by government. There are more offending reasons why the refinery is malfunctioning, but space forbids their inclusion.

This research is considered paramount at this point in time because it is embarrassing to hear that a nation that is ranked seventh in the world oil output is being seen by the outside world as a banana republic that is characterized by exporting raw materials (crude oil in this case) and then goes to buy back the bye products to satisfy its domestic needs. Moreover, it is important that exhaustible resource should be judiciously used in such a manner that the proceeds from the utilization would be ploughed back for the establishment of heavy industries that will in turn become sources of income generation that will be relied upon when the natural resource would have depleted.

As it were, now, petroleum appears to be an albatross on the neck of government because by mismanaging the resources, it has become a burden that hinders our progress. For instance, economic activities are

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hampered by fuel scarcity and where you find it to buy it is at a prohibited cost. This situation has lingered and is still lingering .A number of studies has examined a range of problems associated with the conversion of crude oil into end products and found that they are multi-facetted. However, update research in this field reveals that the balance of literature is glaringly deficient on the combined use of Kendall coefficient of Concordance and a brand of Factor Analysis, Principal Component Analysis (PCA), as analytics in researching the problem.

The current study breaches this frontier of knowledge by applying the combination of these two models as to have a bird's-eye-view, not worm's view of the problem. Accordingly, the combined model is seemly and adequate as against others that seem to be like viewing the problem from a low position.

Vast literature related to upstream, midstream and downstream of oil sectors abound. Specifically, efforts to address the problem of refinery operation has been carried out by many researchers. Petroleum refining is undoubtedly one of the most complex chemical industries. The Study [3] examined the complex nature of refineries comprising many different and complicated processes with various possible configurations and structures. Several attempts had been made to improve refinery output. Globally, the demand for petroleum products will continue to increase. It was opined from a study that the global demand for petroleum products will increase from 77.1 million barrel per day (mbpd) in 2001 to 118 mbpd in 2025[4]. This has encouraged many operators in refineries business to improve the quality of products output through crude blending as observed by [5]. In Nigeria, the effect of petroleum shortages occasioned by poor performance of the Nigerian refineries was studied by [6]. In the research, a projection for petroleum products supply and energy demand was highlighted and necessary steps needed to be taken to meet the projection were outlined as a way forward. Successive administrations have made effort in order to ensure adequate supply of petroleum products in Nigeria, unfortunately, this problem persist. It was recommended in a research study by [7] that as a first step in overcoming the shortages of petroleum products supply, all domestic refineries must be put in full productive capacity**.** Significant efforts have been made by [8, 9] on the application of Linear Programming and Mixed Integer Linear programming models to investigate refinery planning and optimization.

Relatedly, a Mixed Linear Programming approach as it applies to refinery optimization was carried out by [10]. More recently, [11] had studied the inherent risks associated with Nigerian Marginal oilfields and provide useful insight on how to mitigate risks to unlock economic potential of the marginal oil field. Further, modelling of refinery production, planning and scheduling to enhance operational efficiency is credited to [4]. Furthermore, [12] addressed the problem of refinery planning under uncertainty using applied stochastic optimization. The study [13] applied mathematical programming in optimizing operations in petroleum refineries while [14] takes a cursory study on how best our refineries can be deregulated to achieve optimal performance of the industry.

Again, safety of operators and equipment is of great essence in refinery operation as it enhances production output and reduces as reasonably practicable, the effect of hazard to operators. One of the latest researches on this is credited to [15] who carried out detailed safety evaluation and analysis of Naphtha Hydro-treating unit (Nhu) of the Kaduna Refining and Petrochemical Company to ascertain the safety level of the unit's operation. The study concluded by suggesting proactive control measures to be implemented to reduce safety and occupational health hazard. Moreover, maintenance of refinery is a key success factor for optimal output as seen in [16]. The investigation focused on how best refineries can be maintained to reduce the down time due to pressure on the equipment. The result revealed that Reliability Centred Maintenance (RCM) is popular among other methods in achieving continued improvement in reliability of equipment. It is noted that Refineries equipment are always overstretched due to continuous operation. The study [17] reported on how best refineries can overcome the problem of equipment stretch and concluded that debottlenecking can enhance the efficiency and effectiveness of the refinery. Similar study was carried out by [18] who analysed the criteria used in the industry for measuring the performance of petroleum refineries and recommended management intervention model for tracking trends of development. The paper [19] studied the uncertainty of refinery using Hybrid of Stochastic Programming Approaches with Economic and Operational Risk Management. Nigerian refineries have become cost centre [2, 18] and effort is needed to correct this anomalies, the paper noted. Besides, several research

