IDENTIFYING THE DIMENSION OF THE FACTORS RESPONSIBLE FOR MILITANCY IN THE NIGER DELTA REGION: EXPLORATORY FACTORS ANALYSIS APPROACH

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ABSTRACT

Pipeline vandalism have resulted into economic and environmental losses to the Niger Delta region of Nigeria. This has significantly affected the socioeconomic lives of the people in the oil producing communities. The study employed the exploratory factor analysis (EFA) in identifying the dimension of factors that encouraged pipeline vandalism. It is a better model because previous studies only used descriptive statistics and ordinary least square models (OLS) in determining the factors that causes and sustained vandalism in the region. The study employed 269 respondents who were selected from the Niger Delta region of Nigeria using convenience sampling techniques. The exploratory factor analysis results suggest that ten factors account for seventy percent (70%) of the total variance that causes vandalism. The Kaiser-Mayer-Ohlin is 0.771 and the Bartlett's test of sphericity (P>0.000) suggest that factor analysis can be applied for the data set. Promax rotation and Kaiser Normalization was applied and ten (10) factors (i.e. Governance, underdevelopment, black market availability, corruption, marginalization, legal factors, political factors, environmental degradation, unemployment, and poverty) were extracted. The main findings of the research study suggested that 48 items were much reliable instruments than the 54 items scale with their Cronbach's alpha correlation coefficients of 0.710 minimum.

Keywords: vandalism; socioeconomic; environmental and institutional factors; exploratory factor analysis.

1. INTRODUCTION

A number of factors are said to have contributed to the environmental degradation of the Niger delta region over the years which includes; gas flaring, industrial pollution, oil spillage. (NNPC, 2012). However, there exist large empirical studies in the recent years crediting environmental degradation in the region to pipeline vandalism by Militant groups (Raji & Abejide, 2013; UNEP, 2011). This has resulted to significant negative socioeconomic and environmental problems in the region especially on, farm lands, rivers, and sources of water supply. These problems maybe be trace to institutional weakness, lack of effective implementation of environmental laws which result into people taking laws in to their hands through vandalism of oil pipelines. Despite that, few researches address the problems of vandalism adequately due to its inability to use advanced statistical models in identifying and analysing the factors responsible for and sustaining pipeline vandalism in the Niger delta region.

It is against this background that the researchers undertake this study with a view to identifying the dimension of the factors that responsible for oil pipeline vandalism in the Niger Delta region of Nigeria, using a superior statistical model. The study did not aimed at solving all the problems of oil spill in the region rather, its main focus is assessing the dimension of the real factors responsible for frequent pipelines vandalism. This research paper therefore poised on identifying factors responsible for oil pipeline vandalism in the Niger delta region through exploratory factor analysis (EFA) models.

2. THEORETICAL AND EMPIRICAL REVIEW

A deliberate and hostile behaviour aimed at environmental objects with the motives of damaging or achieving some economic or political objectives can be said be a vandalistic behaviour (Christensen, Johnson, & Brookes, 1992). In addition a vandalism can also be referred to sabotage at work place, revenge or even playful, and frustration (Winter, 1992). Understanding the concept of vandalism would enable us to understand and predict the human behaviour (Christensen, *et al*., 1992). Also Kagan, Evans, Knowles, Sixsmith, Burns, & Burton, (2002) observed that, being in a state of deprivation or denial may encourage vandalism and may results to tress and emotional outburst (Tajfel, 1982). Vandalistic behaviour can be traced to previous records through police records, victims' survey (Gladstone, Sturman, & Wilson, 1978).

While Gurr (1970) viewed relative deprivation (RD) as a perceived discrepancy between individuals subjective "value expectations and value capabilities". Which present assumed value expectations expected good conditions of living as a right to be attained in life, therefore failure may result in emotion disappointment, indignation. Which may results in stress which will leads to emotional outburst and violence against the society (Crosby, 1976). Equally, the Criminal Opportunity Theory Cook (1986) pointed out that criminals somewhat selective of crime target that appear to offer a high payoff with little effort or risk of legal consequences" (Cook, 1986: P2). The author further argued that Potential victims usually takes precautionary measures of self-protection efforts in respond to the crime threat they commits.

Exploratory factor analysis (EFA) attempts to investigate the nature of the constructs influencing a measure of results. EFA, considers taking decisions are about the number of factors to consider in a rotational scheme are based on pragmatic (realistic approach) than theoretical criteria (Williams et al., 2012). Number of steps to be taken in carrying out EFA were outline by (DeCoster, 1998; Williams, et al., 2012). The first step is to determine the suitability of the data for factor analysis i.e. sample size. Tucker & MacCallum (1997) pointed out that the domain and the population of interest for the study should be defined. While Tabachnick & Fidell (2001) rule of thumb suggested a minimum of 300, Hair et al. (1995) suggested 100 or greater than.

Furthermore, on the factorability of the rotation matrix, Williams, Brown, and Onsman (2012) cited Tabachnick and Fidell (2001) recommends factor correlation or correlation matrix in EFA usually termed as *R* for correlation coefficient of over 0.30, Haire, Anderson, Tatham, and Black (1995) ± 0.30 minimal, ± 0.40 important and ± 0.50 significant. If there exists no correlation beyond 0.30, then there is a need to reconsider if FA is applicable. Because, 0.30 means there is only 30% relationship between data or it shows a third of the variable shares large variance, and therefore, becomes impractical to determine whether there is a correlation between the variables with others or the dependent variable (multicollinearity). In addition, KMO test must be carried out to measure sampling adequacy and Bartletts test of sphericity. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index is recommended if the cases to variable ratio are less than the ratio of 1 to 5 (< ratio of 1:5). The index is usually ranges 0 – 1, therefore, 0.50 is considered suitable for FA. While Bartletts tests of Sphericity are considered significant if, $P < 0.05$ for Factor Analyis.

Also a model must be adopted to carry out factor extraction, and the most commonly used are the principal component analysis (PCA) and the principal axis factoring (PAF). However, Thompson (004) argued that the main difference between the two

is less significant, especially when variables, records high reliability, or where the number of variables is 30 and above. PCA considers to be a default method in statistics and is recommended for use in EFA. It's also recommended where no priori theory or model considered existing. PCA is also to be used in EFA for establishing preliminary solutions.

Data extraction strategy is required to in order to reduce a large number of items into the factors. This can be done through different criteria and given the nature of FA there are no definite single criteria that are employed for factor extraction. Hair Anderson, Tatham, William, and Black et al. (1995) observed that most factor analysts use multiple criteria. In addition, rules of thumb Kaiser's criteria (eigenvalue>1 rule), the Scree test, the cumulative percent of variance extracted and parallel analysis are also used. Just like any other criteria, the Cumulative Percentage of Variance (CPV) has its share among researchers, particularly among various disciplines like natural sciences, psychology and humanities. Although no threshold that is used, but a number of cuts off percentages are suggested. Haire et al. (2010) recommended that in natural factors be stopped when a minimum of 95% of variance is explained. While for humanities if 50% - 60% of variance is explained it can be accepted.

Furthermore, scree test and parallel analysis. The interpretation of scree plots is highly subjective and requires the researcher's judgment (Tabachnick, Fidell, and Osterlind (2001) and Thompson, 2004). Thus, it is debatable among researchers on the number of factors to be retained. However, this problem is usually reduced when the sample size is large enough e.g. *N: P ratio* is> 3:1with high commonalities.

Although various rotation techniques were used in EFA, the most commonly used rotational technique is the orthogonal varimax. Thurstone (1947) also emphasized oblique rotation, which was broadly felt that correlated factors were a more plausible representation of reality. Some researchers have provided some guiding rules which specify that only variable with loadings greater than.40 (> 0.04) are considered significant in defining factors (Tait, 1986). Failure to adhere to the rule will cause the value of the factor analysis to be significantly limited (Tait, 1986).

It is argued that, Niger Delta militants vandalize oil pipeline for economic and political gains. This have manifested in terms of allocations of developmental projects and improved revenue allocations (Okpo, &and Eze, 2012). While it can also be looked as a source of revenue, where stolen petroleum products were supplied within Nigeria and neighbouring states to bridge the gap in supply shortages (UNDP, 2006; Khalifaa, Alsarhanb, Bertuccelli, 2017). However, these results in significant effects on demand, supply and price shocks in the global markets outlook (Misund, and Oglend, 2016).

Despite positive theoretical relationship between unemployment and crime, a number of empirical studies have shown weak or negative relationship. Notwithstanding, Altindag (2012) finding a positive relationship between unemployment and property crime especially among people with lower educational levels, Phillips and Land (2012) found a mixed relationship between unemployment and crime to be weak and statistically not significant but there exist a positive and significant relationship with property crime such as burglary, car theft. While Blomquist, and Westerlund (2014) findings shows a non-stationary relationship between unemployment and crime or there exist no cointegration between unemployment and crime. In addition they questioned previous results of being spurious.