studies credited to [14, 12, 13and 14] were carried out to evaluate the administration of subsidy payments by the Federal Government. Similarly, [20] observed that subsidies on petroleum products rose from N70 billion in 2003 to N450 billion in 2006, furthermore, in 2008, it was increased to over N1.5 trillion naira which can fund a capital budget in a year. The NNPC online report also stated that, in order to meet the deficit in petroleum products supply (premium motor spirit, kerosene and Automotive gas oil) in 2012 alone, Nigeria spends between $12 and $15 billion (United States Dollars) for importation. The economic benefit of a nation refining in excess of its demand is quite enormous. Therefore, over dependence of imported petroleum products is a burden that cannot be carried for too long [21]. Arising from the foregoing sample review, it is clear that the balance of literature is deficient on the use of elaborate analytics to analyse the dysfunctionality of the Nigerian refineries. This paper supplies the essential.

The aim of this study is to conduct a survey of a diversity of factors that impact on the performance of oil refining functions in Nigeria. And having identified these factors, to further examine the interplay among them so that through such knowledge and understanding of the dynamics, policy variables can be articulated to guide the operators of the refinery on the optimal plan to follow in order to achieve effectiveness and efficiency in their operations. This has become imperative because resources have to be well managed and utilized for the growth and development of the Nigerian economy. Natural resources like the crude oil deposit is an endowment from nature and it is exhaustible. Therefore, optimal utilization is needed so that proceeds from such sector can be reinvested for future utilization when the resources are depleted

2. METHODOLOGY

2.1 Research Design

The game plan adopted in this research setting involves a general survey of attitudes of refinery workers towards crude refining. The population is the total workforce in Nigeria refineries. However, a stratified sampling comprising Kaduna Refining and Petrochemical Company (KRPC), Warri Refining and Petrochemical Company (WRPC), and part of the academia represented by Federal University of Petroleum Resources, Effurun (FUPRE) were taken as our sampling units.

A mixed bag of scale items, sixty-one numbers, abstracted from a wide survey of past studies were used to craft a set of questionnaire that were administered to ruddily knowledgeable respondents selected from the sampling units of the Nigerian refineries and Federal University of Petroleum Resources, Effurun (FUPRE). Altogether, 150 sets of questionnaire were administered and 118 were retrieved. Respondent's scores were collated as data matrix and fed into StatistiXL software that provided the following output:

i. scree Plot
ii. eigen value and eigen vectors
iii. factor loadings, and
iv. descriptive statistics

These outputs guided the subsequent interpretations that were rendered.

Previous to this, the sixty-one scale items were referred to 40 judges who ranked them in the descending order of importance. The consistency in ranking is represented by Kendall's coefficient of concordance and chi square (χ^2) statistic was used to appraise how consistent the judges were in ranking the scale items.

The detail of the application of the coefficient of concordance is sketched hereunder.

a Let N be the number of scale items to be ranked and let, k be the number of judges assigning ranks.
b. Cast the observed rank into K*N matrix
c. For each entity obtain R_j, which is the total scores of each of the scale item
d. Obtain the mean of the various R_j's, where j refers to the variable response or stimulus from the judges on scale item, i
e. Obtain the deviation of every R_j from the calculated mean of R_j
f. Obtain the square of the deviation of each of the scale items
g. The Kendall Coefficient of Concordance (W), which measures the degree of agreement between the judges is obtained from the equation (1)

$$W = \frac{12S}{K^2(N^3 - N)} \quad (1)$$

where $S = \sum(R_j - \sum R_j/N)^2 =$ Rank variance

See [22] for detailed information on the application of the Coefficient of Concordance.

2.2 Test of Hypothesis

Here, we put forward the following hypotheses:

H_o: The rankings of the 40 judges are discordant

H_1: The judges are using the same standard in ranking.

Since N is essentially large, we apply χ^2-test statistic to ascertain the significant level of W calculated.

Clearly, $\chi^2 = k\,(N-1)\,W$, and if $\chi^2_{cal.} > \chi^2_{tab.}$, fail to accept the null hypothesis.

2.3 Abridge Theory of the Application of the Principal Component Analysis (PCA)

Let X_{ij} and Y_{ij} represent a pair of variables in the data matrix.

Define column mean as

$$\bar{X}_j = \sum_{i=j}^{N} \frac{X_{ij}}{n_j} \text{ and } \bar{Y}_j = \sum_{i=j}^{N} \frac{Y_{ij}}{n_j}$$

Then

$$x = X_{ij} - \bar{X}_j \text{ and } y = Y_{ij} - \bar{Y}_j$$

Where i and j refers to the state of the matrix, x and y refers to the respective mean deviation or deviation from the mean

Hence, the Correlation coefficient, r_{ij} is defined as

$$r_{ij} = \frac{\sum xy}{\sqrt{(\sum x^2).(\sum y^2)}}$$

When r_{ij} is computed for every pair from the whole lot of ${}^{n}C_2 = \frac{n!}{(n-2)!2!}$. We then collate same into a correlation matrix which forms the first input into Factor Analysis.

StatistiXL software is then used to generate output such as:

i. Descriptive Statistics
ii. Communalities
iii. Factor Loading
iv. Eigen values and Eigen vectors

3. RESULT

From tables 1 and 2,

$$\sum R_j = 79200$$

$$[\frac{\sum R_j}{N}] = 79200/61 = 1298.361$$

$$S = \sum (R_j - \frac{R_j}{N})^2 = 17218503.35$$

$$W = 17218503.35/\,[(1/12)*40^2\,(61^3 - 61)]$$
$$= 17218503.35/30256000$$
$$= 0.569093$$

$\chi^2 = K\,(N-1)\,W = 40\,(61-1)0.569093 = 1365.8252$

$(N-1)$ is the degree of freedom, H_o: The rankings of the 40 judges are discordant, H_1: The judges are using the same standard in ranking.

At 0.05 significant level, $\chi^2 = 79.08$ at 0.1 significant level, $\chi^2 = 74.4$

$$\chi^2_{cal} = 1365.8252 > \chi^2_{0.05} = 79.08 \text{ and } \chi^2_{cal} = 1365.8252 > \chi^2_{0.1} = 74.4$$

Table 1: Data matrix of the 61 scale items and sum of ranks, R_j

Scale items	1	2	3	4	…	60	61
Sum of Ranks	102	1447	1489	709	…	2131	481

Table 2: Deviation of ranks from mean and the corresponding variance.

$R_j - [\frac{\sum Rj}{N}]$	$(R_j - [\frac{\sum Rj}{N}])^2$
-1196.36	1431279.642
148.639	22093.55232
190.639	36343.22832
-589.361	347346.3883
…	…
432.639	187176.5043
-305.361	93245.34032
137.639	18944.49432
832.639	693287.7043
-817.361	668079.0043
Total	17218503.35