On other hand, empirical studies found that, countries with ineffective governance, poor accountability and weak legal system may lead to violent behaviour, especially in developing countries of Africa and Latin American (Acemoglu, Johnson, Robinson, and Thaicharoen, 2003).In addition, the above may also makes it difficult to adhere to environmental standards (UNEP, 2011; Slavíková, Kluvánková-Oravská, and Jílková, 2010). It's evident that environmental poor quality is as a result of failure of the state as the main leader to block the evolution of property right due to its interest. (Stroup and Goodman, 1992) also existence of substantial evidence of institutional failure. Equally, UNDP (2006) observed that despite huge allocations to NDDC, OMPADEC derivation fund, less is achieved in terms of development of the region due mainly to corruption mismanagement, lack of adequate justice and human right abuses. d'Agostino, Dunne, and Pieroni (2016) also argued in that line, where they observed that despite having abundant resources that could have benefited African countries, it turn out to be resource curse which fuel conflict primarily due to poor governance. Furthermore, d'Agostino, *et al*. (2016) blamed increased high government expenditure with limited or no impact on growth which breeds corruption, hence, anger frustration and loss of confidence and vandalism (Osaghae, Ikelegbe, Olarinmoye, and Okhomina 2007; Ulman, and Bujancă (2014)). Equally Akpomera (2015), pointed out that government failure to protect the environment through strict environment laws ultimately leads to environmental degradation.

3. SURVEY DESIGN AND METHODS

Survey design

The respondents for the study were made up of 320 militants and stakeholders in the Niger delta region of Nigeria who were selected through convenience sampling techniques. 300 questionnaire were completed and returned while 20 were not returned. The respondents were asked about their age groups and their income levels which are considers significant to the study. Using four (4) point likert-scale,

respondents were asked about their environmental awareness and its significance. The results from the sample size of 300 respondents with rating of shows that, 91.8% siders environmental issues very serious; 4.1% considers it rather important, while 2.2% and 1.9% considers environment not very important and not important respectively. This signifies a good understanding of the environment around them.

Model specification

Exploratory factor analysis (EFA) is an acceptable statistical tool for computing unobservable variables such as the socioeconomic and environmental factors (Pallant, 2010; Hair, Anderson, Babin, and Black, 2010). EFA conventionally enumerate such that the computed indicators (items used to measure the unobserved latent variables) are expressed as linear combinations of both the underlying common and unique factors (Bartholomew, 2007; Adam, Shamsudin, Sidique, Rahim, and Radam, 2015). The underlying common factors denoted by "f" in Eq. (1) represent the number of latent constructs found to describe the structure of a set of items or variables. Meanwhile, the unique factors represented by "ε" describe the variation in each of the measured variables not explained by the "underlying" factors.

These are commonly referred to as the error divergence.

$$\boldsymbol{Xi = \lambda_{i1} f_1 + \lambda_{i2} f_2 + \ldots + \lambda_{iq} f_q + \varepsilon_i \ (i = 1, 2 \ldots p) \ (1) \ Eq.}$$

Equation (1) denotes a factor analysis for the vectors of *X* observed variables and F underlying common factors such that: $X = (x_1, x_2. \ldots x_p)$, $F = (f_1, f_2, \ldots, f_q)$ and λ is a constant (called factor loadings/weight) denoting the correlation between individual components of x and f. In a more concise form capturing the vectors of *x*, *f,* λ and ε, Eq. (1) could be re-specified as:\

$$\boldsymbol{X = \lambda f + \varepsilon}$$

Where *X* is a matrix of the measured items/variables, f is a matrix of underlying structure (common factors), λ is a matrix of factor loadings, and ε is a matrix of error variance (unique factors). Based on this specification, factor analysis enables the location of each of the sampled individuals within the factor space (f-space) based on their observed values as may be observed in the questionnaire response items (x). Therefore, in the specific application of this study, *x represents* all the 64 distinct indicators of socioeconomic and environmental factor dimensions (x_i) with F representing the dimensions as specified (f_i) respectively as hypothesized in the factor models.

4. RESULTS AND DISCUSSION

Results

The main concern under EFA is the factorability of items in the study. This can be segmented into sample size adequacy, sufficient inter-correlation between items, and existence of both individual and collective items adequacy (Pallant, 2010). Tabachnick *et al*. (2001) suggest that inter-correlations need to be examined to determine the dominance of greater than 0.3 (>0.3) and this has been achieved in this study. While the anti-image correlation matrix is used to determine sampling adequacy of each variable yielding values ranging from lowest of .508 to a maximum of 0.882 were achieved. Equally the EFA analysis was carried out using principal component analysis (PCA) with varimax rotated matrix. While computing PCA values of communality of less than 0.4 were suppressed.