Table 3: Merit Order sequentiality of the Sixty-one Scale Items

S/No	ORDER OF SEQUENTILITY
1	Funding Risk
2	Cognate Training
3	Technical Knowhow
4	Pipelines Vandalism
5	Equipment/tools inspection
6	Poor Management commitment
7	Gratification
8	Equipment Reliability
9	Political Vicissitudes
10	Refinery Complete Automation
11	Business Sustainability
12	Safety Risk
13	Adequate Manpower Plan
14	Manpower Resource Availability
15	Effective Supervision
16	Explosion Risk
17	Maintenance
18	Paucity of investors
19	Insecurity/ Terrorism
20	Interest Rate
21	Team work
22	Loading / Unloading
23	Operations Risk
24	Infrastructure deficit
25	Gas flaring
26	Currency fluctuation
27	Return on investment

S/No	ORDER OF SEQUENTILITY
28	Motivation
29	Obsolete equipment
30	Properties Acquisition
31	Technology Limitation
32	Changes in demand
33	Job satisfaction
34	Standard Operating Procedure
35	Environmental Regulations
36	Soaring Price
37	Interest Rates
38	Sanction
39	Competition Risk
40	Market volatility
41	Industry Policies
42	Turn Around Maintenance
43	Project Management Risk
44	Petroleum Process Technology
45	Population Encroachment
46	Cost of adequate Techniques
47	Process Safety
48	Choice of Outsourcing
49	Refinery Planning
50	Demand fluctuation
51	Maintenance Methodology
52	Manpower Recruitment
53	Partnering Alliance
54	Skills
55	Relevant Linkages
56	Manpower Planning
57	Effective Communication
58	Leadership Style
59	Reputation
60	Legal Risk
61	Fine

3.1 Result and Discussions

The coefficient of concordance was computed as W = 0.569, which is considered a middling. In order words, it is in the threshold of being substantial. The chi-square (χ^2) test at 0.05 and 0.1 significant levels show the critical values are 79.08 and 74.4 respectively. This inclined us to fail to accept the null hypothesis that the judges ranking is discordant. Our conclusion therefore is that the judges use the same criteria to do the ranking.

The correlation matrix as obtained with StatistiXL, is shown in Table 3. Figures 1 depicts the factor plot displaying the pattern of factor distribution. Figure 2 shows the eigen value. It's obvious from the scree plot that at eigen value of 1, and component number 19, the curvity tends to flatten out, suggesting that nineteen factors extracted are adequate. This shows that there is significant parsimony in factor reduction 61 to 19. We shall proceed now to discuss the 19 variable clusters

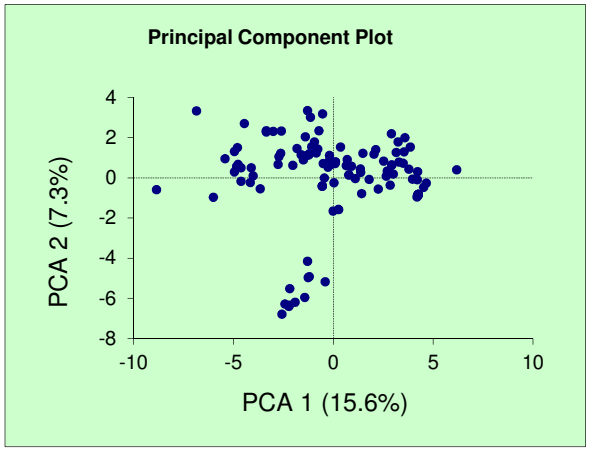

Fig. 1: Factor plot

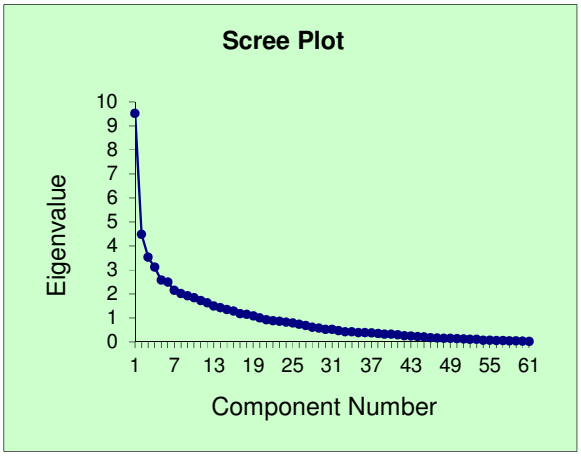

Figure 2: Eigen value

As can be seen from Table 4 that follows, the variables clustered therein comprises a collection of miscellaneous scale items which we have seemly creatively labelled omnium-gatherum.

The factor loadings are predominantly middlings and some moderate loadings. The magnitude of loadings indicates how important the scale item is within the cluster. As we can readily discern from the column vectors of loadings, they are all positive showing that omnium-gatherum cluster is a sturdy factor because none of them is negative. We shall take some samples of these variables to discuss their significance. For instance, scale item 13 wields a factor loading of 0.695. The import is that the exchange rate between the dollar and naira, as far as refinery operations costing is concerned, is very paramount and indeed it is so. Most of the materials used in refining crude are imported and little local content are involved. There is the need therefore for the management to undertake

innovative research to discover how alternative local raw materials can be used in refining.

Table 4: OmniumGatherum

PC1: OMIUM GATHERUM		
Factor Loadings (correlations between initial variables and principal components.		
SCALE ITEM NO	SCALE ITEM	COMPONENT LOADINGS
4	Business Sustainability	0.574
7	Paucity of Investors	0.433
13	Currency fluctuation	0.695
14	Interest Rates	0.433
15	Political Vicissitudes	0.572
17	Properties Acquisition	0.556
20	Gas Flaring	0.509
23	Equipment Reliability	0.631
25	Safety Risk	0.624
28	Technology Limitation	0.603
31	Refinery Planning	0.507
33	Cost of adequate techniques	0.524
34	Infrastructure deficit	0.618
38	Turn Around Maintenance	0.494
41	Operational Risk	0.424
42	Standard Operating Procedure	0.639
43	Cognate Training	0.439
44	Manpower imbalance	0.584
46	Management Commitment	0.449
51	Leadership Style	0.482
53	Manpower Resource Recruitment	0.563
57	Population Encroachment	0.488

The next item is *Standard Operating Procedure (SOP)* with scale item number 42 which have a factor loading of 0.639. And this scale item implies that the standard operating procedure in system operation is to ensure safety of the people and machine. Our interpretation is that WRPC and KRPC are seemly in this aspect. Next in order of importance is equipment reliability with scale item number 23. A good number of equipment appears to be in good working condition but a major problem has been scale item no.15, political vicissitude, in order words changing leadership of the country goes with changes in the fortune of the organisation. Again, item 51 whose factor loading is 0.482 indicates that the leadership style appears to be deficient in grandeur and purposefulness.

Safely risk is scale item no. 25 and the corresponding factor loading of 0.624 is considered substantial. We cannot agree more that the refineries hardly have fire incident except for the scam of two years ago in WRPC which did not result in any serious safety risk. The PCA model employed has singled item 34, infrastructure deficit, as the next in importance to safety risk. It seems that accumulated depreciation including obsolescence in technology is affecting the operations of the refinery and as such Turn Around Maintenance (TAM), which is item 38 appears not to be too important by virtue of the low rating 0.494. Indeed TAM cannot be of much primacy when there is obvious technological obsolescence and this leads to unreliability of equipment. The implication is that the refinery is affected by age. Other important factors are manpower imbalance and manpower resource recruitment with scale items 44 and 53 respectively wielding corresponding factor loadings of 0.584 and 0.563. What is significant is that although the organization may have the right number of people but they appear not to have matching competences. Other variables include interest rate, paucity of investors, and business sustainability. The rest include properties acquisition, gas flaring, refinery planning, operation risk, cognate training and population encroachment. All these are important variables to be included in the first phase of planning for repositioning. The entire gamut of omnium-gatherum constitute elements of policy variables in case the organisation would organise for operational rebirth.

At this juncture, we take up another cluster which is *organization's good will*: Partnering alliance, gratification, maintenance, petroleum process technology and reputation as depicted in Table 5 constitute a bipolar factor.