Meeting the above requirement signifies that there's sample adequacy to allow factor analysis. Also the KMO as well as Bertlett's test of sphericity, table 1 shows there's sample adequacy. Since the KMO is 0.771 which is greater than the threshold of 0.6 (ie >0.6) and Bertlett's test sphericity 0.000 which is less than 0.05 (ie <0.05) factorability of variables is assumed appropriate.

Table 1. KMO & Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.771
Bartlett's Test of Sphericity	Approx. Chi-Square	8679.575
	Df	2016
	Sig.	0.000

Source: analysis, 2016

Factor extraction method is the next significant step which includes principal component, maximum likelihood factoring, image factoring, and alpha factoring among others. However, the study adopted the most common, principal component in determining the exact number of factors to be extracted. Determining the number of factors to extract we have to refer to the Eigen values greater than one as well as number of factors above the scree plot elbow.

However, before we do extraction we have to see the results of our parallel analysis which will determine the exact number of factors to be extracted. Table2 below shows factor extraction, where eleven (11) factors. This is because the eigenvalues'

after the seventh factors the eigenvalues from our parallel analysis is higher than the normal eigenvalues.

Table 2. Total variance explained

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.211	14.392	14.392	9.211	14.392	14.392
2	6.087	9.511	23.903	6.087	9.511	23.903
3	3.519	5.499	29.401	3.519	5.499	29.401
4	3.069	4.795	34.196	3.069	4.795	34.196
5	2.636	4.120	38.316	2.636	4.120	38.316
6	2.236	3.494	41.810	2.236	3.494	41.810
7	2.010	3.140	44.950	2.010	3.140	44.950
8	1.970	3.077	48.028	1.970	3.077	48.028
9	1.783	2.786	50.813	1.783	2.786	50.813
10	1.693	2.646	53.459	1.693	2.646	53.459
11	1.572	2.457	55.916	1.572	2.457	55.916
12	1.467	2.293	58.208	1.467	2.293	58.208
13	1.356	2.119	60.327	1.356	2.119	60.327
14	1.287	2.010	62.337	1.287	2.010	62.337
15	1.120	1.750	64.087	1.120	1.750	64.087
16	1.102	1.722	65.810	1.102	1.722	65.810
17	1.057	1.651	67.461	1.057	1.651	67.461
18	1.014	1.585	69.045	1.014	1.585	69.045
19	.975	1.523	70.568			
Extraction Method: Principal Component Analysis.						

Parallel analysis was carried out using the Brian O'Connor 2005. The table below show the random data eigenvalues using component analysis. It indicates that seven factors are to be retained, since the total initial eigenvalues from one to seven is higher than the mean values of parallel analysis, see table 2 and table 3 above and below.

Table 3: Parallel Analysis: Eigenvalues Extracted

Root	Means	Percentile
1	2.12381	2.23101
2	2.01324	2.103441
3	1.93799	1.996042
4	1.8809	1.935567
5	1.82404	1.867303
6	1.77038	1.814617
7	1.72329	1.766367
8	1.67614	1.719692
9	1.63212	1.673352
10	1.5863	1.623115
11	1.54767	1.582772
12	1.5112	1.548636

Source, Brian O'Connor 2005, online computation, 2016.

Discussion of results

Assessment of Normality

The assessing normality of the data is important before undertaking SEM analysis. However, there are disagreements between researchers on the cut off points for skewness and kurtosis. While, some researchers gave the normal distribution with a base of positive and negative signs kurtosis (DeCarlo, 1997; Kline, 2011; West, Finch, & Curran, 1995). However, it appears no consensus reached to date (Kline, 2011), but absolute kurtosis values ranging from ± 2.0 (Byrne, 2013 citing Boomsma & Hoogland, 2001; Muthen and Kaplan, 1985) to ± 7.0 (West et al., 1995) and higher (DeCarlo, 1997) have been proposed as possible early departure points of non-normality. Therefore, in this study, we adopted Byrne (2013) kurtosis which ranged between ± 2.0 to ± 7.0 as cut off point. The skewness of the data falls within -1.968 to -. 439, while kurtosis -1.194 to + 6.040. Although orthogonal rotation, which produce factors that are uncorrelated and this reduces the presence of multicollinearity (Garson, 2013). However, this study carried out the multicollinearty test before the analysis and found to be within an acceptable limits of 1.342 to 2.072 VIF.

On the other hand, the main purpose of conducting EFA was to validate the instruments, because they were not adopted from previous studies. The main concern

under EFA is the factorability of items in the study which can be segmented into; sample size, adequacy, sufficient inter-correlation between items, and existence of both individual and collective items adequacy (Pallant, 2010). Tabachnick and Fidell, (2006) suggest that inter-correlations need to be examined to determine the dominance of greater than 0.3 (>0.3), see appendix A. While the anti-image correlation matrix is used to determine sampling adequacy of each variable yielding value not below 0.5, the study anti-image ranged from 0.06 to 0.88.

EFA analysis was carried out using principal component analysis (PCA) with Promax rotated matrix. While computing PCA values of commonality of less than 0.4 were suppressed. Meeting the above requirement signifies that, there is sample adequacy to allow factor analysis. Also the KMO as well as Bertlett's test of sphericity, table1 shows existence of sample adequacy. Since, the KMO is .771 which is greater than the threshold of 0.6 (ie >0.6) and Bertlett's test sphericity is significant at 0.000 which is less than 0.05 (ie <0.05), therefore, factorability of variables is assumed appropriate.

Therefore, from the results of the study it can said that, the study have achieved its main objective of identifying dimensions of the factors that causes oil pipeline vandalism in the Niger Delta region of Nigeria. In addition, this results justified the existence of a significant relationship between the dependent variable (vandalism) and independent variables. Equally the study has achieved sample size adequacy, because the KMO with a value is 0.771 is greater than the threshold of 0.6 (ie >0.6) signifies that there is sample adequacy to run EFA, also Bertlett's test sphericity of P = 0.000 which is less than 0.05 (ie <0.05) can be accepted since it's below the threshold of 0.05 therefore factorability of variables is assumed appropriate. On the other hand the intercorrelation also achieved the minimum requirement a large number having intercorrelation of .30. That is say a minimum of correlation of 30% between variables have been achieved as suggested by Tabachnick et al. (2001). Failure will signify that issues relating multicollinearity. Furthermore, anti-image correlation matrix which is also used in assessing sample size adequacy is achieved. The results from the study shows that anti-image ranged from lowest of .508 to a maximum of 0.882 were achieved. Since it is expected no variable should have values less that 0.5 and our results shows that the minimum is o.508, therefore sample size have been achieved in this study.

Equally to determine the exact number of factors to be extracted, the study used Kaiser Criterion, scree plot through the use of SPSS and in parallel analysis the study employed Brian O'Connor (see table3). The use of parallel analysis is very important

because both the Kaiser and the scree plot may overestimate the realistic number of components (Pallant, 2010). In trying to obtain interpretable factor pattern the study uses Oblique rotation and Varimax rotation. When Oblique and Varimax failed to give the desired results then Promax rotation was used Equally factors that failed to load up to the minimum requirement of 0.4 were also dropped.

Furthermore, the results from the analysis was carried out using principal component analysis (PCA) with varimax rotated matrix. While computing PCA values of communality of less than 0.4 were suppressed indicates no value of a variable that is less than 0.4 the factor labels are in line with the internal consistency of the factors was assessed using Cronbach's alpha. The alphas were significantly moderate with most of them loading above the threshold. The loadings are as follows: poor governance & vandalism has a loading of .913, underdevelopment .911, black market availability .812, corruption, poor management & unemployment .758, marginalization .799, legal factors .820, political factors .710, environmental degradation .653, unemployment .580 & poverty .710 respectively. This indicates that the likely factor that causes vandalism in the niger delta region are poor governance, underdevelopment, black market availability, unemployment, marginalization, legal factors, political factors and poverty respectively.

5. CONCLUSION

The exploratory factor analysis of this research study indicates that 10 key contributing factors to pipeline vandalism in the Niger delta region of Nigeria. This is because the factors account for more than 70 % of the total variance reducing the unwanted data by 30 %. Kaiser-mayer-ohlin value of 0.771 and Bartlett's test sphericity (0.000) satisfies that FA can be applied for the data. Equally varimax rotation with Kaiser Normalization that was outline 10 factors: The major findings suggest that 48 items scale provides much needed reliable instruments than the 54 items through the Cronbach's alpha correlation coefficient of: 0.913; 0.911; 0.812; 0.758; 0.799; 0.820; 0.710; & 0.710 respectively. Therefore, EFA models has achieved its basic requirements for analysing factors responsible for causing militancy and vandalism in the Niger delta region.

Acknowledgements

This research work is part of a PhD thesis carried out at the university Putra Malaysia (UPM).We therefore wish to acknowledge the contributions of University Putra Malaysia (UPM), TETfund and MAUTECH, Yola.

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Abbreviations

NNPC: Nigeria National Petroleum Corporation
UNEP: United Nations Environmental Programme
NDDC: Niger Delta Development Commission
OMPADEC: Oil Mineral Producing Areas Development Commission
MND: Ministry for Niger Delta
UNDP: United Nations Development Programme
NSDC: Nigeria Security and Civil Defence Corps