Table 5: Organization's Good will

PC2: Organization's Goodwill		
11	Partnering Alliance	-0.448
16	Gratification	0.690
26	Maintenance	0.522
30	Petroleum Process Technology	0.418
56	Reputation	0.536

The respondent's evaluation of organisation's good will is well captured in the five some cluster creatively labelled as organisation's good will. It is a bipolar factor with four scale items wielding positive signs. Partnering alliance wields a factor loading of -0.448. The import of the negativism is that the refinery management is not partnering or networking with similar refineries outside Nigeria with a view to copying positive development as being practised in other places. Gratification is scale item 16. It has the highest factor loading. In order words, the

respondents could not agree more that standard ethical practices appear to be unwonted in the refineries. Scale item 26, wielding a factor loading of 0.522, is a mediocre. It signifies that average attention is given to maintenance in the organization. But scale item 30, refinery process technology, wields moderate factor loading. This signifies that the processing methodology adopted by NNPC is not the state-of-art technology. Finally, the reputation of the organisation is considered adequate by virtue of factor loading of 0.536 for scale item 26. Generally, the corporate deportment, correctitude, reputation quotient, carriage of Nigeria Refineries is at its best at all times. Like Fredrick Taylor said "give us the tools and we shall do the job". We believe that if WRPC and KRPC are seemly equipped and properly funded, they will do the job [23].

The next cluster creatively labelled *economic condition* is another bipolar factor.

Table 6: Economic Condition

1	Funding	0.485
2	Soaring price	0.428
3	Competition	0.469
18	Sanction	0.475
24	Explosion Risk	0.466
47	Motivation	-0.522q

With the exception of scale item no. 47, motivation, which has a negative factor loading of -0.522, the rest four factors are moderately loaded. We know that payment in NNPC is very much higher than what obtains those in the civil service but judging by the negative loading, the impression is that motivation is low. Besides its well-known that reward motivates behaviour but reward may not necessary be monetary; it could be recognition or it could be in terms of challenging opportunities jobs offer. Jobs that offer little challenges are by themselves dull and unpleasant; they hardly afford job satisfaction. If this be the case, it's advised that management make jobs more productive and challenging. This factor has to be looked into. Our interpretation will be that, in part, lack of motivation might be that the work is not productive and challenging even though workers get good remuneration.

The scale item, soaring price, has factor loading of 0.428. The factor loading indicates that the issue is fairly important. However, the soaring price arises on account of the fact that Nigeria exports crude and buys back refined products and that exposes Nigeria to market forces which tend to influence the high cost of the products in the domestic market. Competition, sanctions and explosion risks all have similar factor loadings representing economic condition.

However, further downstream, we have oligopolistic practices by few oil marketers which sometimes create artificial scarcity in order to create soaring prices. This oligopoly is both practised by independent and major marketers alike. Funding, that is, the no. 1 scale item, wielding a factor loading of 0.485 falls within the regime of middling. Our interpretation of this scale item, based on the factor loading, is that the organization is moderately funded by government but respondents appear to be undecided about the income and expenditure pattern in the organization. Again, sanction and explosion risk are also of moderately significance in the organization. Sanctions and explosion risk wield factor loadings of 0.475 and 0.466 respectively. Sanction such as prohibition of gas flaring is still loosely enforced to say the least while explosion risk appears to be an unwonted occurrence.

Another important cluster is creatively labelled *Nuggets of know-how*.

Table 7: Nuggets of know-how

6	Changes in demand	-0.415
12	Project Management Risk	0.556
29	Maintenance Methodology	0.405
49	Skills	-0.481

It is another bipolar factor because the matrixes of the factor loadings are having negative and positive signs. Scale items nos. 6 and 49, changes in demand and skills respectively wield factor loadings of -0.415 and -0.481 respectively. The Nigerian consumers are in need of more products but there is no corresponding increase in supply. Marketers, who are importing the products, are not meeting demands, hence the negative value. More importantly, the refinery appears not to have the right know-how and the working plants to meet up with increase in demand and that appears to be the main reason decision to export crude and buy back the refined products. Equally, the refineries do handle certain projects and we know that risks skulls in stillness just like surprise waits in ambush. The middling factor loading which this scale item wields suggests that project management risks are classified as average importance.

Maintenance methodology: this scale item no. 29, has moderate loadings, suggesting that maintenance attention is given fair concern. Skills, serial no. 49,

have negative factor loadings of -0.489. The implication is that the skill to refine crude oil is lacking.

The next cluster is creatively labelled *corporate overdrive*.

Table 8: Corporate Overdrive

39	Process Safety	-0.451
48	Job Satisfaction	-0.419
55	Manpower Resource Availability	-0.585

It is a lanky factor because all the variables have negative factor loadings. The implication is that extra effort is not being made in the area of process safety, job satisfaction, and manpower availability in order to achieve corporate goals.

Talking about *supply chain management* which encompasses three factors, market volatility, crude loading/unloading, and adequate manpower resource availability are negatively loaded as middling, suggesting that they are shadows of themselves.

Table 9: Supply Chain Management

5	Market Volatility	-0.519
40	Loading/ Unloading	0.492
54	Adequate Manpower Planning	-0.492

It further suggests that the products are unsteadily available in the market while adequate manpower availability is a farce. Besides, loading of crude for export and unloading of refined product when they are imported do involve unavoidable delays. All these scale items are associated with supply chain of products distribution in Nigeria.

Villianousness of vandalism: This represents a bipolar dual factor.

Table 10: Villianousness of Vandalism

58	Insecurity/ Terrorism	-0.450
60	Legal Risk	0.489

The first reflects insecurity and terrorism. As a matter of fact, villians, for whatever reasons they have, disrupt pipelines bearing crude oil and gas for their own selfish motives. The factor loading on this issue wields a value of -0.450 suggesting that the issue is middling by PCA evaluation. The negative value show that, within the context of the cluster, the variable is destructive, and it is neither in the interest of the organization nor that of Nigeria. The issue needs to be addressed. On the other hand, legal risk is associated with havoc caused by the activities of villians. The effect of these villianous acts affect the communities in which they operate. The NNPC is held accountable for payment of compensation. The issue is thus a serious environmental pollution matter.

Seemly corporate culture: In this motley, effective monitoring and supervisory role is considered. NNPC should liaise with the relevant enforcement agency to reduce the menace of pipeline vadalization

Table 11: Seemly Corporate culture

44	Effective Supervision	-0.403
59	Environmental/Regulation	-0.568

Miscellany: PC 12 – PC 19

This breed is a lanky factor because they all wield negative values.

Table 12: Miscellany

PC12		
10	Relevant Linkages	-0.407
PC13		
22	Refinery Complete Automation	-0.414
PC19		
	Pipeline Vandalism	-0.414

The import is that there appears not to be adequate networking of existing facilities, infrastructure and other facilities. These resources need to be optimally utilized. Again, the refinery operations need to be automated. Since this idea is yet to be implemented, it is loaded as negative factor.

Finally, we examine pipeline vandalization. We have stated from the foregoing, the negative dimension which the actors -villains - perpetrate. But that's a longer matter for another time.

4. RECOMMENDATIONS

Arising from the foregoing analysis, the following recommendations are offered:

i. Government should be mindful of the personalities that are appointed into the ministerial and Board positions.
ii. Government should hold fast to the vision and mission of KRPC and WRPC that should sustain its purpose of creation optimally and efficiently.

5. CONCLUSION

At the onset, we set out the objective of this study to identify the gamut of factors that impact on the operation of the NNPC especially the WRPC. The study further tries to appraise the inter correlation among these variable. To this end, our results show that the

variables identified are multifaceted and substantial correlation exist among them. These correlations have been found significant in the area of policy articulation for dealing with the research problem.

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